MICHAŁ KALECKI

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MICHAŁ KALECKI

VOLUME II

CAPITALISM

Economic Dynamics

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Contents

List of Tables

List of Abbreviations

COMECON (also CMEA)	Council of Mutual Economic Assistance
EUI	European University Institute (Florence)
GUS	Główny Urząd Statystyczny (Main Statistical Office, Warsaw)
IGS	Instytut Gospodarstwa Społecznego (Institute for Social Problems, Warsaw)
ILO	International Labour Organization
ISBCP	Institute for the Study of Business Cycles and Prices (Instytut Badania Koniunktur Gospodarczych i Cen, Warsaw)
KiW	Książka i Wiedza (Educational Books)
NBER	National Bureau of Economic Research
PS	*Przegląd Socjalistyczny*
PWE	Państwowe Wydawnictwo Ekonomiczne (Polish Economic Publishers, Warsaw)
PWN	Państwowe Wydawnictwo Naukowe (Polish Scientific Publishers, Warsaw)
SGPiS	Szkoła Główna Planowania i Statystyki (Main School of Planning and Statistics, Warsaw)

List of Polish Journals

Dziennik Powszechny	*Commoner Paper*
Ekonomista	*Economist*
Koniunktura Gospodarcza	*Business Review*
Koniunktura Włókiennicza	*Textile Business*
Kwartalnik Statystyczny	*Statistical Quarterly*
Oeconomica Polona	
Polish Perspectives	
Polska Gospodarcza	*Polish Economy*
Przegląd Gospodarczy	*Economic Review*
Przegląd Socjalistyczny	*Socialist Review*
Przegląd Socjologiczny	*Sociological Review*
Przemysl i Handel	*Industry and Commerce*
Sprawy Międzynarodowe	*International Affairs*
Zeszyty Naukowe Uniwersytetu Łódzkiego	*University of Lodz Discussion Papers*
Życie Gospodarcze	*Economic Weekly*

Editor's Note

Volume ii of Michał Kalecki's *Collected Works* contains his studies on the theory of income distribution in oligopolistic capitalism, and on its economic dynamics. In accordance with the arrangement of the *Collected Works* as a whole, each part of this book consists of essays devoted to a similar topic; individual papers in each part are arranged in chronological order. However, this rule is not strictly observed in Part 5 which is more diversified.

The editorial principles of this edition are set out in full in the Editorial Note to volume i; they will be only summarized here. Kalecki's texts are published in the final version accepted by the author; important differences between successive versions of the same paper are noted in editorial comments.

Kalecki's footnotes—numbered consecutively through each paper—appear at the foot of the relevant page. Editorial comments—numbered consecutively within square brackets through each paper—are placed at the end of the volume. Cross-references to editorial notes also have the number set within square brackets. The first editorial note on each paper contains information on its original publication, its reprints, revisions, and translations, and usually also some brief information on the background of the paper in question and the discussions associated with it; these notes are therefore of a fairly general nature. Any subsequent editorial notes refer to more specific questions. Annexes, also placed at the end of the volume and meant as supplements to the main texts, contain the more important polemical statements, extensions, or explanations by Kalecki or others, directly connected with a given work. In order to avoid repetition, the editorial note relating to the first essay in each part of the volume is even more general, providing, among other things, information about the relationship of Kalecki's ideas, developed in the essays included in that part, to the ideas of contemporary economic theory.

In the 'Editorial Comments and Annexes', Kalecki's own writings are printed in larger type than the rest of the material in this section, except for occasional short quotations, used in editorial material to clarify the context, which are left in smaller type.

The editorial notes make use of verbal information obtained from Mrs Adela Kalecki and from Kalecki's friends and associates, as well as their notes and reminiscences, and the correspondence which has survived in Kalecki's papers, and/or which was made available to me by other people. I am grateful to all who have contributed in this way to the editorial matter in this volume.

I sincerely thank Stanisław Braun, Helena Hagemejer, Włodzimierz Hagemejer, Cezary Józefiak, Tadeusz Kowalik, Mieczysław Nasiłowski, Władysław Sadowski, Adam Szeworski, and the late Józef Zagórski for their comments on the earlier versions of the editorial matter in the Polish edition of this volume. I thank the Director and the staff of the Library of the Main School of Planning and Statistics in Warsaw for their very great assistance in making use of the library's collections.

I also wish to thank Professor J. R. Stone, who in February 1976 gave me a folder of papers and documents: 'Kalecki's Investigation for the Cambridge Research Scheme into Price, Costs, Proceeds and Output', which has been used in the editorial notes on Kalecki's paper 'The Supply Curve of an Industry under Imperfect Competition'.

Finally, I wish to thank those English-language publishers of Kalecki who generously granted permission to reprint essays in the *Collected Works*. More specific acknowledgements are made in the editorial notes.

The main body of this volume differs from volume ii of the Polish edition of Kalecki's works in that it contains the whole of *Studies in Economic Dynamics*; moreover, in updating and revising the editorial matter, it has been possible to include newly available material such as the correspondence between John Maynard Keynes, Joan Robinson, and Piero Sraffa and Kalecki.

J. O.

Warsaw
March 1988

PART 1

FACTORS IN THE DISTRIBUTION OF NATIONAL INCOME

The Determinants of Distribution of the National Income[1]
(1938)

In the present paper we try to investigate both statistically and analytically the problem of the relative share of manual labour in the national income. There are two reasons why we do not consider the total share of labour, although it would be more interesting from the social point of view. (i) The statistics of national income include in the salaries the incomes of directors, managers, etc., which should rather be placed under the heading of profits. In this way, what statistics give as the total share of labour does not correctly represent the distribution of the product of industry between profits and interest on the one hand and wages and salaries on the other. (ii) The relative share of *manual labour* in the national income is more suitable for theoretical analysis.

It must be added that we shall deal here with the relative share of manual labour not in net but in *gross* income, by which is meant the income before deduction of maintenance and depreciation. (Gross income = net income + maintenance and depreciation.) The reasons for this are again both 'technical' and theoretical. (1) The statistics of gross income are much more reliable than those of net income; the latter are based on the net incomes of firms whose allowance for depreciation[1] is certainly more or less arbitrary. In adding to the net national income aggregate depreciation, as given by the firms' accounting, we obtain gross income free from this arbitrariness. (2) It is the share of manual labour in the *gross* national income which—as we shall see below—*ex natura rei* can be more easily treated theoretically.

The Statistical Data

1. The figures for Great Britain are based on Professor A. L. Bowley's *The Change in the Distribution of the National Income*,

[1] For the sake of brevity we shall speak throughout the paper of 'depreciation' instead of 'maintenance and depreciation'.

Table 1. *Relative Share of Manual Labour in the National Income of Great Britain, 1880–1928*

	1880	1911	1913	1924	1925	1926	1927	1928
In net income (Bowley)	43.5	—	39.3	—	—	—	—	—
In gross income (Clark)	—	36.5	—	38.2	37.5	37.0	38.3	38.2

	1929	1930	1931	1932	1933	1934	1935
In net income (Bowley)	—	—	—	—	—	—	—
In gross income (Clark)	37.3	36.5	38.6	38.0	37.5	37.3	36.7

1880–1913 (Oxford, n.p., 1920), and Mr Colin Clark's *National Income and Outlay* (London, Macmillan, 1937).

Using Professor Bowley's data on the distribution of national income (p. 16) and deducting from total income the interest from overseas (mentioned on p. 25), we obtain the relative share of manual labour in home-produced income: 43.5% in 1880, and 39.3% in 1913. (It is the distribution of home-produced income in which we are interested.) The above figures are shares in net income—Professor Bowley does not give data on depreciation and gross income. The rate of increase of gross income in that period, however, is unlikely to differ much from that of net income: the proportion of depreciation to net income in 1913 was only about 8%, and the volume of capital equipment and national income in 1913 and 1880 show that this percentage could not have undergone a great change within this period.[2] Thus the relative share of manual labour in gross income altered within the period in question similarly to that in net income.

The figures for 1911 and 1924–35 are obtained on the basis of Colin Clark's data on 'Distribution of Income between Factors of Production, 1911 and 1924–35' (*National Income and Outlay*, p. 94) and depreciation (pp. 86, 169). The relative shares here calculated differ from those given by Mr Clark (p. 94) only in that they are taken in relation to *gross* home-produced income (see Table 1).

We see that the relative share of manual labour in the national income in Great Britain declined moderately between 1880 and 1913, and showed a remarkable stability between 1913 and 1935, both in the long and in the short term.

2. The figures for the USA are based on W. I. King, *The National Income and Its Purchasing Power, 1909–1928* (New York, NBER, 1930) and a recent estimate of national income and depreciation by S. Kuznets.[2]

The relative shares of manual labour in the net national income in 1909 and 1928 are, according to King, 33.7% and 32.4%.[3] Also here

[2] The real capital per head increased by about 25%, the real income per head by about 40% (see Clark, *National Income and Outlay*, pp. 273 and 232) while the rate of depreciation was probably to some extent higher in 1913 than in 1880.

[3] *The National Income*, p. 80. We have excluded from income the services of durable consumer goods which King treats as a part of national income (he calls this part 'imputed income'). We have also excluded from King's figures for wage income that of shop assistants, which we treat throughout (according to Clark) as salaries.

the change of relative shares in gross income is probably not very different.

For the period 1929–35 (most interesting from the standpoint of short-period analysis), Dr Kuznets's estimates are used. These estimates, however, give separate figures of wages and salaries only for selected industries (manufacturing, mining, construction, and transport). Thus here we could only calculate the share of manual labour in the income of this part of the US economy. But in spite of this the figures obtained are quite valuable for our investigation. For a section of a national economy can of course be treated as an open economic system, and in our theoretical analysis we do not suppose the system to be closed. (Otherwise the figures concerning the English national income could not be taken into consideration either.)

We obtained the gross income of 'selected industries' by adding to their 'income produced'[4] the depreciation estimated by Dr Kuznets in *Gross Capital Formation.*[5] The relative shares of manual labour in this gross income are given in Table 2.

Here, too, the long-run change between 1909 and 1928 is very small. Fluctuations in the period 1929–35, however, are much greater than in Great Britain, no doubt owing to the violent disturbances in the US economy while the depression in Great Britain was relatively mild.

Table 2. *Relative Share of Manual Labour in the National Income of the USA, 1909–1935*

	1909	1928	1929	1930	1931	1932	1933	1934	1935
In net national income (King)	33.7	32.4	—	—	—	—	—	—	—
In gross income of manufacturing, mining, construction, and transport (Kuznets)	—	—	40.0	42.2	42.0	41.0	37.8	39.5	39.5

[4] *Survey of Current Business*, May 1936.

[5] Pp. 11 and 12. Depreciation and maintenance is estimated here for the whole economy (dwelling houses excluded), but as a matter of fact it can be almost totally attributed to manufacturing, mining, construction, and transport. Mr Kuznets has afterwards corrected these figures, and we introduce these corrections as given in Mr Keynes's note, *Economic Journal*, Sept. 1936. For 1934 and 1935 we were obliged to make our own rough estimates by means of interpolation.

With the exception of 1933, however, the divergence from the average is not great.

As we see on the basis of statistical data, the relative share of manual labour in gross income shows only small changes both in the long and in the short term. We shall try to explain this 'law' and to establish conditions under which it is valid.

The Degree of Monopoly and the Distribution of the Product of Industry

Let us consider an enterprise with a given capital equipment which produces at a given moment an output x and sells it at price p.[6] The short-period marginal cost m (i.e. the cost of producing an additional unit of product with a given capital equipment) is made up of the sum of the short-period marginal costs of: depreciation d_m (caused by greater use of equipment), salaries s_m, wages w_m, and raw materials r_m:

$$m = d_m + s_m + w_m + r_m$$

At the same time, the price is equal to the sum of the corresponding average costs d_a, s_a, w_a, r_a and the average capitalist income (profit and interest) c_a per unit of output:

$$p = c_a + d_a + s_a + w_a + r_a$$

We subtract the first equation from the second and obtain:

$$p - m = c_a + (d_a - d_m) + (s_a - s_m) + (w_a - w_m) + (r_a - r_m) \quad (1)$$

Following Mr Lerner,[7] we shall call the degree of monopoly of the enterprise μ, the ratio of the difference between price and marginal cost to price, or:

$$\mu = (p - m)/p$$

If marginal cost is equal to marginal revenue, μ is equal to the inverse of the elasticity of demand for the product of the enterprise. Substituting $p\mu$ for $p - m$ in equation (1), and multiplying both sides

[6] We mean here by p the 'net price', i.e. the revenue per unit of product after deduction of advertising costs, etc.

[7] 'The Concept of Monopoly and the Measurement of Monopoly Power', *Review of Economic Studies*, 1, June 1934, pp. 157–75.

by the output x, we get:

$$xp\mu = xc_a + x(d_a - d_m) + x(s_a - s_m) + x(w_a - w_m) + x(r_a - r_m)$$

Such an equation can be written for each enterprise of an economy (or any of its sections). By adding the equations for all enterprises we obtain:

$$\Sigma xp\mu = \Sigma xc_a + \Sigma x(d_a - d_m) + \Sigma x(s_a - s_m) + \Sigma x(w_a - w_m) + \Sigma x(r_a - r_m) \quad (2)$$

The sum Σxc_a is nothing other than the aggregate net capitalist income C. Further, in a great majority of enterprises marginal depreciation d_m is small in comparison with average depreciation d_a; thus $\Sigma x(d_a - d_m)$ can be represented by $D(1 - \alpha)$ where D is the aggregate depreciation and α a small positive fraction. For similar reasons $\Sigma x(s_a - s_m)$ can be represented by $S(1 - \beta)$ where S is the aggregate salary and β a small positive fraction.

We are now going to examine the member $\Sigma x(w_a - w_m)$. The shape of the average wage cost curve differs in various types of enterprise. In most industries the average cost of manual labour falls slowly, remains constant, or rises slowly until full employment in two shifts of six days a week is reached. In the second type of enterprise, the average wage cost falls rather sharply before this point is attained (railways). In the third type, a sharp rise of average wage cost begins relatively early (agriculture and mining). If we consider now an economy in which: (i) the second and third type do not produce a large percentage of turnover; (ii) most enterprises of the first two types do not exceed full employment in two shifts six days a week; then the sum $\Sigma x(w_a - w_m)$ is likely to be small in comparison with the aggregate wage W. Indeed, the greatest part of income is produced under conditions of slowly changing manual-labour cost, and thus by enterprises for which $w_a - w_m$ is small in relation to W. For the second and third type this difference is not so small in comparison with W, and positive or negative respectively. Since neither of the latter types produces a large proportion of aggregate turnover Σpx, it will be easily seen that the sum $\Sigma x(w_a - w_m)$ is probably small in comparison with W. It can thus be represented by γW where γ is a small positive or negative fraction.

As concerns the average cost of raw materials, it can be supposed approximately constant, and consequently the sum $\Sigma x(r_a - r_m)$ can be neglected as being near to 0.

On the basis of the above assumptions, which seem to hold good for highly developed industrial economies, we can write equation (2) as follows:

$$\Sigma xp\mu = C + D(1 - \alpha) + S(1 - \beta) + \gamma W$$

or

$$\Sigma xp\mu = (C + D + S) - (D\alpha + S\beta - \gamma W)$$

where α, β, and γ are small fractions.

Now it is obvious that both αD and βS are small in relation to $C + D + S$; but the same can be said about γW since, as the statistical data quoted above show, W is less than half of the gross income Y and thus less than $Y - W = C + D + S$. We can consequently conclude that $\alpha D + \beta S - \gamma W$ is also small in comparison with $C + D + S$, and therefore:

$$\Sigma xp\mu = C + D + S$$

can be regarded as a good approximation. Now let us divide both sides of this equation by the aggregate turnover $T = \Sigma xp$.

$$\frac{\Sigma xp\mu}{\Sigma xp} = \frac{C + D + S}{T}$$

The expression on the left-hand side of this equation is nothing other than the weighted average of the degree of monopoly μ which we shall denote by (μ). We have thus the following proposition: *The relative share of gross capitalist income and salaries in the aggregate turnover is with great approximation equal to the average degree of monopoly:*

$$\frac{C + D + S}{T} = (\mu)^{8} \quad (3)$$

How is it Possible for the Degree of Monopoly to Determine the Distribution of the Product of Industry?

1. The results obtained in the last section may seem paradoxical. In the case of free competition, the average degree of monopoly (μ) is equal to zero; thus equation (3) seems to show that free competition

[8] This formula will also be valid for a section of a national economy if the basic assumptions are fulfilled. This will clearly be the case for the set of 'selected industries' in the USA (see pp. 5–7), including manufacturing, mining, construction, and transport.

makes it impossible not only to earn profits and interest, but even to cover depreciation and expenses for salaries—all gross income being absorbed by wages. This paradox is, however, only apparent. Formula (3) can be correct merely when the assumptions on which it is based are fulfilled. According to these assumptions: (i) The short-period marginal-cost curve does not differ considerably in the majority of enterprises from the short-period average-cost curve of manual labour and raw materials—up to a certain point (where full employment of the factory in two shifts of six days a week is reached). (ii) The output in these enterprises is mostly below this point. These assumptions are quite realistic, but such a state of affairs is possible only with the existence of monopoly or imperfect competition. If free competition prevails, the second condition cannot be fulfilled: enterprises must close down or maintain such a degree of employment that the marginal cost is higher than the average cost of manual labour and raw materials. In the real world an enterprise is seldom fully employed in two shifts of six days a week, a fact which is therefore a demonstration of market imperfection and widespread monopolies. And our formula, though quite realistic, is not applicable in the case of free competition.

The second question which may be raised is of a more complex character. Since, according to our formula, the distribution of the product is at every moment determined by the degree of monopoly, it therefore holds both for the short period and in the long run. The formula was, however, deduced on the basis of, so to speak, pure short-period considerations. And neither the elasticity of substitution between capital and labour nor inventions, contrary to the prevailing opinion, have any influence on the distribution of income.

The answer is as follows. (i) The long-period analysis of distribution is generally conducted on a basis of over-simplified representation of output as a function of only two variables—capital (taken in the abstract) and labour. In this way, the short-period cost curves are—as we shall see at once—excluded artificially from this analysis. (ii) On the basis of our assumptions, these curves have a special shape which makes for the elimination of factors other than the degree of monopoly from the mechanism of distribution. To clarify the problems concerned, we shall now consider the dependence of long-run distribution of the product of industry on the shape of the short-period cost curves.

2. A particular commodity can be produced with various types of equipment requiring more or less labour and raw materials per unit of product. The conditions of production are, however, determined not only by the choice of the type of equipment but also by its use. Not only may the kind of machinery be varied, but it is also, for example, possible to work with the same machinery in one or two shifts.

Let us assume for a moment free competition and draw, for each alternative type of equipment which can be applied in the production of the commodity considered, a short-period marginal-cost curve and a short-period average-cost curve of manual labour and raw materials (Fig. 1). The shaded area in the figure then represents the value of net capitalist income, depreciation, and salaries, while the unshaded area, *LMN*0, represents the cost of manual labour and raw materials.

To determine the position of long-period equilibrium, we define first for each type of equipment the level of prices at which the shaded area covers salaries, depreciation, interest, and normal profit (i.e. the rate of profit at which the industry in question neither expands nor contracts). We shall call this price the normal price attached to a given type of equipment, and the corresponding use of this equipment, its normal use.[9] From all types of equipment we choose that to which the lowest normal price is attached. It is easy to see that the normal use of

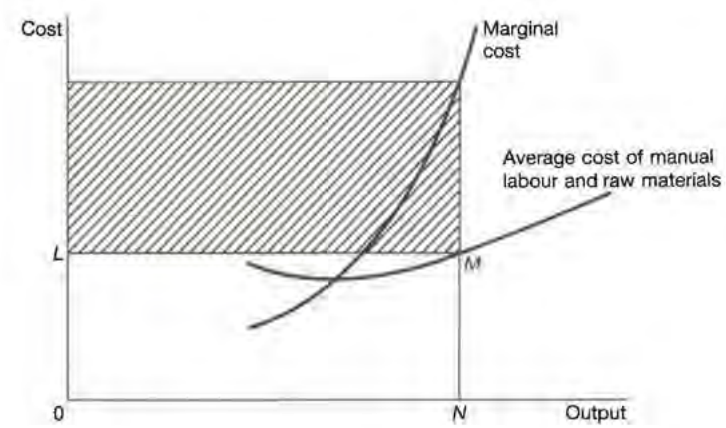

Fig. 1

[9] It is easy to see that with free competition the normal use coincides with so-called optimum use.

this type of equipment represents the long-run equilibrium. It is clear now that the shape of the short-period marginal-cost curves corresponding to various types of equipment influences the formation of long-run equilibrium.

If some change in basic data takes place—e.g. the rate of interest alters or new invention occurs—the long-run equilibrium is shifted; a new type of equipment is used in a 'normal' way, and in general the relation of shaded and unshaded areas will be different from that in the initial position. This is quite in accordance with the prevailing long-run theory of distribution. We shall see, however, that such is not the case with the peculiar shape of marginal-cost curves assumed in the deduction of formula (3) and if we admit, instead of free competition, a certain given degree of monopoly.

We take for granted that the short-period marginal-cost curve does not differ appreciably from the average-cost curve of manual labour and raw materials, below point A (Fig. 2). We represent them thus by the same thick curve PMB. With a given degree of monopoly the relation of price and marginal cost is a constant $1/(1-\mu)$. Thus if output remains below $0A$ the price corresponding to it is represented by the curve QRC, whose ordinates are proportional to those of the curve PMB.[3] The ratio of shaded area, representing profits, interest, depreciation, and salaries, to the unshaded area, representing wages and cost of raw materials, is equal to $\mu/(1-\mu)$.

We define in exactly the same way as before the normal use for each type of equipment as that at which normal profit is earned. The long-run equilibrium is again represented by the normal use of such a type

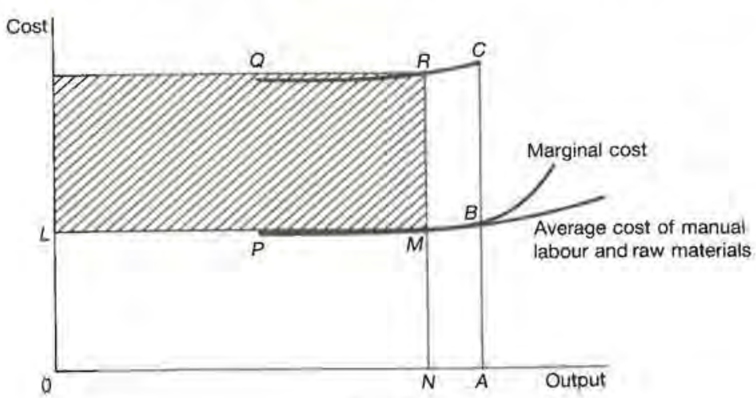

FIG. 2

of equipment that—with a given degree of monopoly—it is impossible to earn profits higher than normal in employing plants of a different type. If the basic data alter, the new long-run equilibrium is represented by the normal use of a different type of equipment. The long-run equilibrium price of the product alters too, but not its relation to the average cost of manual labour and raw materials, since for all types of equipment the marginal-cost curve coincides with the average-cost curve of manual labour, and the degree of monopoly (which is equal to the relation of price to marginal cost) is supposed to be given. In that way the distribution of the product among factors, as expressed by the relation of the shaded and the unshaded area, remains unaffected by changes of basic data so long as the degree of monopoly is unaltered and the use of equipment in long-run equilibrium does not reach point A.

The change of basic data may, of course, also influence the degree of monopoly. For instance, a change in the rate of interest or technical progress affects the size of the enterprise which is essential for the degree of monopoly. (The variation of the scale can be treated as a special case of variation of the type of equipment.) In that way such changes influence the distribution of income; but this is not in contradiction with our results, because it is the channel of the degree of monopoly through which this influence makes itself felt.

Distribution of the National Income

1. Our proper task is to find the relative share of wages W in the national income Y. Since Y is equal to the sum of capitalist income C, depreciation D, salaries S, and wages W, it amounts to the same as to find the determinants of $(C+D+S)/Y=(Y-W)/Y$. In multiplying each side of the equation

$$\frac{C+D+S}{T}=(\mu)$$

by the ratio of turnover T and gross income Y we obtain:

$$\frac{C+D+S}{Y}=(\mu)\frac{T}{Y}$$

Thus it is the degree of monopoly (μ) and the ratio of turnover to income which determines the distribution of income.[4]

On the basis of Mr Colin Clark's data[10] there was in the manufacturing industries of Great Britain in 1934:

$$(\mu) = 0.23; \quad \frac{T}{Y} = 2.3; \quad \frac{C + D + S}{Y} = 0.23 \times 2.3 = 0.53$$

I ventured to make a rough estimate (based also on Mr Clark's data) for the entire economy of Great Britain, and obtained:

$$(\mu) = 0.30; \quad \frac{T}{Y} = 2.1; \quad \frac{C + D + S}{Y} = 0.30 \times 2.1 = 0.63$$

2. The factors (μ) and T/Y are not independent: a change in the degree of monopoly influences the ratio of turnover to income. As we shall see on the basis of a numerical example, a rise (fall) of the degree of monopoly causes a decrease (increase) of T/Y but in a lesser proportion.

We shall consider for our purpose an economy producing its output in two stages: in the first, semi-manufactured goods are produced from foreign raw materials; in the second, the former are worked up into finished commodities. Let the numerical scheme of production be as shown in Table 3.

The degree of monopoly is:

$$(\mu) = \frac{C + D + S}{T} = \frac{6}{24} = 0.25$$

and the relation of aggregate turnover to aggregate income:

$$\frac{T}{Y} = \frac{T}{W + (C + D + S)} = \frac{24}{6 + 6} = 2.0$$

Table 3. *Price Structure and Output at a Given Degree of Monopoly*

	Raw materials	Wages	Profits, interest, depreciation, salaries	Turnover
1st stage	4	2	2	8
2nd stage	8	4	4	16
Total	12	6	6	24

[10] *National Income and Outlay*, pp. 132, 133.

Table 4. *Price Structure and Output at an Increased Degree of Monopoly*

	Raw materials	Wages	Profits, interest, depreciation, salaries	Turnover
1st stage	4	2	2.27	8.27
2nd stage	8.27	4	4.65	16.92
Total	12.27	6.00	6.92	25.19

Let us now suppose that the degree of monopoly has changed at all stages by 10%. Our scheme will then alter as shown in Table 4.

The degree of monopoly is now (in accordance with the assumption of a 10% change):

$$(\mu) = \frac{6.92}{25.19} = 0.275$$

and the ratio of turnover to income:

$$\frac{T}{Y} = \frac{25.19}{6.00 + 6.92} = 1.95$$

Thus the ratio of turnover has diminished by 2.5% as a result of the 10% increase in the degree of monopoly.

We can now conclude that the relative share $(C + D + S)/Y$ increases *ceteris paribus* with the rise of the degree of monopoly but in a lesser proportion than the latter. (In the example above, $(C + D + S)/Y$ increased from $6/(6 + 6) = 0.5$ to $6.92/(6.00 + 6.92) = 0.536$, i.e. by 7.2% as a result of the 10% increase of (μ).)

3. Changes in T/Y can, of course, be caused by influences other than a change in (μ). A change in the price of 'basic raw materials'—i.e. of products of agriculture and mining in relation to wages in other industries—will clearly also have an important influence. It is easy to see on the basis of our scheme that the ratio of turnover to income increases (decreases) with the rise (fall) of the prices of basic raw materials in relation to wages, but in a much smaller proportion.

Let us suppose that the raw materials manufactured in the first stage (we assumed them to be of foreign origin) become 50% dearer, wages (and the degree of monopoly) remaining unaltered. Then our scheme alters as shown in Table 5. And:

$$\frac{T}{Y} = \frac{30.23}{6.00 + 7.56} = 2.23$$

Table 5. *Price Structure, Output, and Degree of Monopoly at Increased Prices of Raw Materials*

	Raw materials	Wages	Profits, interest, depreciation, salaries	Turnover
1st stage	6	2	2.67	10.67
2nd stage	10.67	4	4.89	19.56
Total	16.67	6.00	7.56	30.23

Thus, as the effect of the 50% rise in price of 'basic raw materials' in relation to wages, the ratio T/Y has risen from 2.0 to 2.23, i.e., by only 11.5%.

Since the degree of monopoly has remained constant, $(C + D + S)/Y$ has of course increased in the same proportion (from $6/(6 + 6) = 0.5$ to $7.56/(6.00 + 7.56) = 5.58$). It may at first seem paradoxical that the rise in price of foreign raw materials causes an increase in the relative share of capitalist incomes, depreciation, and salaries, and thus a fall in the relative share of wages. But since the rise in prices of foreign raw materials increases the turnover T, and with a given degree of monopoly $C + D + S$ constitutes a constant percentage of T, $C + D + S$ also must increase, while the wage bill remains by assumption unaltered.

4. We have seen that (i) the rise of the degree of monopoly causes a less than proportional increase of $(C + D + S)/Y$ (in our example 10 and 7.5% respectively); (ii) the rise in price of 'basic raw materials' in relation to wages also causes an increase of $(C + D + S)/Y$ but in a *much* smaller proportion (in our example 50 and 11.5% respectively). Thus we can find here some reasons for the tendency of relative shares towards stability. Indeed, the degree of monopoly does not undergo violent changes either in the long run or in the short run. The fluctuations in prices of basic raw materials in relation to wages, though strong, are only slightly reflected in the changes of relative shares. But, of course, in the most unfavourable case of joint action of these factors, the changes of the relative shares may be appreciable; if, for instance, in our scheme the degree of monopoly increases by 10% and the basic raw materials become 50% dearer, $(C + D + S)/Y$ increases by about 20%. We shall see below that the remarkable stability of the relative shares which we notice in statistics is the result

of these determinants working in opposite directions. This phenomenon occurred only by chance during the long period considered, and may cease in the future; while in the business cycle there seems to be a steady tendency for the conflict of two forces to keep the fluctuation of relative shares within a rather narrow field.

Changes in the Distribution of National Income in the Long Run

1. The degree of monopoly has undoubtedly a tendency to increase in the long run because of the progress of concentration. Many branches of industries become oligopolistic; and oligopolies are often transformed into cartels.

As concerns the secular trend of the ratio of turnover to income under the influence of changes in the relation of prices of basic raw materials to wages, it is difficult to say anything definite a priori.

2. As we saw in the first section, the relative share of manual labour in the national income of Great Britain has fallen between 1880 and 1913 from 43 to 39%, and thus the relative share of capitalist incomes, depreciation, and salaries has risen from 57 to 61%. The relation between Sauerbeck's index of wholesale prices and Mr Clark's index for deflation of national income has not changed (between 1880 and 1913 both Sauerbeck's and Clark's indices[11] increased by 6%). Thus the relation T/Y has not altered, and the degree of monopoly must have increased in the same proportion as the relative share of capitalist incomes, depreciation, and salaries in the national income (i.e. by 7% if the figures are precise).

Between 1913 and 1935 we do not see any appreciable change in the relative shares, but the degree of monopoly increases considerably. Indeed, Sauerbeck's index has fallen during that time by 2%, while 'income prices'[12] have risen by about 60%. Of course Sauerbeck's index is not suitable for representing 'turnover prices', since the weight of raw materials in it is too large and that of finished goods too small; but this divergence is sufficient to show that there was a considerable change in T/Y because of the relative fall in the prices of raw materials. I have tried to make a rough estimate of the rise of T/Y, and I think it is unlikely to be less than 10–15%. Thus the degree of

[11] *National Income and Outlay*, pp. 231 ff. [12] Ibid., pp. 235, 204.

monopoly has increased between 1913 and 1935 more than between 1880 and 1913. The only reason why the relative shares have not changed during the last 20 years is the sharp fall in the prices of basic raw materials. (Between 1930 and 1935 the increase in the degree of monopoly in Great Britain seems to have been especially strong.) Should a fall in price of basic raw materials not have happened during the period considered, the relative share of capitalist income, depreciation, and salaries in gross income would have risen during the last 20 years from 63 to 70% at least, a change which amounts to a fall in the share of manual labour from 37 to 30%. Had this been so, it is obvious that the economic and political face of Great Britain now would be quite different.

The development in the USA between 1909 and 1928 is similar. The relative shares were approximately stable, while the value of T/Y appreciably diminished. The wholesale all-commodity index increased by about 45%, and King's index of 'income prices' by about 80%. Thus, here again the degree of monopoly must have risen considerably, but the influence on the relative shares was counterbalanced by the relative fall in the price of basic raw materials.

It is, of course, not at all certain that in the future the rise of the degree of monopoly will continue to be compensated by a fall in the price of basic raw materials. If it fails to do so, the relative share of manual labour will tend to decline.

Changes in the Distribution of National Income during the Business Cycle

1. We shall examine first the changes which the ratio of turnover to income T/Y undergoes during the business cycle as a result of changes in the price of basic raw materials in relation to wages.

The prices of produce of agriculture and mining fluctuate much more strongly than the cost of labour in other industries. This is due to the fact that marginal-cost curves in agriculture and mining, as distinct from other sectors of the economy, slope steeply upwards. In addition, wages in agriculture fluctuate much more strongly during the business cycle than in other branches of the economy. The rise (or fall) in the price of basic raw materials relative to labour cost causes, as was shown above, an increase (or decrease) in value of T/Y. Thus the value of T/Y must rise in the boom and fall in the slump.

Much more complicated is the question of the changes of degree of monopoly in the trade cycle. It was recently admitted by Mr Harrod that the degree of monopoly increases in the boom and falls in the slump. In the slump, consumers 'resent and resist the curtailment of their wonted pleasures . . . Their efforts to find cheapness become strenuous and eager. Nor are commercial firms exempt from this influence upon their purchase policy; they too have received a nasty jolt and must strain every nerve to reduce costs.'[13] Thus the imperfection of the market is reduced and the degree of monopoly diminished.

Mr Harrod was rightly criticized in that there exist other factors which influence the degree of monopoly in the opposite direction. For instance, in the slump, cartels are created to save profits,[14] and this of course increases the degree of monopoly, while they are afterwards dissolved in the boom because of improving prospects of independent activity and the emergence of outsiders. It must be added that the fall in price of raw materials in the slump creates among the entrepreneurs a reluctance to 'pass it on to the buyer', and this too, of course, increases the degree of monopoly. And it can be stated, on the basis of data quoted above, that the influence of these factors in raising the degree of monopoly during the slump is stronger than that of the diminishing imperfection of the market.

If we look at our data on relative shares, we see that in general they do not change much during the business cycle, and in any case there is no clear tendency for the relative share of manual labour to rise during the slump. But the relative share of capital income, depreciation, and salaries in the total income is equal to $(\mu)T/Y$. Thus, if the value of this expression does not fall in the slump while T/Y does as a result of the fall in the price of basic raw materials relative to wages, the degree of monopoly must have the tendency to *increase* in the slump and fall in the boom.[5]

We see now that, as already mentioned, the apparent stability of relative shares in the cycle is in reality the effect of the opposite changes of (μ) and T/Y.

2. We shall now examine the special problem of the influence of changes in money wages on the distribution of national income.

Wage-cutting is likely to increase to a certain extent the degree of monopoly, because a tendency may exist *not* to pass it on to the buyer. As concerns the ratio of turnover to income, the all-round reduction of wages by the same percentage in a closed economy leaves the latter,

[13] *The Trade Cycle*, Oxford, Oxford Univ. Press, 1936, pp. 86–7.

[14] Joan Robinson, review of J. F. Harrod, *The Trade Cycle*, *Economic Journal*, 46, 1936, pp. 690–3.

of course, unaffected. But in an open economy this is not the case. The reduction of wages in Great Britain, e.g. by importing most basic raw materials, must cause a rise of T/Y. Thus both (μ) (probably) and T/Y (in an open economy importing raw materials) will be increased by the reduction of wages, and consequently so will the relative share of capitalist income, depreciation, and salaries; or, what amounts to the same thing, the relative share of manual labour will be reduced.

These results may be of some importance for the interpretation of the Keynesian theory of wages. This theory states, broadly speaking, that the reduction of money wages in a closed system (the rate of interest being kept constant) causes a proportional fall in prices while employment remains unaltered; for an increase in employment and income must raise the volume of saving, and this must be accompanied by a rise in the volume of investment—which is, however, unlikely to occur. If we take into account, however, that the degree of monopoly increases as a result of wage reduction, which, as we stated above, is likely to happen, and thus the distribution of income is changed to the disadvantage of manual workers, then the same volume of investment corresponds to a lower level of employment; for the same amount can now be saved out of a smaller income. In Keynesian terms this may be expressed by saying that the fall in money wages lowers the propensity to consume by increasing the degree of monopoly, and in consequence tends to reduce employment.[15]

If we pass from a closed to an open system, a fall in money wages may cause an increase in the balance of trade and thus in foreign investment, and this of course raises employment. But it follows from what we have shown above that this is not the only influence appearing in an open system. For in a country importing raw materials, the ratio of turnover to income will increase, and this causes a change of distribution to the disadvantage of manual workers, and consequently reduces the propensity to consume. Thus if we 'open' the system there will be two opposite forces at work, and it is by no means clear in what direction they will push employment.

[15] Mr Keynes also considers the possibility of wage reductions influencing the propensity to consume but on other lines—e.g. by causing a shift of income from entrepreneurs to rentiers. *General Theory*, p. 262.

Money and Real Wages[1]
(1939)

I. Theory

The 'classical' theory of wages

1. The assumptions of the 'classical' theory of wages may be subdivided into two categories:

(i) The assumption of perfect competition and of the so-called 'law of increasing marginal costs'. The consequence of this assumption is the association of the rise in employment with a decline in real wages.
(ii) The assumption of a given general price level or a given value of the aggregate demand, from which it follows that real wages change in the same direction as money wages.

Now, the cut in money wages being followed by a decline in real wages, and the latter being associated with a rise in employment, the reduction in money wages leads, according to the 'classical' theory, to an increase in employment.

Before a critical appreciation of these assumptions we shall describe them in some detail.

2. Let us start from the law of increasing marginal costs and perfect competition. Imagine an establishment with a given capital equipment which produces 100 units of a certain commodity. By increasing employment slightly it may produce 101 units. Now the additional cost of producing the 101st unit, consisting mainly of the cost of raw materials and wages, is called the marginal cost at the level of production equal to 101.

According to the 'law of increasing marginal costs', the marginal cost, i.e. the cost of producing the last unit, rises with the level of output obtained from a given capital equipment. This law will appear to many readers not too plausible, and rightly so: whereas in agriculture a disproportionately higher input of fertilizers and labour is required in order to increase the yield, in an industrial establishment the marginal cost starts to rise spectacularly only when maximum utilization of equipment is approached—which happens to be rather an exception.

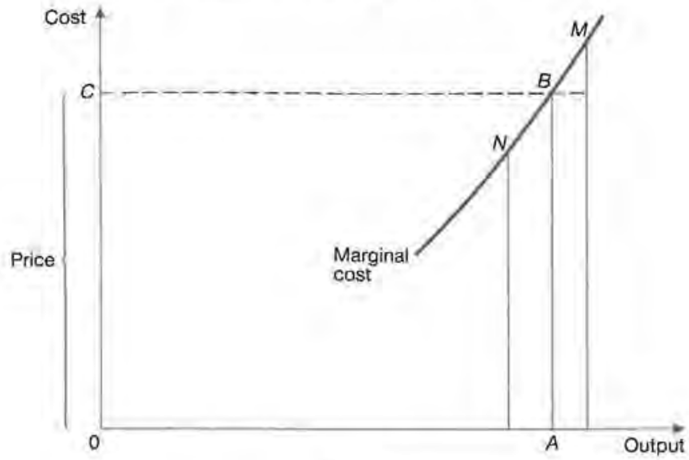

FIG. 3

We shall examine critically the 'law of increasing marginal costs' in the subsequent sections, while at present we shall concentrate on its consequences.

Let us consider a system of perfect competition where a single entrepreneur disregards the fact of 'spoiling the market' through his increasing the supply, but considers the price as given. It will be easily seen that the output of an establishment will be pushed up to the point where the marginal cost is equal to the price (on Fig. 3 this level of output is $0A$).

Indeed, once the entrepreneur increases his output, the marginal cost is higher (according to the law of increasing marginal costs) and therefore the cost of production of the last unit exceeds the price (point M is above the straight line CB), and as a result a cut in production will ensue. If, however, the production is below the level at which the price is equal to the marginal cost, the last unit produced yields more than the additional cost involved (point N is situated under the horizontal line CB), and therefore the output will be expanded. The equilibrium is reached when the marginal cost is equal to the price.

3. Let us now consider a closed economic system. It may be easily shown that, if we assume the law of increasing marginal costs, the aggregate output can expand given the level of wages, provided only that the prices of the commodities produced rise. Indeed, on this assumption the increase in output is associated—given the level of

wages and prices of raw materials—with an increase in marginal costs which must be 'covered' by the rise in prices. But higher prices of finished goods with given wage rates are tantamount to the fall in real wages which will thus accompany the expansion of output.

We have not taken into consideration so far a factor which will exert an additional pressure on real wages. We assumed the prices of raw materials to be given, while in fact, with the increase in production and thus in the demand for raw materials, the prices of the latter will rise in accordance with the law of increasing marginal costs. This will affect the prices of finished goods additionally, and as a result the reduction in real wages associated with the increase in production will be proportionally greater.[1]

On the assumption of the law of increasing marginal costs, production can increase with a given level of money wages only on the condition that prices rise and thus real wages decline. An increase in production may also ensue if the decline in real wages is the result of a cut in money wages while prices of manufactured goods are unaltered. The marginal costs of these goods at the initial level of output will fall (the curve of marginal costs will shift downwards), and this will encourage the entrepreneurs to expand production up to the point where the marginal cost is equal to the price.

Thus from the law of increasing marginal costs follows the inverse relation between production and real wages.

4. From this, however, it cannot be concluded that a reduction in money wages leads to an increase in production, since no relation between the changes in money and real wages has been established yet. The 'classical' theory, in order to deal with this problem, makes additional assumptions of a different type. It is sometimes assumed that the general level of prices depends on the credit policy of the banks (in particular on that of the central bank). Assuming, moreover, that this policy, and thus the general level of prices, is given, the conclusion is arrived at that the reduction in money wages is identical to that of real wages.

Frequently, however, a more sophisticated assumption is made that it is the value of the aggregate demand or—which amounts to the same—the value of the aggregate production that is determined by the

[1] As a result, the curve of the marginal costs of finished goods shifts upwards, and a given level of production then corresponds to a higher marginal cost, and thus to a higher price.

credit policy. Once we assume this value as given, the process of the reduction of money wages will be as follows. The cut in money wages results at the initial level of output in a reduction of marginal costs (the curve of which shifts downwards). However, the general price level does not change initially because the aggregate demand is assumed to be stable. Thus prices exceed the marginal costs, which leads to an increase in production. As a result, the marginal costs increase and at the same time prices decline, since the same money demand is met by a larger volume of goods. The equilibrium is reached when the marginal costs are equal to the respective prices. This equilibrium is obviously reached at a higher level of production, and at a lower level of real wages, than was the case in the initial position. Thus, on the assumption of a given aggregate demand, a cut in money wages results in an increase in production accompanied, as follows from the above, by a reduction in real wages.

The assumption of a given general price level or a given aggregate demand is totally unfounded. We know only too well that in the course of the business cycle both magnitudes are subject to violent swings. Why then should we assume that they remain unaltered in the aftermath of a wage reduction? If, however, we reject these assumptions, a quite new theoretical construction is required in order to enable us to appreciate the consequences of changes in money wages. We shall deal with this problem in the next section.

Reduction of wages on the assumption of perfect competition

1. In this section we assume, for the time being, rising marginal costs and perfect competition in accordance with the 'classical' theory. We drop, however, the assumption of the stable general level of prices, or the stable money value of aggregate demand. We shall assume, in addition, that the system is closed (we shall introduce foreign trade at a later stage), that it consists only of capitalists (entrepreneurs and rentiers) and workers, and that the workers do not save, but spend their total income on consumption. Before considering the consequences of a wage reduction within such a framework, we have to advance some argument of a more general character.

2. The national income in our system may be presented in two ways, namely from the side of incomes and of expenditure:

	Income	Expenditure
	Income of capitalists	Investment
	Wages	Consumption
or		
	Income of capitalists	Investment
		Capitalist consumption
	Wages	Worker consumption

By investment is meant here the purchase of fixed capital (machinery, buildings, etc.) and the increase in inventories. Since the workers are assumed to spend all their earnings on consumption, wages and salaries are equal to workers' consumption. We thus obtain:

$$\text{Capitalist income} = \text{Investment} + \text{Capitalist consumption}$$

This equation is of fundamental importance for our subsequent argument. It enables us to explain the fluctuations of production. Let us consider investment, capitalist consumption, and workers' consumption in a certain period. In which of these three items of national income may spontaneous changes occur? It is first obvious that workers' consumption cannot be subject to such a change. Indeed, it can neither exceed nor fall short of their earnings. But the position is quite different as far as capitalist expenditure is concerned. In the next period they may increase their consumption or their outlay on investment above their present income, drawing on bank credits or on reserves of their own. The capitalists also may reduce their expenditure on consumption and investment below their present income, paying off credits or increasing their reserves. Once they have done it, however, the above equation shows clearly that the income of the capitalists as a whole will increase or diminish precisely by as much as their expenditure was increased or diminished. The aggregate production is bound to reach the level at which the profits derived from it by the capitalists are equal to their consumption and investment. Since the workers spend on consumer goods as much as they receive in wages, the remainder of the national income, being the capitalist share, is just equal to their expenditure on consumer and investment goods. Therefore, the capitalists as a class determine by their expenditure their profits and in consequence the aggregate production.

This result is likely to appear paradoxical to many readers. It will not, therefore, be out of place to shed some light on it from a somewhat different angle.

We shall represent our system schematically as composed of three departments: production of investment goods, production of capitalist consumer goods, and worker consumer goods or wage goods. The latter are partly consumed by workers who produce them, while the surplus is bought by the workers employed in the other two departments. This surplus is the profit derived from the production of wage goods. (Indeed, the value of the remainder is equal to the wages earned in this department.) If, for instance, the value of the production of wage goods is zł 10 milliard, and the workers employed in their production received zł 6 milliard in wages, then the respective profits are zł 4 milliard. But as zł 6 milliard earned in wages in the department of wage goods are spent on these goods, the surplus equal to zł $10 - 6 = 4$ milliard is bought by workers of the two other departments: the department of capitalist consumer goods and the department of investment goods. Thus the wages in the two departments as well as the profits in the third department are equal to zł 4 milliard. If employment and aggregate wages in the capitalists' consumer goods and investment goods industries increase, the demand for wage goods increases as well, and their production is bound to be stepped up to the point where the profits, i.e. the surplus of the value of production over wages in this department, would be equal to the increase of aggregate wages in the other two departments.

Next, the value of production of capitalist consumer goods and investment goods is, of course, equal to the sum of profits and wages in the corresponding departments. However, the wages in these two departments are equal to the profits in the third one; thus the total profits are equal to the value of capitalist consumption and investment. Let us suppose, for instance, that the value of production of these two categories is zł 7 milliard, out of which 3 milliard are profits and 4 milliard wages. As profits in the department of wage goods are equal to the wages in the other two departments, the former amount to zł 4 milliard. Aggregate profits, zł $3 + 4 = 7$ milliard, are equal to capitalist consumption and investment.

3. As will be seen, the fluctuations in production and profits depend on the fluctuations in capitalists' consumption and investment. If at some moment, for instance, the entrepreneurs are in a more optimistic frame of mind, their investment activity will expand, and employment in construction, machine industry, etc. will increase. The resulting rise in the consumption of workers will in turn be followed by an increase in production of wage good industries. As was shown above, the aggregate production will expand to the point where profits will be higher by an amount equal to the value of additional investment—if it is assumed that capitalist consumption remains unchanged.

If, however, the latter increases as well, owing to higher capitalist incomes, the increase in profits will be correspondingly enhanced. In any case, production will be finally pushed up to the point where the increase in profits will be equal to the increase in expenditure on investment and capitalist consumption.

The question is frequently asked about the wherewithal for financing the increase in investment if capitalist consumption does not decrease simultaneously and does not 'release' some purchasing power for investment. It may sound paradoxical, but according to the above, investment is 'financed by itself'.

If, for instance, an entrepreneur is gradually drawing on his bank deposit for construction of plant, he is increasing by the same amount (on the assumption of stable capitalist consumption) profits of other entrepreneurs (through an increase in the production), and as a result, along with the dwindling of his bank deposit the deposits of other entrepreneurs are rising *pro tanto* and therefore the banks are not forced to reduce credits. Here, however, an important reservation should be made: in line with the increased turnover the demand for cash in circulation rises. Consequently the bank deposits would diminish, and thus the banks would lose a part of their cash reserves. This in its turn would cause an increase in the rate of interest which would adversely affect investment activity. For it is, indeed, the difference between the expected rate of profit and rate of interest that stimulates investment. However, the situation is relieved by the expansion of credits by the central bank, which increases the quantity of money in circulation and in this way either prevents any rise in the rate of interest or at least limits its scope. One could, of course, envisage a banking policy which is designed to keep the aggregate demand at a constant level and, therefore, prevents production from either expanding or shrinking. (This is the assumption of the 'classical' theory mentioned in the preceding chapter.) In fact, however, the changes in the rate of interest are in general much too weak to halt an incipient upswing resulting from an increase in investment or to prevent a depression brought about by its collapse.

An important part is undoubtedly played here by a certain factor of a special nature. As we have just seen, an increase in the rate of interest hampers the expansion of production by discouraging investment activity. It is, however, the long-term rate of interest that is relevant to investment in fixed capital. Now, the long-term rate of interest—for reasons we cannot analyse in detail here—reacts only slightly to the changes in the short-term rate determined by banking policy. This results in the following set-up: the increase in investment activity causes a rise in the aggregate output and thus in the demand for cash; this tends to push up the short-term rate of interest, which, however, is only slightly reflected in the level of the long-term rate of interest. Thus the expansion of investment is not much hampered by the reaction of the money and capital market.

4. Let us return to the problem of reduction in wages. Let us assume that money wages have been reduced in a certain proportion. How will this affect production and employment?

In the light of the preceding argument this query is reduced to the following problem: how does capitalist consumption and investment react to a cut in money wages? For, as was shown above, it is the change in the volume of capitalist consumption and investment that is the cause of expansion or shrinkage of production.

At first glance, it may seem that as a result of the wage reduction the capitalists increase their consumption and investment in anticipation of higher profits for their establishments. Should the capitalists act thus in fact, the reduction of wages would, indeed, be followed by an increase in production, and the 'classical' theory would be vindicated.

A closer analysis, however, shows that this is most unlikely to happen. It is, indeed, improbable that the investment and consumption of capitalists should increase *immediately*. First of all, it is almost certain that the entrepreneurs will not step up their investment immediately after wages have been reduced, but will rather wait for an *actual* increase in profits. In addition, even should they increase their orders for capital equipment, the expansion of production in the respective industries would for technical reasons materialize only after some delay.

The same is true of capitalist consumption. In this case also, the capitalists are more likely to postpone any increase in their spending until the expected increase in incomes materializes, and even then some time-lag would probably still be involved. To sum up: *it is most likely that in the period immediately following the reduction of wages, the volume of capitalist investment and consumption will be unchanged.*

It will, however, be easily seen that as a result both these magnitudes and, in consequence, the aggregate production as well will not change at a later date either. Indeed, in the period immediately following the wage cut, capitalist consumption and investment remain stable, as assumed, and thus aggregate production does not change either. However, as a consequence of the general reduction of wages the marginal costs, and along with them the prices (equal to the respective marginal costs in the system of perfect competition), will decrease in the same proportion as wages. But in this case the only change in the economic situation is a proportional decline in the general level of prices and wages. It is therefore obvious that the capitalists will increase neither their consumption nor their investment in a later period, if they do not do so immediately.

This process may be illustrated by means of our scheme of three departments. According to our assumption, capitalist consumption and investment do not change initially. Therefore there is no change either in the production of the department of capitalist consumer goods or in the department of investment goods. The same applies to the employment in both these departments, as a result of which the effective demand for wage goods produced by the third department decreases in the proportion of the wage reduction. But as the marginal costs in this department decline in the same proportion as well, there will be no change in the production of the third department either. As a result, production and employment in all three departments will remain for some time unchanged, while the prices equal to the marginal costs decrease in the same proportion as wages. In this situation, however, there is no reason for the capitalists to increase their consumption and investment, as the expected increase in profitability did not materialize.

If the capitalists do not raise their consumption and investment immediately after the reduction of wages (which seems most unlikely), they are caught in a vicious circle. The profitability of enterprises does not rise, because neither investment nor capitalist consumption has increased. But neither of these items can increase, since profitability has not. Consequently, the only factual result of the reduction of wages in a system of perfect competition is a decrease in the general level of prices.

5. It should, however, be noticed that a change in the general level of wages and prices may have some indirect influence upon employment. Indeed, as a consequence of the decrease of the general price level with an unchanged level of production, the demand for cash diminishes and this in turn causes, as mentioned above, a decrease in the short-term rate of interest, which may favourably affect investment activity and thus cause a rise in production. However, as pointed out above, changes in the short-term rate of interest influence but slightly the long-term rate which is relevant to investment. Therefore the reduction of wages, which only slightly influences the long-term rate of interest, cannot essentially stimulate investment. It may even be argued that the opposite is often the case. A general reduction of prices increases the burden of indebtedness, since money incomes diminish while the 'old' debts do not. This causes difficulties in servicing the debts, ending frequently in failures. As a result, confidence in the solvency of firms is undermined, which may lead to an increase in the long-term rate of interest even though the short-term rate declines.

This discussion points to the improbability of the effect of the reduction of wages on the level of production and employment through the medium of the rate of interest. The most likely effect of wage reduction in a system of perfect competition is a decline in the general level of prices with no change in production and employment.[2]

[2] In the above consideration we omitted the effect of one more factor which may have a certain influence on the consequences of wage reduction. We have in mind here the shift in the distribution of profits from entrepreneurs to rentiers. Indeed, when prices decline in the same proportion as wages, this will be also true of profits. But the money income of rentiers consisting of the interest on 'old' debts does not change and, therefore, their relative share in profits increases. If the entrepreneurs are 'poorer' than the rentiers, this kind of shift will result rather in a decrease of total capitalist consumption. Should the reverse be the case, the result would be an increase in capitalist consumption. The first pattern applies usually to societies where the concentration in industry is not too far advanced, the second to developed capitalist economies. In the latter case, as follows from the above, capitalist consumption is likely to increase, and this in turn will have a favourable effect on production and employment. But the final outcome is by no means certain even in this case, because quite a number of firms are in a precarious financial position, as a result of the decline in income while their 'old' debts remain unchanged, and this discourages any investment activity on their part. In any case, should an increase in employment take place at all, it would be on a small scale.

Dropping of the assumption of increasing marginal costs and perfect competition

1. In the preceding section we assumed, in accordance with the 'classical' theory, increasing marginal costs and perfect competition, while concentrating our attention on the problem of changes in effective demand and, in particular, on how it is affected by a reduction of wages. By dropping the unrealistic assumption of the stable level of prices or of the stable value of the general demand, we have made the first step towards a realistic approach. Next we shall subject to a critical examination the assumption of increasing marginal costs (we have already expressed some misgivings on this account) as well as that of perfect competition.

As was stated in the preceding section, the sphere where increasing marginal costs prevail is agriculture, where an increment in yield requires a disproportionate outlay of fertilizers and labour. The position is altogether different in industry. If, for instance, in a given establishment two shifts rather than one are worked, the cost of raw materials and labour will increase more or less proportionally. Only the third shift may involve some technical problems. It is therefore reasonable to assume that in an industrial enterprise the curve of the marginal costs is horizontal over a rather long range of output and starts rising only when full capacity is approached. As experience shows, such full utilization is fairly exceptional, and therefore the assumption of increasing marginal costs must be dropped.

Then, however, a difficult problem arises. On the assumption of increasing marginal costs, the production of an establishment was pushed up to a point where the price was equal to the marginal cost (Fig. 3). Now, the price is higher than the marginal costs (Fig. 4) when the degree of utilization of the establishment is not very high. If, however, at the level of production $0A$ the price AB_1 is higher than the marginal cost AB, why does the entrepreneur not expand production even though he would in this case make additional profits? (For on each additional unit of production he would gain the difference BB_1 between the price and the marginal cost.)

The question is not difficult to explain in the case of cartels. A cartel does not expand production beyond a certain point, A, because the price of the commodity produced would decrease so much that in effect this would cause a loss rather than a gain. The production of a cartel does not reach the level at which the price is equal to the

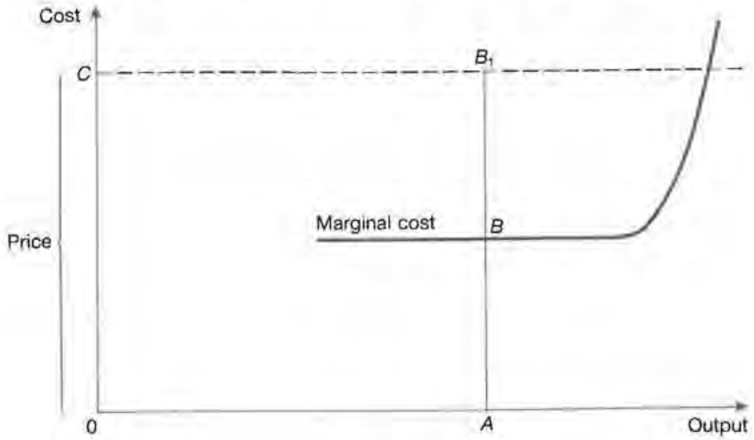

FIG. 4

marginal cost, but is fixed at the point at which the cartel, owing to its monopolistic position, attains the maximum profit. The price then exceeds the marginal cost.

This, however, does not fully solve our problem. It is true that the cartelized sector in a modern capitalist economy is considerable, and yet in a significant part of the economy competition of one type or another is still in existence. Is it possible that in this sort of establishment the position presented in Fig. 4 may prevail?

An ingenious but simple answer to this question has been given only recently.[3]

It appears that even non-cartelized firms compete with each other in a rather *imperfect* way. Let us recall first what is actually meant by perfect competition. This is a situation in which a single entrepreneur is able to increase his sales without 'spoiling the market', i.e. without affecting the market price. This is not in fact usually the case: a single entrepreneur has his 'private' market, i.e. he has permanent customers, he specializes in the production of certain goods which are somewhat different from those produced by his competitors, etc. Thus, in order to increase his sales he must reduce his prices in order to gain new customers, to increase the demand for the specific commodities he

[3] See e.g. P. Sraffa, 'The Law of Returns under Competitive Conditions', *Economic Journal*, 1926; E. Chamberlin, *The Theory of Monopolistic Competition*, 1933; Joan Robinson, *The Economics of Imperfect Competition*, 1933.

produces, etc. As a result, the situation presented in Fig. 4 prevails in general in the non-cartelized industries as well. The entrepreneur expanding his sales beyond point A would increase his profit if the price were fixed. As, however, he has to reduce it, he may make a relative loss rather than a gain. An entrepreneur, when asked why he does not expand his production, hardly ever replies that the cost of additional production would be too high, but rather states that 'he would be unable to sell more'. In the light of the 'classical' theory this would not make sense, but the theory of imperfect competition is in a position to interpret it quite precisely: the entrepreneur considers in fact that the extension of 'his' market would require such a reduction in prices that this would not be offset by increased sales.

This is the solution of the problem in question. The establishments are in general not fully utilized, since they maintain a monopolistic (cartels) or a quasi-monopolistic (imperfect competition) position in the market. This is the reason why we usually encounter the situation presented in Fig. 4, i.e. a horizontal curve of marginal costs much below the price level.

The ratio of the price to the marginal costs (higher than one) indicates how the position deviates from perfect competition and it may serve therefore to measure the 'degree of monopoly'.

2. The above considerations are pertinent to the problem of the changes in prices associated with those in employment. The conception of the association of a decline in real wages with the increase in production is based on the assumption of the 'law of increasing marginal costs'. Once we reject this assumption we have also to revise the views of the 'classical' theory on the problem of real wages.

If the employment of an establishment rises but is kept within the range of stability of marginal costs (Fig. 4), then, with a given 'degree of monopoly', the ratio of the price of the product to the cost of wages and raw materials remains unchanged. As a result the real wages have no tendency to fall, which would be the case with increasing marginal costs. Only the increase in the prices of raw materials in relation to wages may result in a decrease in real wages, since it will cause the rise in the prices of the goods produced and thus a fall in the ratio of wages to prices. From this angle the increase in employment will in fact have an adverse effect upon real wages, because in branches producing basic raw materials (in agriculture as well as mining) marginal costs are increasing, and therefore the prices of raw materials will increase in relation to wages in response to a higher demand. The reduction in real wages is, however, incomparably smaller than it would be were the marginal costs increasing in all stages of production. The price of finished commodities will increase in this case only as a result of the rise in the prices of basic raw materials, which often play only a small part in costs, and therefore a corresponding reduction of real wages with the increase in employment will be kept within narrow limits.

3. There is still another factor influencing real wages in the opposite direction. In the preceding section the 'degree of monopoly' measured by the ratio of prices to marginal costs was assumed to be a constant parameter. In fact, however, this ratio increases in a depression and diminishes in a boom. While the cost of raw materials and wages are reduced in a depression, some prices do not fall at all, or fall but little. The cartels are not endangered by outsiders cropping up; in non-cartelized industries the entrepreneurs are reluctant to reduce prices, fearing to unleash cut-throat competition, etc. If, however, in the course of the business cycle the prices of finished goods change less than the marginal costs, the divergence between them will increase in a depression and will shrink in prosperity. Hence real wages will be lower in the slump and higher during the boom than would be the case with a constant 'degree of monopoly'.[4]

Thus there are two opposite tendencies in the shaping of real wages: when production rises, the prices of raw materials increase relative to wages but at the same time the 'degree of monopoly' declines; when production shrinks, the prices of raw materials fall in a higher proportion than wages, but the 'degree of monopoly' rises.

Let us imagine, for instance, that the ratio of the cost of raw materials to that of wages for some product is 30:70. As a result of the upswing, the prices of raw materials increase by 40% and wages by 10%. The marginal cost of the commodity considered thus increases by $0.3 \times 40\% + 0.7 \times 10\% = 19\%$. We assume that, owing to the 'rigidity' of the price, its ratio to marginal cost decreases by 5%; as a result the price increases only in the proportion $1.19 \times 0.95 = 1.13$. Therefore the real wages decline in the proportion 1.10:1.13, i.e. by approximately 3%.

Thus the rise or decline in real wages depends on the relative weight of the two opposite tendencies. It is very likely that the resulting changes in real wages are generally rather small.[5]

[4] The statistical data for Poland are quoted in Table 12 on p. 45.

[5] See e.g. Tables 13 and 14 p. 47.

4. There is still one more essential problem to consider concerning real wages. So far we have examined the question of how establishments with given equipment and a given technique respond to an increasing demand. However, when a longer period is considered it is necessary to take into account the fact that, because of technical progress, the cost of labour at a given level of wages is falling and hence there is a tendency for a slow but steady decline in prices in relation to wages, tantamount to a rise in real wages. Therefore the changes in real wages reflect the combined effect of cyclical fluctuations and technical progress. Our argument in the preceding section concerned the relation of the cost of labour to prices rather than to real wages. In fact, real wages change in the same way as the product of this ratio and the index of productivity.

In the example considered in the preceding section, the cost of labour rose by 10% and its relation to prices declined by 3%. If at the same time productivity increases, say, by 2%, this means that money wages rose in fact by 12% and real wages declined by 1%.

Reduction of wages under imperfect competition

1. We shall now examine the problem of the reduction of wages after dropping the assumptions of the increasing marginal costs and perfect competition. In order to do that, we shall only have to repeat our argument in the section 'Reduction of wages on the assumption of perfect competition' above, modifying it in accordance with the change in assumptions introduced in the preceding section.

Our argument was based on the fact that the volume of investment and capitalist consumption is the basic determinant of production and employment, which are pushed up to the point where the income of capitalists is equal to their expenditure on consumption and investment. Moreover, we assumed that, immediately after the reduction of wages, capitalists do not increase the volume of their consumption or investment. As a result, the employment in the industries producing capitalist consumer goods or investment goods does not increase, and the purchasing power of the workers shrinks in the proportion of the wage reduction. This line of argument applies *in toto* to the case considered. Modifications are introduced only in its next stage. Under the assumption of perfect competition, prices were equal to marginal costs and thus they fell in the same proportion as wages. Now there is a divergence between the prices and the marginal costs due to cartelization or imperfect competition. Moreover, the reduction of wages will tend to cause a rise in this divergence because most likely some prices will prove to be 'rigid' and thus will fail to decline in the same proportion as wages. Consequently the real purchasing power of the workers will decline: initially it decreases in money terms proportionally to wages while the decline in prices is less. As a result, the demand for wage goods will fall and in consequence the employment in the corresponding department as well. Thus the decline in real wages (the prices are reduced to a lesser extent than wages) is associated here with the *fall* in employment.

Is this the end of the process? Will not investment and capitalist consumption—which according to our assumption did not change immediately after the reduction of wages—increase after some delay as a result of the 'improved' relation of prices to wages? It may easily be shown that this is not the case. The volume of capitalist consumption and investment has, for the time being, not risen. Since capitalists' income is equal to the value of this volume, it declined in the same proportion as prices. Therefore the relation of the income of capitalists to the prices of investment goods has not changed. Consequently, the profitability of new investment has not increased: this profitability is nothing else but the ratio of its yield to its value. Also, capitalist consumption does not tend to increase, as their real income (money income corrected for price changes) has not changed. Thus we are faced here with the same position as in the case of the reduction of wages under conditions of perfect competition: if capitalist consumption and investment do not increase immediately after the reduction of wages, there arises such a situation that these items will not increase at a later date either.

We may summarize the above analysis as follows. A reduction in money wages is usually accompanied as a result of price 'rigidity' by an increase in 'the degree of monopoly', and consequently leads to a reduction in real wages as well. However, this decline is accompanied by a fall rather than by a rise in employment. The slump in employment in question affects the wage good industries, while employment in industries producing investment goods and capitalist consumer goods remains unchanged. The real income of the capitalists does not rise, but the real income of the workers declines.

The reduction of wages in an open system

1. The problem of wages was discussed above under the assumption of a closed system. We will enquire now into the influence of foreign

trade on the processes considered. A reduction in wages and the consequent fall in prices will obviously improve the competitive position of the goods produced by a given country in the world market, and thus will contribute to an expansion in the volume of exports. This would affect production and employment favourably. However, the reduction of wages, as will be seen below, exerts an opposite influence as well, so that the final outcome is by no means certain.

Indeed, the reduction of wages in a given country has obviously no influence on the prices of imported raw materials. Therefore the prices of goods manufactured from them decline *pro tanto* more slowly. As a result, real wages decline (in addition to their decrease caused by the 'rigidity' of prices discussed in the preceding section). Consequently the purchasing power of the workers is correspondingly lower, and has an adverse effect on the industries producing wage goods.

The final outcome of the reduction of wages depends on the extent to which the reduction of wages and prices will increase the volume of exports. For instance, should the resulting increase in employment just balance the reduction in real wages, the purchasing power of the workers as a whole would not change, and therefore the reduction of wages would not adversely influence the production of wage goods. The production will increase in this case by the volume of additional exports; the working class, however, even as a whole, will not benefit from it, while the real income of a single worker will obviously decline. The position would be better, of course, should exports increase more than is necessary to balance the decline in real wages. If, however, they increase to a lesser degree, the real purchasing power of the workers will decline, and it will be followed by a decrease in production and employment in the wage-good industries. It may even happen then that the volume of exports will increase in consequence of the reduction of wages, but the aggregate production and employment will decline.

As was said above, the effect of a reduction of wages in an open system depends—as far as aggregate production is concerned—on the extent of the expansion of exports—in other words, on the response of the foreign demand to the decline in prices of a given country. If this demand is elastic, i.e. if a small reduction in prices and wages is followed by a relatively large expansion in exports, then production and employment increase (which, however, is not necessarily tantamount to an increase in the real purchasing power of the workers). If the demand for exports of a given country is inelastic, a decline in production may ensue.

It should be noticed that, because of tariff barriers, import restrictions, etc., the elasticity of demand for products of a given country is quite small. The tariff barriers, high though they are, grow higher still when prices of imported goods decline. Such being the position, it is rather improbable that the reduction of money wages would result in the expansion of production and employment, and in particular in the rise in aggregate purchasing power of the workers, even in an open system.

2. It is worth noticing that the effect of a reduction of wages in an open system is very much the same as that of a currency depreciation. The two cases differ only in that in the former the wages decline and the prices of imported raw materials remain unchanged, while in the latter the wages remain unaltered (in terms of domestic currency), and the prices of imported raw materials increase in inverse proportion to the currency depreciation. The effect of depreciation on production and employment depends, as in the case of the reduction of wages, on the elasticity of the foreign demand for products of a given country.

Conclusions

We attempted to show that the reduction of wages in a closed system does not lead to an increase in production; that in conditions of perfect competition the level of production remains unchanged, while prices decline in the same proportion as wages; however, under existing conditions of monopoly or imperfect competition a reduction of money wages tends to cause a decline in real wages associated with a decrease in employment. Moreover, it appears that in such a system there is in general no reason—in spite of widespread belief to the contrary—for the decline in production to be accompanied by an increase in real wages or vice versa. The analysis of the problem in an open system shows that even in such a case the reduction of wages does not necessarily lead to an increase in employment, and the prospects of raising the aggregate real income of the working class are even dimmer. In particular, under the system of high and rising tariffs it is very likely that a reduction of wages will have an adverse effect upon employment also in an open economy.

The slogan 'Rigid wages as a source of unemployment'—under which title a book by Mr Watecki[6] has been recently published in

[6] J. Wątecki, *Sztywne place źródłem bezrobocia* (Rigid Wages as a Source of Unemployment), Cracow, Towarzystwo Ekonomiczne, 1938.

Poland—proves in the light of the above analysis to be entirely unfounded. And equally hopeless is the case of the supporters of this slogan who preach that collective bargaining by making wages 'rigid' causes unemployment and poverty in the working class.

II. Statistics

Methodological problems

1. Attempts have been made time and again to check by means of a statistical enquiry the thesis of the 'classical' theory that an increase in employment is associated with a decline in real wages. The well-known enquiries of the French economist Rueff may serve as an example. He starts from the generally correct premisses that, when the problem of the relation between real wages and employment in industry is examined, by real wages should be meant the ratio of money wages of the industrial workers to the prices at which the respective products are sold, i.e. wholesale prices. In the realization of this approach, however, Rueff committed gross statistical errors. He simply divided the index of industrial money wages by the general index of the wholesale prices, and considered the fact that the ratio increased during the slump and declined during the boom to be the proof of the 'classical' theory. Now it should be recalled that the indices of wholesale prices are based mainly on raw materials and semi-manufactures. These indices thus reflect to a considerable degree the changes in the prices of domestic and imported raw materials rather than those in the prices of manufactured goods. No wonder, then, that the ratios received by Rueff increased in the slump and declined in the boom, as it is generally known that the prices of raw materials fluctuate more strongly than wages (and prices of manufactured goods). But it is also clear that the ratio of wages of the British worker to the price of Brazilian coffee is rather irrelevant to the conditions of industrial production in Great Britain. Thus Rueff's method, applied by Mr J. Wątecki (referred to above) to Polish data, is far from being a pattern worth following.

However, even apart from questions of statistical technique, Rueff's posing of the problem is not quite satisfactory. The decline in real wages associated with the increase in employment is, according to the 'classical' theory, a conclusion from a more general principle of 'increasing marginal costs'. It follows from this principle that, with the expansion of output, the prices of finished products increase in relation to the prime costs consisting of raw materials and wages. Since, at the same time, the prices of raw materials increase in relation to wages, this enhances the rise in the prices of finished products relative to wages (cf. pp. 22–3). Therefore, in order to check the theorems of the 'classical' theory a somewhat different approach is required. It should first be ascertained whether the prices of finished products do really increase in relation to the costs of raw materials and wages when output expands. Indeed, according to our argument (see pp. 33–4) the position should be the reverse, because the marginal costs are constant rather than increasing over the relevant range of output, while 'the degree of monopoly' increases during the slump and declines during the boom. Only after the answer to this basic question has been found may we turn to another problem: how are real wages affected by the changes in the ratio of the prices of finished goods to prime costs (costs of raw materials and labour) on the one hand and by the changes of the ratio of prices of raw materials to wages on the other? Indeed, should the 'classical' theory be correct, real wages would fall with the increase of production. But if, as we maintain, the ratio of the prices of finished goods to prime costs diminishes in the upswing, then, conversely, the direction of the changes in real wages cannot be foreseen. For while the changes in prices of finished goods in relation to prime costs tend to associate the increase in real wages with the expansion of employment, the changes in the relation of prices of raw materials to wages work in the opposite direction.[7] In addition, it should be recalled that real wages, apart from cyclical fluctuations, tend to increase steadily as a result of the long-run rise in productivity due to technical progress, etc.[8] It is this method that we shall follow when analysing the processes in question in the Polish economy.

Prices, prime costs, and real wages in Poland

1. In the following analysis we shall treat Polish industry as an entity. Thus as 'raw materials' we shall consider only those imported or produced by domestic agriculture. As 'finished industrial products' we shall consider those goods which, after having been sold, do not undergo any industrial processing, as contrasted to goods sold as materials by one industrial establishment to another.

[7] See p. 34. [8] See p. 35.

For the type of enquiry envisaged here the following data are necessary: (i) the price index of 'finished industrial products', i.e. finished goods in the strict sense, as well as raw materials or semi-manufactures used in this condition in other sectors of the economy (for instance, coal for households) or exported; (ii) the price index of imported raw materials and home agricultural products used by industry; (iii) the index of labour cost per unit of output. These data come mainly from the statistical enquiry carried out jointly by myself and Ludwik Landau.[9] The indices obtained in this enquiry covered the period 1928–34; they are extrapolated in this paper up to 1937.

2. The price index of 'finished industrial products' was calculated in the enquiry quoted above in the following way.

First of all, the aggregate sales of these goods were split into domestic sales and exports. Next, the domestic sales were subdivided into the following groups: (i) consumer goods except food and fuel (textiles, utensils, furniture, etc.); (ii) sugar, beer, kerosene; (iii) coal for households; (iv) finished investment goods (buildings, machinery);

Table 6. *Price Index of 'Finished Industrial Products' Sold in the Domestic Market*

Year	Finished consumer goods (except food and fuel)	Sugar, beer, kerosene (net of excise)	Coal for households	Finished investment goods	Goods for agricultural production	'Finished industrial products' sold in domestic market
Weights	34	12	8	36	10	100
1928	100.0	100.0	100.0	100.0	100.0	100.0
1929	98.6	105.8	113.8	103.5	101.3	102.7
1930	91.9	108.7	116.1	101.0	99.2	99.9
1931	78.9	107.3	116.1	95.5	91.5	90.7
1932	67.6	102.0	107.2	80.5	81.4	80.9
1933	61.4	90.3	96.5	70.5	75.8	72.4
1934	59.2	86.0	91.5	67.7	71.1	69.3
1935	56.8	72.7	83.9	67.0	65.6	65.4
1936	56.6	60.9	77.3	63.6	62.0	61.8
1937	58.3	60.6	77.3	66.1	64.0	63.5

[9] *Wahania cen i kosztów a wahania produkcji przemysłowej w Polsce* (Changes in Price–Cost Relations and Fluctuations of Industrial Production in Poland), Papers of the ISBCP, 4/2, 1935. [See also *Collected Works*, vol. vi.] Ludwik Landau was murdered during the Nazi occupation.

Table 7. *Price Index of 'Finished Industrial Products' Sold in the Domestic Market and Exported*

Year	'Finished industrial products' for the home market		Exported goods		'Finished industrial products'
	Weight	Index	Weight	Index	Index
1928	79	100.0	21	100.0	100.0
1929	78	102.7	22	99.1	101.9
1930	75	99.9	25	84.5	96.0
1931	72	90.7	28	70.3	85.0
1932	77	80.9	23	59.0	75.9
1933	79	72.4	21	54.4	68.5
1934	80	69.3	20	51.3	65.8
1935	82	65.4	18	47.6	62.2
1936	84	61.8	16	47.0	59.4
1937	84	63.5	16	53.4	62.9

(v) goods used in agricultural production (fertilizers, tools, agricultural machinery, etc.). Table 6 shows the price indices of these groups of goods, together with their weights, corresponding to their domestic sales in the basic year 1928, as well as the general weighted price index of 'finished industrial products' sold in the domestic market.

Next the price index of industrial exports was calculated on the basis of L. Landau, 'Polish Exports during the Depression'.[10] This index, as well as the index of 'finished industrial products' sold in the domestic market, is weighted according to the proportion exports bore to the sales in the domestic market (both items valued in 1928 prices) in the single years of the period considered.[11] Thus a general index of the prices of 'finished industrial products' is arrived at (Table 7).

3. Let us turn now to the price index of raw materials and semi-manufactured goods imported or produced by home agriculture. This index is obtained as a weighted average of the indices of prices of imported raw materials and semi-manufactures, prices of wood, and prices of sugar beets (weights correspond to the values of respective materials used by the industry in the basic year 1928) (Table 8).

[10] Papers of the ISBCP, 3/2-3, 1934 [in Polish].

[11] Variable weights are applied here because export prices deviate considerably from the home prices for the same goods.

Table 8. *Price Indices of Raw Materials for Industry (Imported or Produced by Home Agriculture)*

Year	Imported raw materials and semi-manufactures	Wood	Sugar beets	Price index of raw materials imported and produced by home agriculture
Weights	66	17	17	100
1928	100.0	100.0	100.0	100.0
1929	93.3	93.3	93.1	93.1
1930	68.6	71.9	75.7	70.4
1931	51.0	49.5	58.4	52.0
1932	41.6	38.3	65.7	45.1
1933	43.8	38.7	63.1	46.2
1934	43.2	44.3	69.9	47.9
1935	41.6	44.0	62.7	45.6
1936	45.2	52.3	61.1	49.1
1937	50.9	68.3	60.8	55.7

4. The estimates of the cost of labour given in the paper quoted are corrected for changes in productivity which were not accounted for in that paper: the index of hourly wages in industry and mining is divided by the index of average productivity based on L. Landau, 'Bezrobocie technologiczne w przemyśle polskim w latach 1929–1935' (Technological Unemployment in Polish Industry, 1929–1935)[12] (Table 9).

Now it is easy to calculate the general index of prime costs as the weighted average of the index of prices of raw materials and the index of the cost of labour. As weights we adopt: (i) the value of imported raw materials and of home agricultural products used by the industry, and (ii) the wage bill of industry and mining in the basic year 1928. The former amounts to zł 1.7 milliard,[13] the latter to zł 1.67 milliard.[14] Thus the weights bear roughly the proportion 1:1. The results are presented in Table 10.

[12] *Studies and Contributions*, published by the Institute for Social Problems, vol. i, 1938.

[13] *Wahania cen i kosztów*, p. 55.

[14] *Mały Rocznik Statystyczny, 1938* [Concise Statistical Yearbook, 1938], Warsaw, GUS, pp. 145, 258.

Table 9. *Indices of Labour Cost*

Year	Index of hourly wages	Index of productivity	Index of labour cost
1928	100.0	100	100.0
1929	108.4	103	105.2
1930	108.1	107	101.0
1931	100.9	110	91.8
1932	92.8	116	80.0
1933	85.5	124	68.0
1934	82.0	127	64.5
1935	80.5	130	61.9
1936	80.3	134[a]	59.9
1937	82.2	137[a]	60.0

[a] Estimate.

Table 10. *Indices of Prime Costs in Industry*

Year	Cost of imported raw materials and home agricultural products	Labour costs	Prime costs
Weights	50	50	100
1928	100.0	100.0	100.0
1929	93.1	105.2	99.1
1930	70.4	101.0	85.7
1931	52.0	91.8	71.9
1932	45.1	80.0	62.5
1933	46.2	68.0	57.1
1934	47.9	64.5	56.2
1935	45.6	61.9	53.7
1936	49.1	59.9	54.5
1937	55.7	60.0	57.8

5. Having at our disposal now the index of 'finished industrial products' and the index of prime costs, we may calculate their ratio—which was actually our purpose. The results are presented in Table 11.

We shall now compare the changes in the ratio of prices of 'finished industrial products' to the respective prime costs with the changes in

Table 11. *Ratio of Prices of 'Finished Industrial Products' to Prime Costs*

Year	Index of prices of 'finished industrial products'	Index of prime costs	Ratio of prices to costs
1928	100.0	100.0	100.0
1929	101.9	99.1	102.8
1930	96.0	85.7	112.0
1931	85.0	71.9	118.2
1932	75.9	62.5	121.4
1933	68.5	57.1	120.0
1934	65.8	56.2	117.2
1935	62.2	53.7	115.8
1936	59.4	54.5	109.0
1937	62.9	57.8	108.8

Table 12. *Ratio of Prices of 'Finished Industrial Products' to Prime Costs, Industrial Production, and Employment*

Year	Ratio of prices of 'finished industrial products' to costs	Index of industrial production	Index of industrial employment
1928	100.0	100.0	100.0
1929	102.8	101.9	100.9
1930	112.0	89.7	83.5
1931	118.2	78.2	70.4
1932	121.4	63.7	55.2
1933	120.0	70.0	54.8
1934	117.2	78.8	62.0
1935	115.8	84.9	65.8
1936	109.0	94.3	71.8
1937	108.8	110.7	82.6

the indices of production[15] and employment (aggregate working hours in mining and industry)[16] (Table 12).

It is immediately clear that the 'classical' theory is not supported by the results of our statistical enquiry. It will be seen that the decline in production and employment is accompanied by an increase in the prices of 'finished industrial products' in relation to prime costs, and conversely. But this phenomenon, which is in disagreement with the

[15] *Monthly Statistical Tables*, published by the ISBCP.
[16] *Maly Rocznik Statystyczny, 1938*, p. 248.

law of 'increasing marginal costs', can be easily explained by our hypothesis: by the constancy of marginal costs over the relevant range of output, and by the 'degree of monopoly' increasing in a slump due to the 'rigidity' of prices, and decreasing in a boom. Contrary to accepted opinion, the ratio of prices to prime costs 'improves' in the depression! It does not follow, of course, that profitability is high: the effect of the drop in sales outweighs by far the advantage from the increased ratio of prices to prime costs.

6. We shall now calculate the index of real wages of industrial workers. By real wage is usually meant the ratio of the money wage rate to the cost of living. As, however, in the latter the prices of the agricultural products and the rent are included—and even weigh heavily upon them—it is difficult to discover a close connection between real wages thus defined and conditions of industrial production. The counterpart of what was meant by 'real wages' in our theoretical discussion is the ratio of money wages to the wholesale prices of the consumer goods sold by the industry in the domestic market. This 'real wage' measures the amount of industrial consumer goods a worker could buy for his money wage. We shall first examine this series. The real wages in the usual sense are only loosely related to it. Nevertheless, we shall next have a look at this series as well.

Let us construct the index of prices of the industrial consumer products for the home market. We shall use for this purpose the group indices presented in Table 6 of prices of: (i) finished consumer goods except food and fuel; (ii) sugar, beer, kerosene; (iii) coal for households—adopting the weights proportional to those shown in this table. Next the index of money wages (taken from Table 9) is divided by the index of industrial consumer products for the home market, and thus the index of 'real wages' in our sense is obtained (Table 13).

This series shows in the period considered a long-run positive trend resulting from the increasing productivity of labour due to technical progress etc. (cf. p. 35). In order to eliminate this factor and to obtain the cyclical fluctuations of 'real wages', we shall divide the cost per unit of output rather than the hourly wages by the prices of industrial consumer goods (Table 14). (This series shows the changes in the amount of industrial consumer goods a worker could buy for the wages he receives per unit of output.)

This series is in complete agreement with the results of the theoretical analysis on pp. 31–5. We stated there that the changes in real

Table 13. *Index of 'Real Wages' Based on Prices of Industrial Consumer Products for the Home Market*

Year	The index of money wages	The index of prices of industrial consumer products for the home market	'Real wages' (ratio of money wages to prices)
1928	100.0	100.0	100.0
1929	108.4	102.4	105.8
1930	108.1	99.2	109.0
1931	100.9	90.7	112.2
1932	92.8	81.2	114.2
1933	85.5	73.0	117.1
1934	82.0	69.8	117.3
1935	80.5	64.3	125.0
1936	80.3	60.6	132.3
1937	82.2	61.6	133.3

Table 14. *Index of the Ratio of Cost of Labour to the Prices of Industrial Consumer Goods*

Year	Cost of labour	Index of prices of industrial consumer goods	The ratio of cost of labour to prices
1928	100.0	100.0	100.0
1929	105.2	102.4	102.8
1930	101.0	99.2	101.8
1931	91.9	90.7	101.3
1932	80.0	81.2	98.5
1933	68.0	73.0	93.2
1934	64.5	69.8	92.4
1935	61.9	64.3	96.3
1936	59.9	60.6	98.8
1937	60.0	61.6	97.3

wages associated with business fluctuations are fairly small because of two factors working in the opposite direction: in a depression, the increase in the 'degree of monopoly' affects real wages adversely, but this is counterbalanced by the influence of the decline in raw-material prices in relation to money wages; in a boom, the opposite is the case. As a result, the fluctuations are slight and rather irregular. We do observe this phenomenon in the series shown in Table 14. (It is worth noticing that at the bottom of the depression in 1932 'real wages'—after the elimination of the influence of the increase in productivity—remained more or less at the same level as at the top of the boom in 1928.) The index of actual 'real wages' shown in Table 13 is the result of the cyclical fluctuations and of the steady increase in productivity (cf. p. 35).

7. Let us have a look now at the changes in real wages in the normal sense, i.e. in the ratio of money wages to the cost of living (Table 15).

This series also shows an increasing trend. After eliminating the rise in productivity by calculating the ratio of the cost of labour per unit of output to the cost of living, we obtain in this case also a series showing rather small and irregular fluctuations (Table 16).

Indeed, these fluctuations—which, by the way, are greater than those in the ratio of the cost of labour to the prices of industrial

Table 15. *Index of Real Wages Based on Cost of Living*

Year	Money wages	Cost of living	Real wages
1928	100.0	100.0	100.0
1929	108.4	100.5	107.9
1930	108.1	92.1	117.4
1931	100.9	82.8	121.9
1932	92.8	74.8	124.2
1933	85.5	67.5	126.6
1934	82.0	62.6	131.0
1935	80.5	60.0	134.3
1936	80.3	58.0	138.5
1937	82.2	62.0	132.7

Table 16. *Index of Cost of Labour in Relation to Cost of Living*

Year	Cost of labour	Cost of living	Ratio of cost of labour to cost of living
1928	100.0	100.0	100.0
1929	105.2	100.5	104.7
1930	101.0	92.1	109.7
1931	91.9	82.8	111.0
1932	80.0	94.8	106.9
1933	68.0	67.5	100.5
1934	64.5	62.6	103.0
1935	61.9	60.0	103.1
1936	59.9	58.0	103.3
1937	60.0	62.0	96.8

consumer products—do not show either any clear-cut positive or negative correlation with the level of production or employment.

Money wages and employment

1. We statistically tested above the 'classical' theory of the changes in the ratio of prices to prime costs and in real wages, as well as testing our hypothesis on the subject. It will be difficult to find as precise a method to settle the dispute between the point of view of the 'classical' theory and our own on the subject of the effect of the reduction of money wages upon the level of production and employment. For the changes in production depend on many other factors, of which the most important is the mechanism causing automatic business fluctuations, which bears no definite relation to the changes in money wages. We may only show that even considerable cuts in money wages could not counteract a fall in production due to the cyclical downswing.

2. In Table 17 the index of money wage rates is compared with the indices of industrial production and employment.

As will be seen, a considerable reduction in wages (about 8% per year) occurred in the period 1930–3. This reduction, however, did not by any means contribute to the alleviation of the downswing, which was very drastic indeed. It is true that wage cuts, although on a smaller scale, continued through the period 1933–5 when production began to rise. Hardly anybody will, however, see this factor as significant in the improvement of the business situation in recent years. Rather, it is

Table 17. *Indices of Money Wage Rates and of Industrial Production and Employment*

Year	Money wage rates	Industrial production	Industrial employment
1928	100.0	100.0	100.0
1929	108.4	101.9	100.9
1930	108.1	89.7	83.5
1931	100.9	78.2	70.4
1932	92.8	63.7	55.2
1933	85.5	70.0	54.8
1934	82.0	78.8	62.0
1935	80.5	84.9	65.8
1936	80.3	94.3	71.8
1937	82.2	110.7	82.6

generally accepted that the first stimulus was generated by depreciation of the dollar in 1933, which caused the spending of hoarded dollars on goods (residential building, especially for private use, accumulation of stocks, in particular of textiles, etc.). This brought about an increase in production in 1934. The improvement in business profitability in turn stimulated private investment in subsequent years. In addition, government investment played an important part in the expansion of business activity.

Conclusions

Analysis of the Polish statistical data shows that the 'classical' theory is wrong in maintaining that prices of finished industrial products increase in relation to prime costs when production expands and vice versa. In fact the reverse is true. This is in complete agreement with our theoretical analysis, which rejects the law of increasing marginal costs and assumes that the degree of monopoly increases in the depression and declines in the boom.

It appears also most unlikely that the considerable cuts in money wages which took place in Poland during the downswing had any mitigating effect upon the latter. This again is in accord with our approach to the problem of reduction of money wages.

The Supply Curve of an Industry under Imperfect Competition[1] (1940)

Pure Imperfect Competition

1. The difficulties involved in the concept of the short-period supply curve of an industry under imperfect competition are generally known. Such a supply curve depends on how the demand curves for the product of a firm shift when the general demand or the price of prime factors change; without the knowledge of the exact nature of this shift, therefore, nothing definite can be said about the supply curve.

Some light may be thrown upon this problem, I think, if we clearly determine what is meant by a *given* state of market imperfection and if we understand by the supply curve that drawn under this given state of market imperfection. *Changes* in the imperfection of the market can then be represented as *shifts* of the supply curve.

We consider initially only pure imperfect competition: we assume the number of firms to be so great that the problem of oligopoly does not come into the picture; we assume, moreover, that the entrepreneur knows the demand curve for his product and his marginal-cost curve; finally, we leave aside selling costs. All these assumptions will be removed in the next section.

2. Let us assume n firms in the industry whose outputs we denote by $o_1, o_2 \ldots o_k \ldots o_n$ and prices by $p_1, p_2 \ldots p_k \ldots p_n$. The average price $\bar{p}$ is the weighted average of p_k with outputs taken as weights. Our definition of a given state of market imperfection is as follows: The market imperfection is given if the elasticity of demand for the product of each firm e_k is a determinate function of the ratio of its price p_k to the average price $\bar{p}$ or:

$$e_k = \varepsilon_k\left(\frac{p_k}{\bar{p}}\right) \tag{1}$$

the shape of the function ε_k representing the state of market imperfection. If the shape of the function ε_k changes so that to the same $p_k/\bar{p}$

there corresponds a smaller e_k we say that market imperfection increases, and vice versa.

This amounts to considering imperfection of the market constant if (i) with given average price $\bar{p}$ the elasticity of demand for the product of a firm e_k is uniquely correlated with its price p_k; (ii) when the average price $\bar{p}$ and the firm's price p_k change in the same proportion, this elasticity remains unaltered.

Here, I think, the following question may arise. If the imperfection of the market is due to, say, transport costs, a change in $\bar{p}$ and p_k in the same proportion (transport costs being stable) will alter the elasticity of demand e_k. This, however, just shows that our definition is plausible. For only if transport costs change in the same proportion as the prices of the product under consideration will the degree of market imperfection, in the usual sense of the term, be unaltered. It will *rise* if the price of the product falls and transport costs are stable. And this will be duly accounted for by equation (1) because a fall in prices, transport costs remaining stable, will cause such a change in the shape of the functions ε_k (which, according to our definition, represents the market imperfection) that to the same $p_k/\bar{p}$ will correspond a smaller e_k.

3. It is easy to see that, from equation (1), which may be written

$$e_k = \frac{do_k}{dp_k}\frac{p_k}{o_k} = \varepsilon_k\left(\frac{p_k}{\bar{p}}\right)$$

we obtain by integration that with a given $\bar{p}$

$$o_k = c_k f_k\left(\frac{p_k}{\bar{p}}\right) \tag{2}$$

where c_k is an integration constant and f_k is a function whose logarithm

$$\operatorname{Log} f_k\left(\frac{p_k}{\bar{p}}\right) = \int \frac{d\frac{p_k}{\bar{p}}}{\frac{p_k}{\bar{p}}}\varepsilon_k\left(\frac{p_k}{\bar{p}}\right)$$

Thus the shape of f_k is determined by the shape of ε_k.

Equation (2) represents the 'individual' demand curve of the firm k in terms of the ratio of its price to the average price $p_k/\bar{p}$.

Variations in c_k signify a change in the general demand for the product considered. The output o_k corresponding to a given $p_k/\bar{p}$ thus

varies with the change in the general demand proportionally to c_k (as is seen from equation (2)).

In short-period equilibrium, the equality between the short-period marginal cost m_k and the marginal revenue $p_k(1 - 1/e_k)$ must be fulfilled, so we have:

$$m_k = p_k\left[1 - \frac{1}{\varepsilon_k\left(\frac{p_k}{\bar{p}}\right)}\right] \tag{3}$$

or if we denote $1 - (1/\varepsilon_k(p_k/\bar{p}))$ by $\phi_k(p_k/\bar{p})$:

$$m_k = p_k\phi_k\left(\frac{p_k}{\bar{p}}\right) \tag{3a}$$

It must be noted that since the function ϕ_k is derived directly from ε_k it determines the market imperfection as well. And it is easy to see that, if the shape of the functions ϕ_k changes so that to the same $p_k/\bar{p}$ there correspond smaller values of $\phi_k(p_k/\bar{p})$, the imperfection of the market increases and vice versa.

For the sake of simplicity we shall assume in the following discussion that marginal-cost curves are horizontal or increasing, which is in general likely to be the case.

4. We shall now consider a simple case when all n firms are quite similar, so that at any moment all o_k, m_k, and p_k are equal. We thus denote them by o, m, and p. The average price $\bar{p}$ is here of course equal to p, and the total output $O = no$. In this case it is extremely easy to construct a supply curve for an industry under a given state of market imperfection.

Indeed, from equation (3a) we obtain, taking into account $\bar{p} = p$

$$m = p\phi(1)$$

But m is a function of the firm's output o and the total output $O = no$. Thus this equation establishes the connection between p and O or the short-period supply curve of the industry. It is easy to see that the supply curve may be here obtained from the marginal-cost curve of a firm by multiplying the abscissae by the number of firms and dividing the ordinates by $\phi(1)$. It follows directly that this supply curve has the following properties: (i) It is horizontal or upward-sloping. (ii) If the prices of prime factors rise, its ordinates increase more or less proportionally to an appropriate index of these prices.[1] (iii) If the imperfection of the market increases, i.e. the shape of the function ϕ changes so that to the same $p_k/\bar{p}$ corresponds a lower value of $\phi(p_k/\bar{p})$, the supply curve shifts upwards, since $\phi(1)$ then diminishes.

We may now consider the general case and demonstrate that here also the supply curve possesses the above properties.

5. In the general case, when firms in the industry considered are different, an additional assumption is necessary for the determination of the supply curve.

We must assume, namely, that if the general demand rises the coefficients c_k also rise in a definite way. And from this follows directly that all c_k may be represented as increasing functions of one of them, say, c_1.

This assumption having been made, it is now possible to construct the supply curve of an industry.

Let us take a certain value for c_1, whereby, according to the above, all c_k are fixed. Consider a firm k. We may now draw its individual demand curve $o_k = c_k f_k(p_k/\bar{p})$ or—if we denote $p_k/\bar{p}$ by π_k—$o_k = c_k f_k(\pi_k)$ in terms of π_k (Fig. 5). AK is here the 'usual' individual demand curve with ordinates divided by $\bar{p}$, and the corresponding marginal-revenue curve AL the 'usual' marginal-revenue curve divided by $\bar{p}$. Thus equilibrium is reached at the point of intersection of AL with the marginal-cost curve whose ordinates are divided by $\bar{p}$, i.e. $m_k/\bar{p}$. While, however, we can draw the demand curve divided by $\bar{p}$ without knowing $\bar{p}$, since the function f_k expresses the output in terms of π_k (the ratio of the price of the firm to the average price), we cannot draw $m_k/\bar{p}$ as long as $\bar{p}$ is not determined. Thus we draw a family of curves m_k/x. To determine $\bar{p}$ we have the condition that the weighted average of π_k of all firms must be equal to 1 (being the average of $p_k/\bar{p}$). Or $\bar{p}$ is equal to that x to which corresponds the average π_k—or, as we shall denote it, $\bar{\pi}$—which is equal to 1.

Let us draw the horizontal $\pi_k = 1$. It is obvious from Fig. 5 that with a sufficiently small x all π_k corresponding to the intersections of marginal-revenue curves with marginal-cost curves are > 1, and with

[1] If wages and prices of raw materials do not rise in the same proportion, the relative change in various ordinates of the marginal-cost curve may differ (the ratio of marginal labour and raw materials being in general not the same for various outputs). This discrepancy will, however, be usually not very great, and thus an index of wages and raw material prices may be constructed which is a good approximation of the changes in all ordinates.

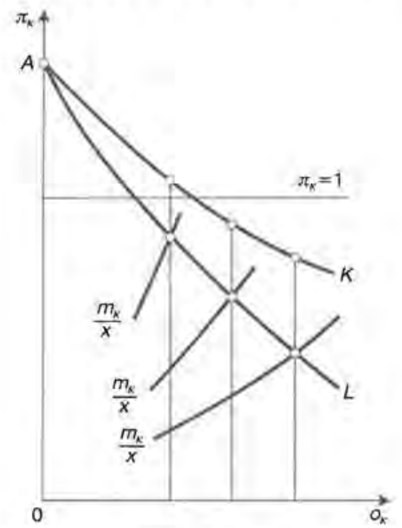

FIG. 5

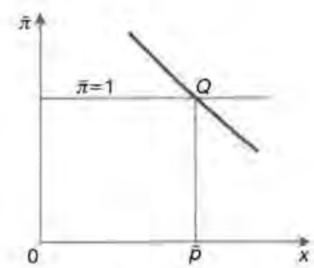

FIG. 6

sufficiently great x they are all < 1. Thus when x rises the average π_k or $\bar{\pi}$ passes from a value > 1 to a value < 1. Thus the curve of $\bar{\pi}$ in terms of x (Fig. 6) must cut somewhere in Q the horizontal $\bar{\pi} = 1$, and this point gives us the average price $\bar{p}$.

We can now determine all outputs o_k and thus the total output O; in this way we obtain a point of the supply curve $\bar{p}, O$.

6. To obtain its other points we must vary c_1, which remained constant throughout the argument of the last subsection. If we attribute to it a new greater value, say c_1', all c_k will now obtain also definite greater values c_k'. The new demand curve of the firm AK' has all abscissae increased in the proportion c_k'/c_k as compared with AK, and the same holds good of the respective marginal-revenue curve AL' (Fig. 7). NN' is one of the m_k/x curves. It may now easily be seen from the diagram that the new π'_k corresponding to a given x is higher than the old π_k (or equal to it if the marginal-cost curve is horizontal). It follows that with $c'_k > c_k$ to a given x corresponds a higher (or equal) π', i.e. average $\bar{\pi}'_k$.[2]

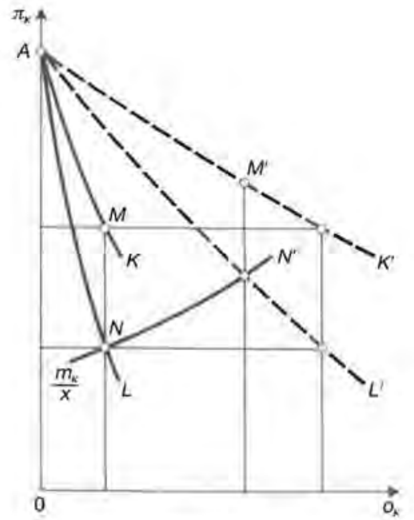

FIG. 7

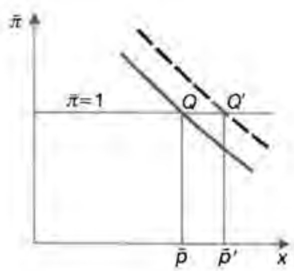

FIG. 8

[2] There will be in general some change in the weights of π_k for the calculation of $\bar{\pi}$ because of the change in the proportion of outputs. This, however, will only reinforce the rise from $\bar{\pi}$ to $\bar{\pi}'$, because the relative importance of high-cost producers will increase.

From this it follows that the π curve of Fig. 6 shifts upwards (see Fig. 8)—or is stationary—and as a result the average price $\bar{p}'$ in the new position of equilibrium is higher than (or equal to) its previous level $\bar{p}$. Or with the rise in the general demand the average price $\bar{p}$ increases or remains unaltered, i.e. the supply curve slopes upwards or is horizontal.

7. We shall now consider the influence upon the supply curve of a rise in the prices of prime factors. It is easy to show that if all ordinates of the marginal-cost curves of all firms change in the same proportion, all prices change in this proportion, while outputs remain unaltered. Indeed, if all marginal costs and all prices change in the same proportion, the curves $m_k/\bar{p}$ do not alter and the short-period equilibrium is established at the same level of outputs o_k. Thus in this case $\bar{p}$ changes in the same proportion as marginal costs and the total output O remains the same; or the supply curve of the industry shifts, all its ordinates changing proportionally.

It follows that, if prices of prime factors rise, the supply curve shifts upwards, its ordinates increasing more or less proportionally to an appropriate index of these prices.

8. We have still to consider what happens to the supply curve when market imperfection increases, i.e. when the functions ε_k and ϕ_k alter their shape so that for the same $\pi_k = p_k/\bar{p}$ they have a smaller value. A direct treatment of this problem proves to be very difficult, and a rather artificial method is therefore adopted here.

Let us consider first a special case of all firms having an identical demand curve and different but horizontal marginal-cost curves. In the initial position we have the equation

$$m_k = p_k\phi(\pi_k) \quad \text{or} \quad m_k = \bar{p}\pi_k\phi(\pi_k)$$

(ϕs are here identical for all firms). After the increase in market imperfection we have:

$$m'_k = \bar{p}'\pi'_k\phi'(\pi'_k)$$

It follows:

$$\frac{\bar{p}'}{\bar{p}} = \frac{m'_k}{m_k}\frac{\pi_k}{\pi'_k}\frac{\phi(\pi_k)}{\phi'(\pi'_k)}$$

and because the marginal-cost curves are horizontal and thus $m'_k = m_k$:

$$\frac{\bar{p}'}{\bar{p}} = \frac{\pi_k}{\pi'_k}\frac{\phi(\pi_k)}{\phi'(\pi'_k)}$$

So far it is impossible to say whether $\bar{p}' > \bar{p}$: we know that $\phi'(\pi_k) < \phi(\pi_k)$, but from this and the last equation it does not yet follow that $\bar{p}' > \bar{p}$.

It is clear that for some firms $\pi'_k > \pi_k$ and for others $\pi'_k < \pi_k$, for the average of both π'_k and π_k is equal to 1.[3] Since firms differ only by the level m_k of their marginal-cost curves, π'_k/π_k is a function of m_k. Thus, for some values of m_k we have $\pi'_k/\pi_k > 1$ and for some < 1. Consequently there must be a firm whose level of marginal cost m_0 is such that $\pi'_0/\pi_0 = 1$. For this firm we shall have from our last equation

$$\frac{\bar{p}'}{\bar{p}} = \frac{\phi(\pi_0)}{\phi'(\pi'_0)}$$

and since $\phi'(\pi'_0) < \phi(\pi_0)$ we have demonstrated that $\bar{p}' > \bar{p}$ or that the average price has increased.

This demonstration may be extended for the case when marginal-cost curves are horizontal but demand curves are different. π'_k/π_k will then depend not only on the level of the marginal cost of the firm but also on the value of parameters representing the peculiarity of its demand curves and their shifts resulting from the change of market imperfection. And it may be concluded in the same way that a firm will exist for which $\pi'_0/\pi_0 = 1$.[4]

9. What about the case, however, where marginal-cost curves are not horizontal? It appears that the proposition of the upward shift of the supply curve as a result of increased market imperfection and vice versa is not then generally valid.[5]

Since, however, in general marginal-cost curves of a great majority of firms do not slope steeply upwards over the relevant range of output, the proposition is likely to be frequently valid. And, at any

[3] This, however, subject to the qualification that the change in the shape of the function ϕ does not redistribute strongly the output between 'high-cost producers' and 'low-cost producers'; for if this is the case, the weights of π'_k in the weighted average $\bar{\pi}'$ may be such as compared with those of π_k in the weighted average $\bar{\pi}$ that π'_k may be greater (or less) than π_k.

[4] Subject to the qualification referred to in n. 3.

[5] This may be shown by a simple example. In an industry there are two types of firm, *A* and *B*, each producing half of the total output. Firms *A* work up to capacity and sell the product at 10*s*. per lb.; firms *B*, having excess capacity and marginal cost of $11\frac{1}{2}$*s*., sell the product at 12*s*. owing to the imperfection of the market. The average price is thus 11*s*. Suppose that market imperfection disappears: then the price must clearly reach the level of *B*'s marginal cost, i.e. $11\frac{1}{2}$*s*. Thus the average price is here higher with perfect than with imperfect competition.

rate, it is valid in the slump when marginal cost curves may be assumed horizontal.

10. We may conclude that the supply curve possesses generally the following properties established in subsection 4 above for the special case of all firms being similar: (i) the supply curve is horizontal or increasing; (ii) a rise in the prices of prime factors causes all ordinates of the supply curve to increase more or less in the same proportion as an appropriate index of these prices; (iii) when market imperfection increases, the supply curve usually shifts upwards.

Assumptions of Pure Imperfect Competition Removed

1. We shall introduce in this section the complications arising out of the existence of oligopoly, the lack of knowledge on the part of the entrepreneur as to the precise shape of his individual demand curve and marginal-cost curve, and selling costs. I am afraid, however, that a reader who expects an equilibrium theory of oligopoly or selling costs will be disappointed. Such a theory is entirely beyond the scope of this article, and I rather doubt whether it is practicable for the short period at all. We shall assume as data what we shall call the degree of oligopoly or certain elements in selling policy, and examine only how these data change under the influence of short-period factors, in particular in the course of the trade cycle.

2. So far we have assumed the number of firms in an industry to be so great that the problem of oligopoly may be neglected. If this is not the case the entrepreneur does *not* equate his marginal revenue $p_k\phi_k(p_k/\bar{p})$ to his marginal cost m_k, but fixes his price at a certain point where the former is *greater* than the latter. He does not reduce his price below this level because he assumes that this will induce his competitors to reduce their prices, and so the average price, sufficiently to render his operation unprofitable. But neither does he raise the price above this level, because he assumes that his competitors will not raise their prices sufficiently to make *this* operation profitable.

We shall say that the ratios:

$$\alpha_k = \frac{p_k\phi_k\left(\dfrac{p_k}{\bar{p}}\right)}{m_k}$$

(which are all greater than 1) determine the degree of oligopoly, and shall try to find out in the next section on what objective factors their change in the course of the business cycle may depend. And by a supply curve of an industry we shall now mean that drawn under the assumption of a given state of market imperfection as given by the functions ε_k or ϕ_k and a given degree of oligopoly as given by the coefficients α_k; while changes in both will be reflected in shifts of the supply curve.

The only modification brought about by the introduction of oligopoly is that equation (3a) now becomes:

$$m_k = p_k \frac{\phi_k\left(\frac{p_k}{\bar{p}}\right)}{\alpha_k} \tag{4}$$

It is obvious from the above that all properties of the supply curve we have deduced hold good under a constant degree of oligopoly, and that an increase in it, i.e. in all α_k, causes the supply curve to shift upwards.[6]

3. We have assumed throughout our argument that the entrepreneur knows the actual elasticity of demand for his product in terms of the ratio of his price to the average price, i.e. $\varepsilon_k(p_k/\bar{p})$. In fact he has only a vague idea about this subject, which may diverge substantially from the actual position.

This may be taken into account by rejecting the equality between $\phi_k(p_k/\bar{p})$ and $1 - (1/1 - \varepsilon_k(p_k/\bar{p}))$. While $\varepsilon_k(p_k/\bar{p})$ is the objective elasticity of demand for the firm's product which determines the actual shape of the demand curve, $\phi_k(p_k/\bar{p})$ is now regarded as being based on $\omega_k(p_k/\bar{p})$ which is the entrepreneur's estimate of $\varepsilon_k(p_k/\bar{p})$. In this way the problem of imperfect competition cannot now be reduced to the function ε_k but involves both ε_k and ϕ_k, since the latter is *not* determined by the former. If, however, the shape of ω_k changes only in a manner parallel to that of ε_k, this does not introduce any substantial changes in the above discussion.

4. Another point of an allied nature is still to be raised. The entrepreneur as a rule is ignorant not only about the demand curve for his products but even about the precise nature of his marginal-cost function. On the basis of various enquiries made recently, it seems likely that in making decisions the entrepreneur usually only considers

[6] Subject to the qualifications referred to in n. 3.

a crude notion such as the average cost of manual labour and raw materials at a 'normal' output.[2] It is obvious that, for the purposes of the preceding argument, we must attribute to the marginal cost m, not its actual value, but what the entrepreneur considers it to be; and that in consequence the relevant marginal-cost curve is often horizontal up to the point of the full use of equipment.

5. This is, however, not yet the end of the story. By m we have meant so far only marginal production costs. If by p we mean the price at which the commodity is sold by the enterprise to other entrepreneurs or consumers, exclusive of transport costs but inclusive of selling costs (advertisements and the remuneration of agents), then marginal selling costs also come into the picture. In the preceding argument we must substitute $m + s$ for m where s is the marginal selling cost.

It is likely that the entrepreneur in general apportions a certain—and probably the larger—part of his selling costs to 'investment or overhead selling costs' (a great part of advertising expenditure is usually treated in this way) and the rest (an important part of which consists of the remuneration of agents) to 'prime selling costs', calculates the ratio β of the latter to total proceeds, and then considers βp to be the marginal selling cost, s. Thus his total marginal costs are $m + \beta p$, where m is the marginal production cost while β (which we shall call the rate of prime selling costs) will be here considered as a datum. Formula (4) must now be written:

$$m_k + \beta_k p_k = p_k \frac{\phi_k\left(\frac{p_k}{\bar{p}}\right)}{\alpha_k}$$

or:

$$m_k = p_k \left[\frac{\phi_k\left(\frac{p_k}{\bar{p}}\right)}{\alpha_k} - \beta_k \right] \tag{5}$$

Henceforth we shall regard as the supply curve of an industry the functional relation between the average price $\bar{p}$ and the total output O, with a given state of market imperfection as expressed by the functions ε_k and ϕ_k, a given degree of oligopoly as expressed by α_k, and given rates of prime selling costs β_k. The supply curve shifts upwards if there is an increase in market imperfection, in the degree of oligopoly, or in the rates of prime selling costs.[7] All other properties of this supply curve are obviously the same as deduced above.

The Reduced-Supply Curve and its Shifts

1. It has been shown above that, given the state of market imperfection, the degree of oligopoly, and the rates of prime selling costs, the ordinates of the supply curve vary more or less proportionally to the appropriate index of the prices of prime factors. Let us call prices of the commodity in question, divided by this index, *reduced* prices. It is clear that a curve relating reduced prices and output is approximately stable so long as the three elements mentioned at the end of the last section do not change.

It must be added that the rise in the productivity of labour as a result of an increased intensity of work or of technical progress has in this context exactly the same influence as the fall in wage rates, and it thus has to be accounted for in the 'price of labour'.

2. Here, however, we come across a new complication in our problem. Technical progress is, of course, connected with changes in capital equipment, but the latter, whether or not they are due to technical progress, involve shifts in the marginal-cost curves and consequently shifts in the supply curve. When, for example, capacity increases in a boom as a result of strong investment activity, the supply curve shifts to the right. In a slump the reverse is true, but only in so far as equipment actually in use is scrapped. Scrapping of idle equipment has no *immediate* effect on the supply curve, but in the subsequent recovery the shrinkage of equipment may make itself felt and the supply curve will then shift to the left.

These shifts of the supply curve may be conveniently expressed in terms of 'reduced output'. Let us consider the state of equipment in some base period. We shall mean by the reduced output of an industry corresponding to a given situation the volume of output which would be supplied at the same average price if market imperfection, etc. were the same as in the situation considered, while equipment is the same as it was in the base period.

We can now say that in periods in which the capacities of firms alter little, reduced output changes in much the same way as actual output.

[7] It is easy to see that changes in the rates of prime selling cost may to a certain extent affect the market imperfection.

The increase of capacity in the boom makes reduced output fall short of actual output. Scrapping of idle plant in the slump does not cause divergence between reduced and actual output, but in the subsequent recovery reduced output increases more sharply than actual output. If the productive capacity of an industry increases, as the result of the extension of normal working hours, actual output will exceed reduced output in the same proportion as the increase in working hours.

3. It is now clear that a curve relating reduced prices (ratios of commodity price to the index of prime-factor prices) and reduced outputs (as defined in the previous section) is more or less stable if there is no change in market imperfection, the degree of oligopoly, and rates of selling costs. We may call it the reduced short-period supply curve, and say that if these three elements are unchanged this curve is more or less stationary.

It follows that, if we consider a reduced-supply curve, it shifts only if one (or more) of these three elements changes. Thus the price fluctuations which will accompany fluctuations in prime-factor prices and in reduced output are determined if the simultaneous changes in the state of imperfect competition, the degree of oligopoly, and the rates of prime selling costs are known. We shall try now to discuss the factors which are the chief determinants of these changes.

4. There seem to be two important possible reasons for the change in the state of market imperfection. One has been given by Mr Harrod.[8] He assumes that buyers are more careful in comparing prices charged by various sellers in a slump than in a boom. As a result, market imperfection tends to fall in a slump and to rise in a boom.

A second reason works rather in the opposite direction. If transport costs and allied charges rise relatively to the prices p_k, imperfection of the market increases, and vice versa.[9] Since these charges are likely to be more sticky than commodity prices, this factor will often cause an increase of market imperfection in a slump and a reduction in a boom.

On balance it is difficult to ascertain how market imperfection changes in the course of the trade cycle. It seems that both factors mentioned will be much less powerful in most industries than those ruling the change of the degree of oligopoly which we are going to discuss in the next section.

[8] *The Trade Cycle*, pp. 86–7. [9] Cf. pp. 51–2.

5. With a given reduced-supply curve, both the fall in the prices of prime factors and in the volume of output cause the gross profits to fall. A fall in the prices of prime factors causes, for a given output, a proportional fall in prices and consequently in profit margins (including overheads) per unit of output. And a fall in output causes *ceteris paribus* a proportional fall in profits if the supply curve is horizontal, and a more than proportional fall if the latter is increasing.[10]

Now the changes in the degree of oligopoly will mainly depend on the type of situation which develops in the face of the decline in profits: 'cut-throat competition' or 'tacit agreement'.

In the first case, the 'stronger' firms (low-cost producers) try to improve their situation by lowering their degrees of oligopoly in order to drive out of the field the 'weaker' ones (high-cost producers) who already are on the verge of ruin as a result of the 'natural' fall in gross profits.

A necessary (though not a sufficient) condition of this state of affairs is a considerable dispersion of the levels of prime costs between the different firms.

6. In the case of a 'tacit agreement', the single entrepreneur in a slump arrives at the conclusion that if his degree of oligopoly α falls, or even remains constant, he will inevitably reach a position of not being able to cover his overhead expenditure (salaries, redemption of debts, payment of interest, etc.). Thus he raises α, his only hope being that his competitors will do likewise. If they do not he is lost, but so he would be if he did not raise his α. If such is the prevailing attitude a tacit agreement is established and the supply curve shifts upwards. (It is interesting to note that the indebtedness of firms will exert a certain influence through this channel upon α, thus the popular view that prices are relatively high because of heavy debts in firms is not altogether senseless.)

As opposed to 'cut-throat competition', this case is favoured if there are no considerable dispersions between the prime costs of various producers. And, obviously, an intermediate case is possible when the reduced-supply curve shifts neither downwards nor upwards.

As for the case of 'tacit agreement', it is important to note that the rise of α does not mean a high measure of profit, because it only partly

[10] Strictly speaking, with a horizontal supply curve the fall in profits will be often more than proportional, owing to increasing average returns of prime factors.

compensates for its fall due to the decline in the prices of prime factors and output. The existing firms need not be afraid that new enterprises will emerge. In the recovery, however, the lower level of the degree of oligopoly is restored; not only because of the fact that the 'danger is over' but also because of the fear of newcomers.

It cannot be said a priori whether 'cut-throat competition' or 'tacit agreement' takes place more frequently in a slump. But an empirical enquiry suggests that in a deep slump the latter prevails.

7. As regards the rates of prime selling costs β, it is not unlikely that they would tend to increase in a slump. Firms which did not have recourse in a boom to the services of agents may well employ them in a slump, and thus their βs rise. Advertisements aimed at a short-period effect probably increase as compared with the value of output, etc. It is necessary to remember, however, that this is of importance only for certain types of finished good.

The Ratio of Proceeds to Prime Costs and the Reduced-Supply Curve

1. In order to investigate empirically the reduced-supply curve and its shifts, we have first to establish the two time series of reduced output and reduced price.

In the case of the former series this is, strictly speaking, impossible. As mentioned above, however, in periods when changes in the productive capacity of firms are known to be small, reduced output may be identified with output. The same is true of slump periods if idle plant is scrapped, for this change in capacity has its bearing on reduced output only in the next recovery. If important changes in capacity do occur, the best approach is to consider the time series of output proper, but to give qualitative information as to when and to what extent this series is unrepresentative of reduced output.

The series of the reduced price (or ratio of price to the index of prime-factor prices) seems relatively easy to establish. Nevertheless, in practice we again encounter serious difficulties. The price data of finished products are very often unsatisfactory, the prices quoted being 'official' rather than actual. The same is true of the prices of prime factors, in particular wage rates. But the most difficult problem is to allow for the changes in the productivity of labour resulting from changes in the intensity of work or in technical progress, which must be taken into account in the index of prime-factor prices (see p. 62). Practically the only way to obtain the relevant data is to divide the index of output by the index of employment (hours worked). This ratio reflects, however, both 'technical' changes in the productivity of labour and those resulting from increasing or diminishing average returns. The procedure of separating them by some method of trend elimination is always to some extent arbitrary.[3] Another source of arbitrariness is the dependence of an industry's index of output on the choice of weights. For the index of output as such, this is usually not very important; but the ratio of output to employment is usually subject to relatively small changes which consequently may be very strongly affected even by slight variations in the index of output.

2. We have therefore chosen another way of dealing with our problem. It is often relatively easy to get data on the aggregate proceeds and aggregate prime costs of an industry (at least in the years in which a census of production is taken), while for other years a reasonable interpolation is frequently possible. Now it may be shown that the ratio of aggregate proceeds to aggregate prime costs is closely allied to reduced price.

Indeed, by dividing the numerator and denominator of this ratio by the volume of output we obtain:

$$\frac{\text{Proceeds}}{\text{Prime Costs}} = \frac{\text{Price}}{\text{Average Prime Cost}}$$

Moreover, if we divide the numerator and denominator of the right-hand side by an index of prime factor prices, we obtain in the numerator the reduced price and in the denominator the 'real' average prime cost, r—from which, however, the 'technical' changes in productivity are eliminated (for these changes are accounted for in the index of prime factor prices: see p. 62), and which may be assumed to be a fairly stable function of the reduced output. Thus we have:

$$\frac{\text{Proceeds}}{\text{Prime Costs}} = \frac{\text{Reduced Price}}{r} \tag{6}$$

If the reduced-supply curve is stable, i.e. if reduced price is a stable function of reduced output, the ratio of proceeds to prime costs will also be a stable function of the latter, since r (the real prime costs after the elimination of technical changes in productivity) may be assumed to be a function of reduced output. The curve representing the functional connection between the ratio of proceeds to prime costs and reduced output we shall call the *quasi supply curve*. We may thus say that if the reduced-supply curve is stable so also is the quasi supply curve.

3. It follows directly from equation (6) that if the reduced-supply curve shifts as a result of change in market imperfection, etc., the quasi supply curve undergoes the same relative shift, i.e. the ordinates of the latter change in the same proportion as those of the former.

Further, we have shown above that, on certain assumptions,[11] the reduced-supply curve is horizontal or upward-sloping, and the same is likely to be true of the quasi supply curve. Indeed, all recent investigations of costs suggest that average returns to prime factors are constant or increasing over the relevant range of output. Thus r in equation (6) may be assumed to remain constant or to fall with the rise of reduced output. And it follows from this that, if the reduced price is constant or rising with the reduced output, the same applies to the ratio of proceeds to prime costs.[12]

It is now clear that we may investigate the quasi supply curve instead of the reduced-supply curve. The only disadvantage of this method consists in the difficulty of distinguishing in the former the influence of the shape of the reduced-supply curve and that of increasing (or constant) returns. But, as we shall see, in particular cases a rough estimate may be made. On the other hand, it may be easily seen that it is the curve of the ratio of proceeds to prime costs or the quasi supply curve, and not the reduced-supply curve, which is directly relevant for the distribution of the industry's product.

An Empirical Enquiry

1. We now proceed to an empirical enquiry into our problem. Table 18 shows the results of the calculation of the ratio of proceeds to prime costs and the index of output in four British industries—coal-mining, cotton-spinning and weaving (exclusive of finishing), ship-building, steel-smelting and rolling—in the period 1922–37. A brief description of the statistical methods applied is given in an Appendix on pp. 75–8. The possible divergence between reduced output and

[11] The marginal-cost curves were assumed to be horizontal or upward-sloping.

[12] If even with a high output r does rise, the upward slope of the supply curve at such a level of output is likely to be sufficiently steep at least to compensate.

Table 18. *Ratio of Proceeds to Prime Costs and the Index of Output in Four British Industries, 1922–1937*

Coal				Cotton				Shipbuilding				Steel			
Year	Proc./pr. c.	Outp. (adj.)	Aggr. pr. c.	Year	Proc./pr. c.	Outp.	Aggr. pr. c.	Year	Proc./pr. c.	Outp.	Aggr. pr. c.	Year	Proc./pr. c.	Outp.	Aggr. pr. c.
1922	*103*	*113.5*	135	1922	—	—	—	1922	—	—	—	1922	—	—	—
1923	*106.5*	*126*	149.5	1923	—	—	—	1923	—	—	—	1923	—	—	—
1924	*100.5*	*121.5*	152.5	1924	*100*	*122*	217	1924	*94*	*81.5*	92	1924	86	112	155
1925	*98.5*	*111*	123	1925	*101.5*	*140*	221	1925	*93*	*78*	85	1925	86	101	124
1926	—	—	—	1926	*97.5*	*125*	158	1926	*88*	*71*	74.5	1926	—	—	—
1927	*94.5*	*103*	117	1927	*105.5*	*141*	165	1927	*89.5*	*93.5*	98	1927	90.5	124.5	133
1928	*92.5*	*97.5*	99	1928	*95.5*	*131*	176	1928	*95*	*96.5*	98.5	1928	93.5	116.5	118.5
1929	100.5	105.5	104	1929	*98*	*129.5*	163.5	1929	*98*	*106.5*	108	1929	92.5	132	137
1930	100	100	100	1930	100	100	100	1930	*100*	*100*	100	1930	100	100	100
1931	100.5	96.5	89	1931	107	99.5	77.5	1931	101	61	59.5	1931	104	71	67
1932	101.5	93	83	1932	105	105.5	83	1932	98	46.5	45	1932	104	72	64.5
1933	102.5	94.5	79.5	1933	98.5	106.5	88	1933	95.5	44.5	43.5	1933	106	96	82.5
1934	102.5	99	83.5	1934	98.5	101.5	99.5	1934	95.5	52	51	1934	107	121	108.5
1935	103.5	101.5	84.5	1935	97.5	103	91.5	1935	98	57.5	56.5	1935	114	134.5	117
1936	105.5	104	92	1936	—	—	—	1936	—	—	—	1936	107	161	153
1937	105	109.5	106	1937	—	—	—	1937	—	—	—	1937	113	177.5	190

output is accounted for (except in one case) only by qualitative comment.

Besides the indices of the ratio of proceeds to prime costs and output, we have computed that of total prime costs in order to facilitate the analysis of the changes in the degree of oligopoly. Indeed, we have shown above (see p. 63) that the latter are closely connected with the fall of gross profits; and that these, with a given reduced-supply curve, fall proportionally to prime factors prices and proportionally or more than proportionally to output. It follows that aggregate prime costs will be a good (though not a perfect) indicator of the tendency of profits to fall if the reduced- or the quasi supply curve does not shift.

2. We shall now interpret the data given in Table 18. I must warn the reader that, owing to the extreme complexity of the phenomena considered, this interpretation is to a certain degree arbitrary.

Coal. In order to obtain an approximation to reduced output, we have divided output by the normal length of shift (which changed in 1926 and 1931–2). Thus adjusted, the output still differs from the reduced output because other changes in the productive capacity are not accounted for.

There is a rather close positive correlation between the proceeds–prime costs ratio and reduced output, in the period 1922–8. (The figures of both these series showing correlation are printed in italics throughout Table 18.) It is likely that the capacity of mines—apart from the changes in normal working hours—increased in the period considered. It may easily be seen that if this were taken into account the correlation would be improved. After 1928 the correlation clearly breaks down. This is caused in 1929 and 1930 by regional agreements and later on by the Coal Mines Act.

We may now discuss in more detail the nature of the correlation in 1922–8. It suggests the existence of an upward-sloping quasi supply curve. Moreover, an examination of the average productivity of labour (tons per man-hour), as given in the *Reports of HM Inspector of Mines and Quarries*, leads us to the conclusion that changes in average returns to output are not likely to be important, the relevant series showing a more or less uniformly increasing trend. Thus the correlation is probably due to the upward slope in the reduced-supply curve.

We may still try to throw light on the factors which cause this slope. The *Reports of HM Inspector of Mines and Quarries* gives the average number of shifts per week that mines were operated. The comparison of this series with the reduced output shows that in the period 1922–8 about 60% of the changes in reduced output were due to changes in the number of shifts worked per week. Increases in shifts per week are not likely to involve increasing marginal costs. The simplest interpretation of this state of affairs seems to be as follows. When demand rises, many mines are in a position to increase output in a way not involving rising marginal costs (i.e. by a change in the number of shifts per week). However, in the mines which work more or less up to capacity, marginal costs increase. As a result the average price rises, which makes it possible for some high-cost producers to reopen their mines, and this accounts for that part of the change in the reduced output which is not due to the change in the number of shifts per week (on average 40% in the period considered).

Cotton. Changes in productive capacity before 1930 were unimportant in this industry. In 1930–5 an intensive scrapping of idle spindles and looms took place, while output was more or less stable. Thus reduced output may be here assumed identical with output over the whole period considered (see pp. 62–3).

There is an appreciable positive correlation between the ratio of proceeds to prime costs and output in 1924–9, though much looser than in coal-mining. However, it breaks down entirely in 1930–2, when the proceeds: prime-costs ratio has a much higher value than in the preceding period, in spite of a lower level of reduced output. This may very likely be due to the existence of a state of 'tacit agreement' in this period as a result of the tendency of gross profits to decline very sharply, as indicated by the fall of aggregate prime costs after 1929.

It may, however, seem strange that after 1932 the ratio of proceeds to prime costs falls again to a level which fits better into the correlation of the period 1924–9; for the change in aggregate prime costs does not suggest that there was a tendency for gross profits to rise. This may, however, be explained on the grounds that some adjustment of overhead expenditure took place in the meantime (a reduction in the salary bill, conclusion of agreements for the reduction of debt charges, etc.).

Let us return for a moment to the positive correlation between the proceeds: prime-costs ratio and reduced output during 1924–9. As already mentioned, it is very loose. This may be due to shifts in the quasi supply curve being appreciable as compared with its slope even if we exclude the period of 'tacit agreement'. And, of course, unavoidable errors in statistical estimates may also interfere. It may be noticed that the positive correlation during 1924–9 depends chiefly on the years 1925 and 1927, when output reached its highest level. This suggests that the reduced-supply curve slopes upwards only after a certain level of output is reached and *some* enterprises are working up to capacity (as with coal-mining).

Shipbuilding. As far as can be judged on the basis of qualitative information, there was no important change in capacity in the industry during 1924–30. In 1930–4 a scrapping scheme was in operation which reduced the capacity of yards by about 40%. This, however, could not affect the reduced output during 1930–3, since clearly it was idle yards which were scrapped, and output was falling. The rise of output in 1934 and 1935, capacity having been so much reduced, could, however, cause (though not necessarily) the index of reduced output to be higher than that of output. Thus we may assume that the index of reduced output is equal to the index of output during 1924–33, and perhaps higher than the latter in 1934 and 1935.

As regards the correlation between the ratio of proceeds to prime costs and output, the position resembles that in the cotton industry. There is a distinct positive correlation (even somewhat closer than in cotton) in the period 1924–30.[13] In 1931 and 1932, in spite of a catastrophic fall in output, the ratio of proceeds to prime costs remains at the boom level. In 1933–4 this ratio decreases, while output stops falling in 1933 and starts to rise in 1934. In 1935 the proceeds: prime-costs ratio rises again. This rise may be due to the rise in reduced output being much greater than in output, as a result of the previous operation of the scrapping scheme.

Steel. As regards productive capacity, there were no important changes in the period 1924–34; in 1935–7, however, there was an appreciable increase. Thus we assume the reduced output to fluctuate in roughly the same way as output in the first period, and to rise somewhat less than the latter in 1935–7.

It is clear from our figures that no correlation between the ratio of proceeds to prime costs and output is traceable over all the period considered. We notice only an upward trend in the ratio of proceeds to prime costs.

[13] From the technique of calculation of this series (see statistical appendix, pp. 77–8), it follows that in 1924–30 it represents the reduced price rather than the ratio of proceeds to prime costs. The positive correlation may be thus attributed safely to the shape of the reduced-supply curve.

This position may be explained by two reasons: (i) There was so much excess capacity that even single firms were never fully employed in the period considered, and thus the reduced-supply curve was horizontal over the relevant range. (ii) The profits in the industry were very low already at the outset of the period examined, in 1924. Their tendency to fall continuously until 1932, as indicated by the downward trend of the aggregate prime costs (caused by the decline in the prime costs per unit of output), created a background for a position of 'tacit agreement' and even for an explicit one for some products. This explains the rise of the proceeds:prime-costs ratio during 1924–32. After 1932 a new reason for the spreading of explicit agreements was the increased customs tariff.

3. The results of the above enquiry may be summed up as follows. In 'normal' times there exists a positive (sometimes rather vague) correlation between the ratio of proceeds to prime costs and the reduced output of an industry. This may be attributed to the upward slope of the reduced-supply curve over a certain range of reduced output, which is probably caused by some firms working up to capacity.

In an acute slump, however, when profits tend to fall owing to the decline in the prices of prime factors and the volume of output, a situation of 'tacit agreement' arises, the reduced-supply curve shifts upwards, and the correlation between the proceeds:prime-costs ratio and reduced output is suspended.

If this tendency is general, we may expect that it will be reflected in the ratio of proceeds to prime costs for the aggregate of manufacturing industry. However, we do not have at our disposal such data for Great Britain, where censuses of production are taken at relatively long intervals. In the USA, where there is a census of production every two years, the relevant figures may be computed directly. In Table 19 the absolute ratio of aggregate proceeds to aggregate prime costs (wage and raw-material bill) of US manufacturing is given, and with it the index of the volume of output[14] and that of aggregate prime costs (both with 1929 taken as base year).

The index of output is here not an adequate substitute for that of reduced output: manufacturing capacity in the USA certainly did increase from 1925 to 1929 and most likely diminished from 1929 to 1935. But the rise in the first period was not so great as to offset fully

[14] Federal Reserve Board.

Table 19. *Ratio of Proceeds to Prime Costs and Output Index in the US Manufacturing Industry, 1925–1935*

Year	Manufacturing in the USA		
	Proceeds / Prime costs	Output 1929 = 100	Aggregate prime costs 1929 = 100
1925	1.345	88	94
1927	1.365	89	91.5
1929	1.405	100	100
1931	1.42	68	58
1933	1.42	63	44.5
1935	1.355	76	68

the rise in output, so that reduced output did increase from 1925 to 1929.[15] And the shrinkage of capacity in the subsequent period was most probably also not so drastic as to render the reduced output of 1935 equal to that of 1925 or 1927. Thus we may safely assume that output in 1935 was smaller than in 1925 and 1927; and that its level in the latter years was in turn lower than in 1929.

If we look at the series of the proceeds:prime-cost ratio, our first impression is similar to what we found previously; that it rises in a boom, rises further in a slump, and falls at the end of a slump. If, however, we consider the data more closely, the situation appears rather more complicated; though after a thorough examination it will be shown that we have here exactly the same phenomena as in the preceding enquiry.

Between 1925 and 1927 there is no appreciable change in output (nor probably in reduced output; if there was, it was a fall), while there is a rise in our ratio. This makes it quite likely that there was a certain upward trend in the series considered, the more so in that there was probably an increase in the rate of prime selling costs in the USA at that time.[16] It is also likely that a part of the rise of the ratio of proceeds to prime costs between 1927 and 1929 may be attributed to

[15] This may be gathered from data given in *America's Capacity to Produce and America's Capacity to Consume*, Pittsburgh, Pa., The Brookings Institution, 1934, p. 307.

[16] This hypothesis is also confirmed by data for the period prior to 1925. We have not given them in Table 19 because the discrepancies between the index of reduced output and that of output would then require much more discussion.

this cause, and it is possible that the trend continued after 1929. The picture thus becomes much vaguer; but still some facts may be stated quite safely.

First, our ratio after trend elimination would be smaller in 1935 than in 1925 and 1927 (see Table 19). Secondly, only a part of its increase from 1927 to 1929 is likely to be due to trend, since the increase is much greater than from 1925 to 1927. Thus we may say that after trend elimination our ratio would be higher in 1925 and 1927 than in 1935, but lower than in 1929. The same is the case for reduced output, and thus the latter is positively correlated with the ratio of proceeds to prime costs if the slump years 1931 and 1933 are left out of consideration.

On the other hand, reduced output in the latter years is certainly lower than in 1935, while the ratio of proceeds to prime costs is higher, and will be the more so after the elimination of any trend which may have been present between 1931, 1933, and 1935.

Thus we may conclude: (i) if we exclude the slump years 1931 and 1933 we have a positive correlation between the proceeds: prime-cost ratio and reduced output; (ii) in these slump years the correlation is 'suspended'.

This is, moreover, exactly what we discovered in our previous enquiry. It must be added that this phenomenon may here be caused not only by 'tacit agreements' in the slump but also by the cyclical change in the rate of prime selling costs. This factor is, however, unlikely to be important in the industries previously considered.

4. It is easy to see that the ratio of proceeds to prime costs is an important determinant of the relative share of manual labour in the value of net output. Indeed, if in addition to this ratio the ratio of the wage bill to raw material bill is given, the distribution of net output between manual workers and other income recipients is determined. For we then know how total proceeds are divided among 'profits' (including salaries and depreciation), wages, and raw-material costs, and thus we have also the proportion between 'profits' and wages.

Moreover, it is clear that a rise in the ratio of proceeds to prime costs tends to diminish the relative share of manual labour in the value of net output, while a rise in the wage bill relative to the raw-material bill tends to raise it.

Now if we had a stationary reduced-supply curve throughout the trade cycle (or if the market imperfection, the degree of oligopoly, and the rate of prime selling costs did not change), the ratio of proceeds to prime costs would rise in a boom and fall in a slump. Moreover, since 'basic' raw materials usually fluctuate more sharply than wages, the proportion of wage to raw-material bill falls in a boom and rises in a slump (though as a rule not very strongly, since 'raw materials' are here in general not 'basic' raw materials but semi-manufactures, the cost of which is much affected by the level of wages[17]). As a result, with a stationary reduced-supply curve we may expect fairly regular cyclical fluctuations of the relative share of manual labour in the net output, with the maximum at the top of a boom and minimum at the bottom of a slump.

It is clear, however, that if in a slump, owing to 'tacit agreements', to an increase in the rate of prime selling costs, etc., the supply curve shifts upwards, the amplitude of these fluctuations is reduced and their regular cyclical character distorted. And if the upward slope of the reduced-supply curve and the fluctuations of the 'basic' raw-material prices relative to wages cause only moderate fluctuations in the relative share of manual labour in the net output, while the influence of factors shifting upward the reduced-supply curve during a slump is of the same order, the resulting fluctuations may be rather small and irregular.

This explanation of the stability of the relative share of wages in the net output does not differ in substance from the one which I gave in an earlier essay.[18] I made there a rather stringent assumption of a horizontal quasi supply curve. This is not necessary if the upward *shift* of this curve during a slump is sufficiently important to have an influence upon the relative share of manual labour in the net output of the same order as that exerted jointly by the upward *slope* of the same curve and the change of 'basic' raw-material prices relative to wage cost.

Statistical Appendix

We give here a brief description of methods applied in the computation of the series contained in Table 18.

[17] In the US manufacturing the ratio of aggregate wage bill to aggregate raw-material bill fluctuated as follows: 1925:—0.335; 1927:—0.31; 1929:—0.305; 1931:—0.33; 1933:—0.315; 1935:—0.285.

[18] 'The Determinants of the Distribution of the National Income', *Econometrica*, 1938, repr. in *Essays in the Theory of Economic Fluctuations* [see above, and *Collected Works*, vol. i].

Coal. The *Reports of HM Inspector of Mines and Quarries* give directly the average proceeds and the average costs of labour and timber per ton of coal produced. The ratio of these series gives us thus the ratio of proceeds to prime costs.

The index of adjusted output is the index of the ratio of tonnage raised by the average normal length of the shift. The aggregate prime costs are obtained as the product of tonnage raised and the average cost of labour and timber per ton.

Cotton. (This calculation was carried out by Mr Y. N. Hsu.) The most important item in the raw-material bill—the value of cotton consumed—was obtained by multiplying the tonnage of cotton consumption[19] by the average value of imported cotton.[20] In addition, imports of yarn and waste were taken into account.[20] The wage bill was calculated as the product of man-hours worked and hourly earnings. The first series is obtained for the years in which there was a census of production by multiplying the number of workers employed, taken from the census[21] by average working hours taken from the Ministry of Labour Earnings and Hours Inquiries,[22] the interpolation between the census figures made on the basis of the number of workers insured minus those unemployed[22] (which reflects to a certain degree the extent of short time, a broad category of part-time workers being registered as unemployed when not actually working). The series of hourly earnings was computed directly from the Ministry of Labour Earnings and Hours Inquiries[22] and interpolated in the intervening years on the basis of the monthly samples published in the *Ministry of Labour Gazette.*

Aggregate proceeds of the cotton industry as a whole were taken from the census of production in the census years.[21] The value of the export of yarns was available also in intervening years,[20] and the interpolation index for the rest of the proceeds was calculated as the product of the tonnage of home consumption of yarn by the average proceeds per lb. of grey cloth. The first series was obtained by interpolating between the census figures[21] of the tonnage of yarn production by means of the series of cotton consumption, and by adding to the result the tonnage of yarn imports and subtracting that of yarn exports.[20] The second series was obtained by interpolating

[19] *Board of Trade Journal* and *International Cotton Bulletin.*
[20] *Annual Statement of the Trade of the UK.*
[21] Census of production.
[22] *Ministry of Labour Gazette.*

between the average proceeds per lb. of grey cloth in the census years[21] by means of the index of prices of such cloth.[23]

The index of output was calculated by deflating the aggregate proceeds by the combined price index of cloth and yarn.[23]

Steel. (This calculation was carried out by Mr B. Tew.) The wage bill and the tonnage of the various raw materials used were taken from the Federation's statistics.[24] Average values per ton of the different raw materials were calculated thus: pig iron, census figures[21] of the average value per ton of basic and hematite pig produced, interpolated and extrapolated on the basis of continuous series of the average selling values of pig produced in various counties,[22] corrected for imports[20] and transport costs,[25] bought scrap, prices of steel scrap,[26] coal, the average value of gas coal exported from the UK.[20] The total proceeds of the steel industry were obtained by multiplying the quantum outputs of the various types of final product[27] by their respective average values, which were census figures[21] interpolated on the basis of the quoted prices of these products.[26]

The index of the output of steel is simply an index of the output of raw steel, i.e. of ingots and castings.[24] This index did not greatly differ from a more sophisticated index, in which the different types of final product were weighted according to their estimated average prime cost of production.

Shipbuilding. Because of the scarcity of data, a more indirect method was applied here to obtain the ratio of proceeds to prime costs. This was first calculated for the years in which there was a census of production. Aggregate proceeds, the raw-material bill, and employment were taken from the census,[28] the average earnings per worker from the Ministry of Labour Earnings and Hours Inquiries.[29]

To establish an index for interpolation in the intervening years, the following series were used: (1) 'Fair-play' price of building a 7500-ton

[23] Based on price quotations given in *Statistical Abstract of the UK.*
[24] *Statistics of the Iron and Steel Industry.*
[25] *Ministry of Transport Railway Returns.*
[26] *Iron and Coal Trades Review.*
[27] See *Statistics of the Iron and Steel Industry*, 1937. Our final products include 'finished steel' (Table 25) except galvanized sheets, tin, terne and black plates, plus the net amount of semi-finished steel going 'out of the industry' (as we have defined it) to be used in the manufacture of galvanized sheets, tinplate, tubes, wire, etc. Our 'industry' has the same scope as the Federation's wage statistics.
[28] Census of production.
[29] *Ministry of Labour Gazette.*

steamer. This price is relevant to *orders*. Since the average construction period fluctuates around one year, the 'price of output' was taken as the average between the price in the year considered and that in the preceding year. (2) The raw-material price index should consist of the prices of the relevant steel products[30] and the price of engines. The latter is not available. Since it follows from export statistics[31] that prices of machines in general were very stable over the period, the price of marine engines has been assumed to be constant. The index of raw-material prices calculated in this way agreed very well in the census years, with the ratio of raw-material bill to 'real output' obtained by dividing aggregate proceeds by the 'price of output'. (3) The hourly earnings given by the Ministry of Labour Earnings and Hours Inquiries in 1924, 1928, 1931, 1935[28] show a great stability, which makes it possible to estimate roughly their probable level in the intervening years.

The indices of the raw-material bill and hourly earnings taken with appropriate weights were then combined in one index. This is the index of prime-factor prices, without allowing for the change in the technical productivity of labour. We divided the price of output by this series, and used it for interpolation between the ratios of proceeds to prime cost in census years. It is easy to see that in the resulting series the long-run changes in the productivity of labour *are* accounted for, but changes in the returns to scale only partly. Thus the series obtained is intermediate between the reduced price and the ratio of proceeds to prime costs. And since the level of output in 1924 and 1930 (see Table 18) differs relatively little, this series during 1924–30 represents the reduced price rather than the ratio of proceeds to prime costs.

The approximate index of output was obtained by interpolation between the 'real outputs' in census years (calculated as mentioned above) by means of the index of employment. The latter was based on the difference between the numbers of workers insured and those unemployed.[29]

The approximate index of aggregate prime costs is obtained by multiplying the index of output by the index of 'the price of output' and dividing by the index of the ratio of proceeds to prime costs.

[30] *Iron and Coal Trade Review.*

[31] London and Cambridge Economic Service.

A Theory of Long-run Distribution of the Product of Industry[1]

(1941)

I

1. The problems of the distribution of the product of industry in long periods are usually approached on the assumption of long-run equilibrium. It is tacitly assumed that it is the distribution corresponding to long-run equilibrium which dominates the picture if cyclical fluctuations are eliminated. And the long-period changes in the distribution of the product of industry are accordingly attributed to those in the basic parameters of long-run equilibrium such as the rate of interest and the state of technical knowledge.

This approach might be considered correct if our economy were quasi-stationary—i.e. if all its 'dynamics' consisted of cyclical fluctuations round a certain stationary level. Once, however, we realize that what we call more or less vaguely a 'trend' must also be considered, the matter becomes very complicated. Indeed, the existence of a 'secular trend' actually presupposes that long-run equilibrium in a strict sense (i.e. in the sense of the system's being at rest) is never reached. To that it may be replied that, if the trend is uniform, the modifications required in the equilibrium theory can be easily introduced. This is quite true, but why should the trend be uniform? Secular trend is at least as complex a dynamic process as the business cycle, and no simplifications representing it as a 'natural growth', etc., will do. If we admit this fact, the usefulness of the long-run equilibrium theory of distribution becomes rather doubtful.

In section III below we give an example showing how remote the real long-period dynamic process may be from the pattern of long-run equilibrium: in the period 1899–1923 the rate of profit in US manufacturing fell drastically, while the long-term rate of interest showed a steady rise.

2. If, however, we reject the long-run equilibrium theory of distribution as unrealistic, what else may be put in its place? It is clear that the problem becomes indeterminate unless some additional parameter describing the long-period changes of the system is given. As we shall see below, it is most convenient to take as such a parameter the utilization of equipment, i.e. the ratio of actual output to its maximum productive capacity.

In the first stage of this investigation we assume perfect competition. On this assumption, with given capital equipment, the distribution of the value added by an industry between wages, on the one hand, and salaries, depreciation (including maintenance), and profits, on the other, is determined by the utilization of equipment. Indeed, price being equal to short-period marginal cost, the average value added (i.e. price minus average cost of materials) is approximately equal to the marginal wage cost, since it may be assumed that the average cost of materials is independent of a firm's output, and that the marginal cost of salaries and depreciation is small. Further, the ratio of average to marginal wage cost is determined for each firm by the utilization of its plant. Finally, the utilization of equipment of the industry as a whole determines the utilization for each firm.[1] It follows clearly that the utilization of equipment of the industry as a whole determines the relative share of wages in the value added.[2] Thus, denoting the utilization of equipment by u and the relative share of wages in the value added by σ, we have:

$$\sigma = f(u) \tag{1}$$

where f is a diminishing[3] function.

3. Equation (1) has been deduced on the assumption of a given capital equipment. When equipment changes, this will in general affect the shape of function f, but we shall try to show that this function is likely to be fairly stable, even in long periods.

Imagine that all firms increase their capital equipment by the same percentage without any change in the method of production being involved. It is clear that the shape of the function f will not be affected. But even if the increase in capital equipment does involve a change in the method of production, but the average wage cost corresponding to

[1] If, however, the wage rates paid by various firms differ, their percentage discrepancies will be an additional determinant.

[2] According to n. 1, the discrepancies in wage rates will also exert some influence upon this share, which will, however, be of no great importance.

[3] This is not strictly correct: in certain intervals the ratio of average to marginal wage cost may be an increasing function of u. Such cases are, however, rather exceptional.

any utilization of plant alters in the same proportion, the shape of function f is still unaffected. Indeed, all ordinates of the average wage cost curve drawn with utilization of the plant as abscissa then change in the same proportion, and so do the ordinates of the corresponding marginal-cost curve.

If, for instance, all firms increase the amount of capital and reduce the amount of labour per unit of output, and if the resulting increase in the productivity of labour reduces for every firm the average wage cost corresponding to any utilization of plant in the same proportion, the shape of function f remains exactly the same.

We thus come to the conclusion that changes in capital equipment may affect the shape of function f only as a result of: (i) discrepancies (quantitative and qualitative) in the investment activity of various firms; (ii) disproportionate change in the average wage costs, corresponding to various degrees of utilization of a plant. Thus, for example, technical progress modifies the shape of f only to the extent to which it causes the 'disproportions' mentioned; it leaves f unchanged if it is entirely 'uniform'. It is for these reasons that function f need not necessarily change its shape in the long period; and since there are no strong a priori reasons for its change in one way rather than in another, one can even venture to say it is likely to be fairly stable.

4. The long-run equilibrium theory of distribution is, of course, not in contradiction to equation (1). Moreover, the latter will be an important link in the system of equations, determining the long-run equilibrium and the distribution of the product of industry which corresponds to it.

If, for instance, there is a change in technique causing a rise in the amount of capital in relation to productive capacity, the utilization of equipment must rise to secure the same rate of profit. However, according to equation (1) the rise in the utilization of equipment is accompanied by 'shift to profits'; thus the percentage increase in the utilization in the 'new' long-run equilibrium as compared with the 'old' one will be less than in the ratio of capital to maximum capacity. If, however, we do not attach any particular significance to the state of long-run equilibrium, the distribution of the product of industry is determinate, as already mentioned above, provided only that we introduce a parameter reflecting the dynamic changes in the system; and it is now clear that the utilization of equipment is a very convenient parameter for this purpose.

II

1. We shall now have to reckon with a certain degree of market imperfection and oligopoly in the industry considered, and also with selling costs. I have considered how these factors affect the formation of short-period equilibrium elsewhere,[4] and I can here give only a brief account of the matter.

Let us begin with imperfect competition. We assume that its degree is determined by the elasticity of demand for the product of a firm being a definite function ε of the ratio of this firm's price p to the weighted average of prices of all firms in the industry $\bar{p}$. If we denote the marginal cost of this firm by m, we have:

$$\frac{m}{p} = 1 - \frac{1}{\varepsilon\left(\frac{p}{\bar{p}}\right)}$$

This formula holds good only for the case of pure imperfect competition or polypoly. In the case of oligopoly, m/p is smaller than the value given by it and thus we have:

$$\frac{m}{p} = \frac{1}{\alpha}\left[1 - \frac{1}{\varepsilon\left(\frac{p}{\bar{p}}\right)}\right]$$

where $\alpha > 1$ is what we call the degree of oligopoly. Finally, m is the marginal *production* cost, and we must still allow for selling costs. We assume that the marginal selling cost is proportional to price p or $= \beta p$, and call β the rate of prime selling costs.[5] Taking this into account we obtain the final formula

$$\frac{m + \beta p}{p} = \frac{1}{\alpha}\left[1 - \frac{1}{\varepsilon\left(\frac{p}{\bar{p}}\right)}\right]$$

This may be written

$$\frac{m}{p} = g\left(\frac{p}{\bar{p}}\right) \tag{2}$$

[4] M. Kalecki, 'The Supply Curve of an Industry under Imperfect Competition' [this volume].

[5] Ibid.

where the shape of function g depends on the degree of the market imperfection, the degree of oligopoly, and the rate of prime selling costs. If the imperfection of the market, the degree of oligopoly, or the rates of prime selling costs increase, functions g change in such a way that to the same $p/\bar{p}$ corresponds a smaller m/p.[6]

2. Consider now an industry in a state of short-period equilibrium. It is easy to see from formula (2) that if wage rates and prices of materials used by the industry increase in the same proportion and functions g do not alter, nothing is changed in this state, except that prices will go up in this proportion. For in such an event marginal costs m and prices p increase for all firms in the same proportion, and thus equation (2) is fulfilled, since the average price $\bar{p}$ also increases in this proportion. It follows directly that as long as wage rates do not change relative to the prices of materials and functions g remain stable, the relative share of wages in the value added, σ, corresponding to a given utilization of equipment, is constant.

This, however, does not hold good if we allow for variations in the ratio of wage rates to prices of materials. Suppose, for example, that with a given utilization of equipment u and a given shape of functions g the prices of materials rise, while wage rates are stable. The prices p increase in more or less the same proportion as marginal costs m, and so do the differences $p - m$. As a result the value added rises while wages are stable, and thus the relative share of the latter in the former declines.

It is now easy to see that the relative share of wages in the value added, σ, is in the short period a diminishing function of the utilization of equipment u and an increasing one of the ratio of the average wage to material cost, which we denote by w—provided that the functions g are stable:

$$\sigma = F_g(u, w) \tag{3}$$

the subscript g indicating the influence of the degree of market imperfection, degree of oligopoly, and the rates of prime selling costs upon σ.

3. Formula (3) is valid also for long-run development if the factors which govern the shape of functions f and g are stable. True, a change in technique causing a rise in the efficiency of labour in the industry

[6] In general ε, α, β, and consequently function g are different for each firm.

considered produces an influence similar to that of a fall in wage rates relative to prices of materials. This is, however, accounted for by our formula, since the ratio of average wage to material cost w falls correspondingly.

Thus formula (3) may be applied for long-run analysis, provided that possible changes in the shape of function F_g arising from those in functions f and g are taken into account.

In other words, the relative share of wages in the value added, σ, is a diminishing function of the utilization of equipment, u, and an increasing one of the ratio of average wage to material cost, w. This function may in the long run undergo changes dependent on those in functions f and g. The former are caused, as shown above, by quantitative and qualitative divergencies in the investment activity of various firms, or by a change in technique involving a disproportionate change in average wage costs corresponding to various degrees of utilization of plant; these 'f factor' changes are likely to be small. The 'g factor' changes are long-run changes in the degree of imperfect competition, the degree of oligopoly, and the rates of prime selling costs. We shall now consider them in some detail.

4. The long-run changes in the imperfection of the market are caused by two groups of factors, exerting their influences in opposite directions. The fall in transport costs as compared with production costs, the standardization of goods, the spreading of commodity exchanges, etc., tend to diminish it. On the other hand, the expansion of advertising may in many cases create an artificial market imperfection. In the early stage of capitalist development the first group of factors seem to have the upper hand; in the later one the balance is uncertain.

The degree of oligopoly has a rather steady tendency to increase in the long run owing to the concentration of industry. And oligopolies are often transformed into cartels, which should also be accounted for in the changes in shape of functions g.

Finally, the rates of prime selling costs are also likely to rise in the long run, particularly in the later stages of capitalism.

On balance it may be said that while, in the early development of the capitalist economy, it is uncertain whether changes in functions g tend to raise or reduce the relative share of wages in the value added, the later stages of this development are likely to be accompanied by such changes in g as press this share down. And since, according to the above, the changes in function F_g are probably chiefly due to those in

g, the same is true of F_g. In other words, the relative share of wages in the value added, σ, corresponding to a given utilization of equipment and to a given ratio of wage to raw-material cost is likely to fall in the later stages of capitalist development.

5. It is still necessary to make some remarks about the influence of the utilization of equipment, u, upon the relative share of wages, σ, as given by formula (3). This influence is important only if the marginal wage cost curve is rising appreciably within the relevant range of output. Under conditions of perfect competition, this is the typical case. Under imperfect competition and oligopoly, it may well happen, however, that output is below the point where the marginal-cost curve starts rising sharply. And it is this state of affairs which often seems actually to prevail, particularly if, in order to examine long-period development, we consider averages over full cycle periods.

It is therefore quite likely that in the long-period development the influence of changes in the utilization of equipment upon the distribution of value added is in general rather slight, the chief determinants being the ratio of wage to material cost on the one hand and the degree of market imperfection, the degree of oligopoly, and the rates of prime selling costs on the other.

III

1. We shall now analyse some data on US manufacturing[7] in the light of the above theory. We shall first review the course of the rate of profit during 1899–1923, to show that there was no tendency towards long-run equilibrium in this period.

In Table 20 we give the index of 'real' value of fixed capital in US manufacturing and the price index of investment goods according to Professor Douglas.[8] By multiplying these two series we obtain the index of fixed capital valued at cost of reproduction. We give further the index of non-wage incomes in manufacturing, i.e. of the value added minus the wage bill,[9] and divide it by the reproduction cost of

[7] To avoid misunderstanding, it should be noted that developments in manufacturing cannot be taken as representative for those in the US economy as a whole: in 1923 the net income derived from manufacturing was only 24% of the US national income.

[8] P. H. Douglas, *The Theory of Wages* [New York, Macmillan, 1934], p. 121.

[9] Computed from census data as given in *Statistical Abstract of the USA*.

Table 20. *'Real' Value of Fixed Capital and Prices of Investment Goods in US Manufacturing, 1899–1923*

Year	Indices (1899 = 100)				
	'Real' fixed capital (1)	Prices of investment goods (2)	Reproduction cost of fixed capital (3)	Non-wage incomes (4)	Ratio (4):(3)
1899	100	100	100	100	100
1904	138	99	137	130	95
1909	198	109	216	181	84
1914	244	115	280	205	73
1919	366	223	816	522	64
1923	450	209	940	535	57

fixed capital. As we shall see, the resulting series enables us to draw certain conclusions as to the course of the rate of profit.

Table 20 shows that the ratio of non-wage incomes to the reproduction cost of fixed capital shows a strong long-run tendency to fall: from 1899 to 1923 it declined by more than 40%. We shall argue that the relative fall of the rate of return on fixed capital was even greater.

The non-wage incomes consist of salaries, selling costs, interest on inventories, and the gross (i.e. including depreciation) return on fixed capital.[10] We shall attempt to show that the latter item rose in the period considered less rapidly than total non-wage incomes.

From the data on inventories[11] and on the short-term rate of interest, it follows that the deduction of the interest on inventories would have only a slight effect on the index of non-wage incomes. As to selling costs, their ratio to the (gross) value of production was most likely somewhat increasing, while the ratio of non-wage incomes to the latter was more or less stable in the period considered, fluctuating between 23 and 24.5%. It follows that the deduction of selling costs would probably slow down the rise in the index of non-wage incomes. Finally, salaries (as given in census returns) increased in the period considered much more rapidly than the total of non-wage incomes.

[10] Actually taxes and payments for contract work are also included. The exclusion of these rather small items would affect our indices (4) and (5) very little except in 1919, for which they would be somewhat lower (see F. C. Mills, *Economic Tendencies in the United States*, [New York, NBER, 1932], pp. 111, 232, 394).

[11] Douglas, *Theory of Wages*, p. 116.

This is partly due to the elimination of small entrepreneurs, and for our purpose the rise due to this factor should be disregarded. It is probable, however, that even after such adjustment the rise in salaries would be at least as great as that in total non-wage incomes.[12] The obvious conclusion is that the gross return on fixed capital rose less rapidly than total non-wage incomes. And from this it follows directly that the gross rate of return on fixed capital fell even more strongly than the ratio of non-wage incomes to the reproduction cost of fixed capital.

Now the gross rate of return on fixed capital may be represented as the sum of the percentage rate of depreciation and the net rate of return on fixed capital. Since the former is unlikely to have been falling in the period considered, the relative fall in the latter must have been greater than that in the gross rate of return on fixed capital.

To sum up: the net rate of return on fixed capital during 1899–1923 showed a drastic decline.[13] In the same period, however, the long-term rate of interest had a definite tendency to rise. Such a state of affairs is incompatible with a tendency towards long-run equilibrium, unless we postulate that the 'standard profit rate' (i.e. the rate by which the rate of profit exceeds the rate of interest in long-run equilibrium) declined drastically in the period in question. Since, however, no reasonable ground exists for this hypothesis, it is much more plausible to assume that US manufacturing industry was in 'long-run disequilibrium' during 1899–1923.[14]

[12] Prof. F. C. Mills comments on salaries increasing more rapidly than total non-wage incomes as follows: 'There is probably a reflection here of expansion of corporate activities, as well as of the growing importance of "organisation" in the conduct of manufacturing operations' (*Economic Tendencies in the United States*, p. 111).

[13] However, at the end of the period this rate was still at the level of about 10%, and thus well above the long-term rate of interest.

[14] It is rather surprising that Prof. Douglas, on whose data the above argument is based, paid little attention to this problem. He established for the period in question a relation between production on the one hand and labour and capital employed on the other. He treats this relation as a static function of production and derives from it the shares of capital and labour in the product by assuming that a unit of each of them gets its marginal product. This assumption, however, may be justified only under the condition that both the rate of profit and the marginal productivity of capital tend to be equal to the rate of interest (plus the 'standard profit rate'). If this is not the case there is no reason to assume the rate of profit tends to be equal to the marginal productivity of capital.

Table 21. *Average Interest in the USA as Shown by Bond Yields*

1899	3.08	1914	4.04
1904	3.46	1919	4.02
1909	3.63	1923	4.42

Source: Douglas, *Theory of Wages*, p. 46.

2. We are now going to interpret, by means of the formulae established above, the long-run course of distribution of the product of industry in US manufacturing. Table 22 gives the data for the relative share of wages in the value added and the ratio of wage bill to material bill, which is of course equal to the ratio of average wage to material cost w. The figures are computed as averages of consecutive census figures, as indicated in the table.[15] The periods covered by each average are chosen in such a way that cyclical fluctuations are likely to be eliminated.

Our theoretical argument has led us to the conclusion that the share of wages in the value added, σ, is a diminishing function of the utilization of equipment u and an increasing one of the ratio of average wage to material cost w, the shape of the function being subject to long-run changes, chiefly owing to the change in 'g factors'—i.e. in the degree of market imperfection, degree of oligopoly, and the rates of prime selling cost.

Now there is not much difference in w in the first, third, and fourth period. Thus the fall in σ from 45.3 in the first period to 41.7 in the third and to 37.6 in the fourth must be attributed to changes in the utilization of equipment, u, or to those in 'g factors'. Since the qualitative information does not suggest that a rise in u took place, and the changes in it are not likely to have an important influence upon σ anyhow (cf. p. 85), this fall must be attributed to the 'g factors'.

We mentioned on pp. 84–5 that the decrease in σ under the influence of 'g factors' may be expected to be particularly accentuated in the later stages of capitalist development. This is in agreement with the trend of σ observed here. Indeed, the rate of the decrease of

[15] Census data taken from *Statistical Abstract of the USA*, 1938, 1939. The changes in the scope of the census (in 1899, 1914, 1935) are accounted for by linking the relevant series.

Table 22. *Relative Share of Wages in Value Added in the US Manufacturing Industry, 1869–1937*

Year		Relative share of wages in value added	Ratio of wage bill to material bill
		σ(in %)	w(%)
1869, 1879, 1889, 1899	Average	45.3	30.7
1904, 1909, 1914, 1919	Average	41.1	28.9
1919, 1921, 1923, 1925, 1927	Average	41.7	30.6
1929, 1931, 1933, 1935, 1937	Average	37.6	30.5

σ (calculated as difference from period to period divided by the number of years between the middles of these periods) is 0.11 between the first and third period and 0.42 between the third and fourth.

We have so far left out of consideration the second period, in which the ratio of average wage to material cost w is lower than in other periods. According to our theory, σ is an increasing function of w; thus if w were in the second period at the same level as in other periods, σ in that period would be higher. As may be seen from Table 22, it would then fit better into the decreasing trend of σ, which we attributed to the influence of long-run change in market imperfection, degree of oligopoly, and the rates of prime selling costs.

A Model of Hyper-inflation[1] [1]

(1955/1962)

1. The two characteristic features of hyper-inflation are a very rapid rise in prices and a general tendency to convert money into goods. These two features are closely interlinked. The reason for hoarding of goods is the anticipation of a continuous rapid increase in prices; in turn, the hoarding of goods contributes to the pace of the rise of prices. Such hyper-inflations as occurred recently developed in war or post-war periods. Indeed, in such periods scarcity of goods may be associated with large budget deficits and possibly also with large expenditures on private investment. These result in a substantial rise in prices and a drastic reduction in real wages. The adjustment of wages to a higher level of prices is frustrated by the resulting increase in prices. In this way a spiral of prices and wages develops which, if it lasts long enough, may lead to the state of hyper-inflation. The loss of confidence in money leads to universal hoarding of goods. This accelerates the increase in prices and, as we shall see later, basically changes its mechanism.

In fact, under hyper-inflation certain important features of the system are transformed. Long-term lending ceases altogether, and liquid assets other than money are depleted before long. The free-market rate of interest closely approaches the anticipated increase in prices. This is nothing else but a symptom of universal hoarding: as every lender is prepared to hoard goods, the operation of lending has to yield comparable advantages. However, government borrowing from the banks still continues at low rates of interest, in fact at no interest at all if the government prints money. Also, private banking credits are given at relatively low rates of interest, and such credits are actually a privilege available mainly to big business. Indeed, with a very rapid increase in prices only a small part of such credits is repaid in real terms.

The theory of hyper-inflation is of interest (even though the phenomenon is rather exceptional) because this phenomenon is striking

[1] This paper is an altered version of a lecture given at Cambridge University in 1955.

and because, even though hyper-inflation does not last too long, it leaves considerable traces in the economy in the years to come, one of the consequences being the wiping out of the wealth and income of the rentier. The discussion of hyper-inflation has an added theoretical interest, however, because this happens to be the only case where the quantity theory of money finds its full application.

2. In normal conditions the increase of the quantity of money in circulation results directly in a greater liquidity and lower velocity of circulation rather than in an increase in prices. It is true that the consequent fall in the rate of interest will tend to increase investment and thus output and prices. But this effect may be very small. The fall in the short-term rate of interest will normally affect but little the long-term rate of interest in short or medium periods, and this limits the effect upon investment in fixed capital. In any case the effect of the quantity of money on prices will be very indirect in character.

Not so in the state of hyper-inflation. Here any additional money is converted into goods within a certain spending period which itself depends on the rapidity of increase in prices. Thus in this case the expansion in the quantity of money does lead directly to the increase in prices.

We shall now elaborate the relation between the quantity theory of money and hyper-inflation in a more precise fashion. The basic equation of the quantity theory of money should be written for normal conditions as:

$$MV(\rho) = PT \tag{1}$$

where ρ is the short-term interest. This equation determines the rate of interest in terms of the quantity of money and of the money value of transactions. When the quantity of money in circulation increases, the value of transactions remains at least initially unchanged. So the velocity of circulation changes in an inverse proportion, and the rate of interest falls to the point where larger holdings of money are required for the same value of transactions. The fall in the rate of interest, as mentioned above, may after some time engender an increase in the value of transactions.

The transition to a corresponding equation for hyper-inflation is achieved by taking into consideration the fact that the rate of interest is determined here by the anticipated rate of increase in prices. We can write:

$$\rho = \pi_a - c \tag{2}$$

where ρ is the short-term rate of interest, π_a the anticipated rate of increase in prices, and c the carrying costs and compensation for uncertainty of the rate of increase in prices which constitute the disadvantage of actual hoarding of goods. If we substitute this expression for the rate of interest into the preceding equation, we obtain:

$$MV(\pi_a - c) = PT \tag{3}$$

The velocity of circulation appears now to be determined by the anticipated rate of increase in prices, which is of course based on recent experience. This is plausible even without involving the rate of interest, but the argument is nevertheless useful as a reconciliation between the quantity-of-money equation in a normal situation and in the state of hyper-inflation. Let us now assume that in the period examined there is no change in the anticipations of price increases. The velocity of circulation will then be constant, and the equation:

$$MV = PT \tag{4}$$

will be valid in the sense of the crude quantity theory of money.

We shall now apply this formula to the analysis of hyper-inflation. Let us differentiate both sides of the equation in relation to time. According to our assumption, V is constant. The same will be assumed with regard to the volume of transactions T. The total output to which the volume of transaction is related corresponds under hyper-inflation to the full utilization of resources, because the rapidly expanding demand reaches that point fairly soon. There may be, of course, an increase in the capacity to produce as a result of the continued investment, but such change is so small as compared to that in prices that it may be neglected for the sake of simplicity. We thus obtain:

$$V\frac{dM}{dt} = \frac{dP}{dt}T \tag{5}$$

Now dM/dt is the increase in the money in circulation per unit of time which occurs through the channels of budget deficit and the expansion of banking credits to business. We shall call the real value of these two items D. Thus dM/dt is equal to the money value of D:

$$\frac{dM}{dt} = PD \tag{6}$$

Substituting this value of dM/dt into equation (5), we obtain:

$$VPD = \frac{dP}{dt}T \tag{7}$$

or

$$(dP/dt)/P = V\frac{D}{T} \tag{8}$$

This equation shows that the rate of increase in prices $(dP/dt)/P$, which we denote by π, is the greater the larger the real budget deficit plus increment in banking credits for business D and the velocity of circulation V. If we assume that D is maintained at a stable level, the rate of increase in prices is proportional to the velocity of circulation.

3. Let us now recall that the velocity of circulation itself depends on the anticipated rate of increase in prices π_a. It follows from the above that, as long as these anticipations do not change, the rate of increase in prices will continue at the same pace. But in the longer run this process of uniform growth in prices may continue only if the resulting actual rate of increase π equals the anticipated rate of increase π_a. If, for instance, the actual rate is higher, there will be after some time an upward adjustment in the anticipated rate of increase and thus in the velocity of circulation. This will lead, however, to a further acceleration in the rate of increase in prices and so on. This phenomenon of accelerated hyper-inflation is nothing else but the galloping inflation which is based on the increasing velocity of circulation. We shall now deal with this phenomenon in more detail by means of Fig. 9.

The abscissae in Figs. 9 and 10 represent the rate of increase in prices π, and the ordinates the velocity of circulation V. The straight line inclined to the ordinates under an angle less than 45° shows the determination of π in terms of V. The angle is less than 45° because D is less than T. As stated above, however, there exists also the dependence of V on π_a. If the rate of increase in prices π continues for some time, then π_a will be equal to π and V (according to section 2) will be determined by its level. The curve on Fig. 9 represents this relation. From a certain point this curve must show a flattening out, because there exists *some* limit, however high, to the velocity of circulation. Imagine now that we start from a certain level of velocity of circulation $0M$. To this corresponds the rate of increase in prices $0N$. However, the level of the velocity of circulation generated by this rate of increase in prices is NL, which is higher than $0M$. As a result, the

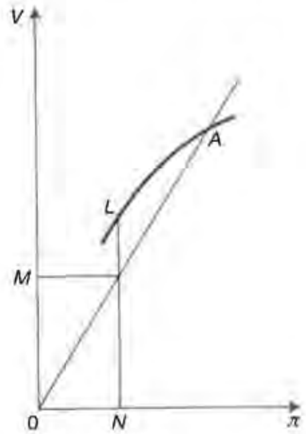

FIG. 9

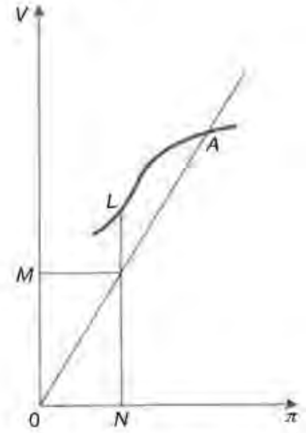

FIG. 10

increase in prices will be accelerated and the 'galloping' will continue until the point of intersection between the straight line and curve A is reached.

The curve may have, and is even likely to have, a different shape from that shown on Fig. 9. It may increase mildly up to a point, show a considerable jump subsequently, and finally flatten out (see Fig. 10).

The theoretical point A may in fact never be reached, because in the meantime a stop may be put to hyper-inflation for reasons which will be discussed in the next section.

4. Let us now consider the impact of hyper-inflation on the distribution of national income. In view of the fact that the course of prices under hyper-inflation is fully determined by the above factors, changes in money wages will not affect prices, provided that the real value of the budget deficit plus banking credit to private business remains unchanged. Thus, if the increase in money wages is sufficiently rapid, a rise in real wages is feasible, which enhances the consumption of the working class at the expense of hoarding of goods. However, in practice it is very difficult to achieve such an increase in real wages. The increase in money wages will usually lag behind the rise of prices. The mere time-lag due to the negotiation of wages may be of decisive importance, and even automatic adjustment may prove not adequate because of payment of wages at certain intervals. Thus real wages under hyper-inflation are usually falling, and the fact that their level is much lower than normal can be seen from the distribution of national

product. Under hyper-inflation the real budget deficit is very high, and so usually is investment in fixed capital. In addition, there is a considerable volume of hoarding of goods. It is clear that much less than normal is left for consumption, and this reduction reflects mainly the reduced real income of the working class. Another phenomenon reflected in it is the impoverishment of the rentier. Counterbalancing this are the enormous profits of entrepreneurs in general and big business in particular.

This explains the manifest support that big business gives to the continuation of hyper-inflation once it has started. However, its interest in hyper-inflation begins to vanish at the point where the techniques of fixing wages are so perfected as to enable the workers to increase real wages. Since, at the advanced stage of hyper-inflation at which this occurs, the rentiers are already so impoverished that they cannot be squeezed any more, hyper-inflation ceases to be a profitable proposition. It is at this point that stabilization schemes usually emerge which put a stop to hyper-inflation. As a result, as mentioned above, point A in Fig. 9 or Fig. 10 may not be reached, hyper-inflation having been stopped earlier.

Class Struggle and Distribution of National Income[1]

(1971)

1. Until fairly recently it was generally accepted that if wages are raised, profits decline in proportion. Even though in the analysis of other phenomena Say's Law was not adhered to, at least not strictly, in this case the preservation of purchasing power was not put in doubt. And the analysis of the increase or reduction in wage rates dealt with the physical consequences of this absolute shift from profits to wages, or vice versa. In the case of the rise in wage rates, the reconstruction of capital equipment in line with the higher spending on wage goods and lower outlays on investment and capitalist consumption was emphasized, as well as the tendency to higher unemployment as a result of substitution of capital for labour that has become more expensive.

Although even today quite a number of economists would argue in this fashion, the fallacy of this approach is fairly widely recognized, even though it may be countered by various economists in a somewhat different way. My counter-argument runs as follows. I assume a closed economic system and a proportional rise in all wage rates.

Suppose that in a short period of time the annual wage bill increased as a result of raising wage rates by ΔW. We may realistically assume that workers spend all their incomes, and that they spend them immediately. By contrast, it may be assumed that the volume of investment and capitalist consumption are determined by decisions taken prior to the short period considered, and are not affected by the wage rise during that period.

If we now subdivide the economy into three departments, producing investment goods (I), consumption goods for capitalists (II), and wage goods (III)—including in each of them the respective intermediate products—it follows that employment in the first two departments is not affected by the rise in wages. Thus, denoting the wage bills in these departments measured in 'old' wage rates by W_1 and W_2 and the fraction by which wages are raised by α, we obtain for the increment of the aggregate wages in Departments I and II $\alpha(W_1 + W_2)$. The profits in these two departments decline propor-

tionally (provided prices of their products have not risen, which in any case is assumed in the argument based on 'preservation of purchasing power').

The position in Department III, however, is quite different because of immediate spending by the workers of the additional proceeds due to the wage rise. In particular, the increment of the wage bill of Departments I and II, equal to $\alpha(W_1 + W_2)$, must unavoidably cause profits of Department III to rise proportionally. Indeed, the profits of this department consist of the proceeds out of the sale of the wage goods which are not consumed by the workers employed in that department to the workers of Departments I and II. Thus the increment in the wage bill of these departments, $\alpha(W_1 + W_2)$, means an equal rise in profits of Department III. This may occur either through the rise in output in that department or through the rise of the prices of its products.

As a result, the total profits remain unaltered, the loss of Departments I and II by $\alpha(W_1 + W_2)$ being counterbalanced by an equal gain of Department III. It follows that no absolute shift from profits to wages occurs, and the argument based on Say's Law would thus prove fallacious—at least with regard to the short period considered.

The last qualification is essential. For it may be argued that the decline in the volume of investment and capitalist consumption as a result of the wage rise, although not immediate, would still come about with delay, say, in the next short period. And this would be true if capitalists at least *decided* to cut their investment and consumption immediately after having agreed to raise wages. But even this is unlikely, for their decisions are based on current experience; and this, according to the above, will show that no loss in total profits occurs in the short period following the wage rise, and thus it will give no reason for a cut in investment and capitalist consumption in the next period. If a decision for such a cut is not taken right away on the basis of the bare fact of the wage rise, it will not be taken at all. And as a result profits will not shrink in the next period either. The argument on the shift from profits to wages as a result of a wage rise based on Say's Law is thus fallacious, even if we consider all the ramifications of this event.

The same applies obviously to a wage cut: no increase in profits will occur either in the short period following it or subsequently.

2. So far we have assumed that prices of investment goods and consumer goods for capitalists remain unchanged when wages increase, which is in line with the theory of shift from profits to wages to the extent of the wage rise. (The preceding section amounted in a sense to the *reductio ad absurdum* of this theory.) In fact, however, this is unlikely to be the case: rather, these prices will rise under the impact of the wage increase—perhaps not in the short period directly following the wage rise, but subsequently. But to discuss this question as well as other repercussions of the wage rise—or of the wage cut—we need to know more about price formation in the system considered.

We shall first leave aside all semi-monopolistic and monopolistic factors, i.e. we shall assume so-called perfect competition. Let me add immediately that this is a most unrealistic assumption, not only for the present phase of capitalism, but even for the so-called competitive capitalist economy of past centuries: surely this competition was always in general very imperfect. Perfect competition, when its actual status of a handy model is forgotten, becomes a dangerous myth.

As follows from the argument in the preceding section, the volume of capitalist investment and consumption is maintained in the short period following the wage rise and consequently thereafter. On the assumption of perfect competition and of supply curves sloping upwards at some point, the rise in wage rates must cause a proportional rise in prices at given levels of respective outputs—perhaps not in the first short period but subsequently. As a result, profits in Departments I and II will rise in the same proportion as wages, i.e. $1 + \alpha$ times.

Now it is easy to prove that the volume of production and consumption of wage goods also remains unchanged. Indeed, in such a case, profits in Department III, as in the other two departments, increase in the proportion of the wage rise, i.e. $1 + \alpha$ times; now, as mentioned in section 1, the profits in Department III are equal to the proceeds out of sales of the wage goods to the workers of Departments I and II, and therefore they must increase in the same proportion as wages in these departments, i.e. $1 + \alpha$ times. If the volume of production and consumption of wage goods increased or declined, such could not be the case.

Thus with perfect competition the volume of production in all three departments remains unchanged, while its value increases in each of them $1 + \alpha$ times. Thus the total wage bill increases in this proportion, and the total profits, i.e. the distribution of national income, remain unaltered.

Consequently, having shown the fallacy of the theory based on Say's Law which maintained that wage movements have a direct and full impact upon the distribution of national income, we now arrive at the

opposite extreme, that they have no influence whatever upon this distribution. But this conclusion is based on the untenable assumption of perfect competition. In fact, only by dropping it and penetrating the world of imperfect competition and oligopolies are we able to arrive at any reasonable conclusion on the impact of bargaining for wages on the distribution of income.[1]

3. In fact, a major part of the economy may be plausibly represented by a model very different from perfect competition. Each firm in an industry arrives at the price of its product p by 'marking up' its direct cost u, consisting of average costs of wages plus raw materials, in order to cover overheads and achieve profits. But this mark-up is dependent on 'competition', i.e. on relation of the ensuing price p to the weighted average price of this product $\bar{p}$ for the industry as a whole. Or:

$$\frac{p-u}{u} = f\left(\frac{\bar{p}}{p}\right) \tag{1}$$

where f is an increasing function: the lower p is in relation to $\bar{p}$, the higher the mark-up will be fixed. From formula (1) we obtain:

$$p = u\left[1 + f\left(\frac{\bar{p}}{p}\right)\right] \tag{2}$$

It should be noted that function f may be different for various firms of an industry. They will reflect semi-monopolistic influences referred to above, resulting from imperfect competition or oligopoly. The more intensive these factors, the higher $f(\bar{p}/p)$ corresponding to a given relation $\bar{p}/p$. Prices p will be in general different for various firms because of the differences in direct costs u, and because of those in functions f.

The price system is determined. Indeed, with s firms in an industry there will be $s + 1$ price values to be determined, i.e. $p_1, p_2 \ldots p_s, \bar{p}$, and as many equations: s equations of type (2) and one determining $\bar{p}$ in terms of $p_1, p_2 \ldots p_s$.

If all direct costs u, with given functions f, increased $1 + \alpha$ times, so do all prices $p_1, p_2 \ldots p_s$. Indeed, this solution satisfies equation (2)

[1] We left aside here the influence of the increase in the price level upon the rate of interest by assuming tacitly that the supply of money by the banks is elastic. Otherwise the higher demand for money would have increased the rate of interest, which would adversely affect investment and consequently profits. Such an effect seems unlikely to be of any greater importance, especially because the changes in the bank rate are reflected on a much reduced scale in the long-term rate of interest.

because u by assumption increases $1 + \alpha$ times and $\bar{p}/p$ remains unaltered.

If, however, the direct cost u_k increases only for one firm (again with given functions f), it is easy to see that p_k increases in a lesser proportion because $\bar{p}$ will then not rise in the same proportion as u_k.

4. Since prices p for a product are in general not equal, the above applies strictly to imperfect competition or differential oligopoly, but not to non-differential oligopoly or monopoly. However, apart from basic raw materials produced frequently in conditions approaching perfect competition, most of the products in fact *have* differential prices. (Let us not forget that absolutely identical products with the same transport costs but different periods of delivery may have different prices.)

It seems, therefore, a fairly good approximation to an actual economy if we assume it to consist of the model described above and the sector of basic raw materials conforming in their price formation to that of perfect competition.

Let us now imagine that, in a closed system of this type, wage rates in all industries increase in the same proportion, $1 + \alpha$ times. It follows that all prices will also increase $1 + \alpha$ times *provided that functions* f *in industries to which they are relevant are unchanged.* It follows that, if these conditions were fulfilled, we should arrive at the same conclusion as for the perfectly competitive economy in section 2—that a general increase in money wages in a closed economy does not change the distribution of national income. The same would apply to the case of the decrease in money wages. However, we shall argue that functions f depend on trade union activity.

5. The existence of high mark-ups will encourage strong trade unions to bargain for higher wages, since they know that firms can 'afford' to pay them. If their demands are granted but functions f are not changed, prices will also increase. This will lead to a new round of demands for higher wages, and the process would go on, with price levels rising. But surely an industry will not like such a process making its products more and more expensive, and thus less competitive with products of other industries.[2] To sum up, trade union power restrains

[2] Despite the fact that, for the sake of simplicity, we assume that all wage rates are raised simultaneously in the same proportion, we consider realistically that bargaining by industries *is* proceeding.

the mark-ups, i.e. it causes the values $f(\bar{p}/p)$ to be lower than would otherwise be the case.

Now, this power manifests itself in the scale of wage rises demanded and achieved. If an increase in bargaining capacity is demonstrated by spectacular achievements, there is a downward shift in functions $f(\bar{p}/p)$ and the mark-ups' decline. A redistribution of national income from profits to wages will then take place. But this redistribution is much smaller than that which would obtain if prices were stable. The rise in wages is to a great extent 'shifted to consumers'. And 'normal' wage increases will usually leave functions f unaffected while mark-ups may otherwise tend to get higher because of the rise in productivity of labour.

6. Let us imagine that a spectacular wage rise depresses somewhat the mark-ups, so that a redistribution of national income from profits to wages occurs. Now from section 1 it follows that profits in Department III will increase in the same proportion as wage rates. But, as there is a redistribution of income from profits to wages as a result of the reduction of mark-ups there, the wage bill in Department III increases more than wage rates, i.e. there is a rise in employment and output there. In consequence output and employment will be unaltered in Departments I and II, while they will rise in Department III. Or the volume of investment and capitalist consumption will not change, but workers' consumption will increase. Such an expansion of total output and employment will be feasible because, in fact, our model of semi-monopolistic price fixing, as developed in section 3, presupposes the existence of excess capacities.

As to the (money) value of the wage bill, it will clearly increase in a higher proportion than the wage rates. However, total profits will increase *less* than the wage rates: indeed, profits in Department III increase proportionally to the wage rates, employment in Departments I and II being unaltered, but profits in the latter two departments increase less than the wage rates as a result of the decline of mark-ups there.[3]

[3] This, however, is subject to the following qualification. As a result of the increase of total output there will be an increase in prices of basic raw materials, *inter alia* those used alike by Department I or II and Department III. This, although not very likely, may offset the influence of the decline in mark-ups in Departments I and II upon the distribution of income between profits and wages. In any case, however, total profits will rise in a lower proportion than the total wage bill.

If trade union power declined, the process described above would be reversed. Employment and output in Departments I and II would remain unchanged, but in Department III they would decline. Or the volume of investment and capitalist consumption would remain unchanged and the consumption of workers would fall. The total output and employment would thus decline. The value of the wage bill would fall more than the wage rates, while the value of profits would decline less than the wage rates.[4]

Since the decline in the mark-ups tends to increase aggregate output, this would cause a rise in prices of basic raw materials, subject to conditions of perfect competition, in relation to wages. As a result, the increase in output and employment would be somewhat restrained. In the same fashion this factor would somehow restrain the fall in output and employment caused by the rise of the mark-ups.

It follows from the above that a wage rise showing an increase in trade union power leads—contrary to the precepts of classical economics—to an increase in employment. And conversely, a fall in wages, showing a weakening in their bargaining power, leads to a decline in employment. The weakness of trade unions in a depression, manifested in permitting wage cuts, contributes to deepening unemployment rather than to relieving it.

7. It follows from the above that the class struggle as reflected in trade union bargaining may affect the distribution of national income, but in a much more sophisticated fashion than expressed by the crude doctrine: when wages are raised, profits fall *pro tanto*. This doctrine proves to be entirely wrong. Such shifts that occur (i) are connected with widespread imperfect competition and oligopoly in the capitalist system; and (ii) are contained in fairly narrow limits. However, the day-to-day bargaining process is an important co-determinant of the distribution of national income.

It should be noted that it is possible to devise forms of class struggle other than wage bargaining, which would affect the distribution of national income in a more direct way. For instance, actions may be undertaken for keeping down the cost of living. The latter might be achieved by price controls which, however, may prove difficult to administer. But there is an alternative: subsidizing the prices of wage goods, which is financed by direct taxation of profits. Such an operation, by the way, will not affect aggregate net profits: the

[4] Subject to a qualification analogous to that stated in n. 3.

argument is the same as used in section 1 in the case of a wage increase. The same is true of the effect of price controls. And, if such measures cannot be carried out by political parties associated with trade unions in parliament, the power of the trade unions may be used to mobilize strike movements in support. The classical day-to-day bargaining for wages is not the only way of influencing the distribution of national income to the advantage of the workers.

8. The redistribution of income from profits to wages, as described in the last two sections, is feasible only if excess capacity is in existence. Otherwise it is impossible to increase wages in relation to prices of wage goods because prices are determined by demand, and functions f become defunct. We return then to the position described in section 2, where the wage rise could not affect a redistribution of income.

Price control of wage goods will then lead to scarcities of goods and haphazard distribution. Also, subsidizing prices of wage goods (financed by direct taxation of profits) can reduce prices only in the longer run by stimulating investment in wage good industries.

It should be noted, however, that even contemporary capitalism, where deep depressions are avoided as a result of government intervention, is in general still fairly remote from such a state of full utilization of resources. This is best shown by the fact that prices of finished goods *are* fixed on a cost basis rather than determined by demand.

PART 2

ELEMENTS OF ECONOMIC DYNAMICS

A Theorem on Technical Progress[1]

(1941)

I

1. The problems of technical progress, like all long-period problems, are usually considered from the angle of long-run equilibrium. This approach is particularly unrealistic in the case of technical progress. If we start from a position of long-run equilibrium and assume some changes in the technique of production, we may establish what will be the 'new' long-run equilibrium. But the results achieved in this way do not help us much in answering the question: what are the actual effects of technical progress upon economic development? For the adjustment which is necessary to reach the new equilibrium will require a certain time, and in the meantime technical progress goes on and therefore the new long-run equilibrium is actually never reached.

2. We try in this paper to consider certain problems of technical progress without assuming long-run equilibrium but considering a more general case of long-period dynamic process. We make, however, certain simplifying assumptions about the economic system considered.

(i) We assume that this system is closed.

(ii) We assume that the short-period marginal-cost curves are horizontal over the relevant range of output. (This is obviously possible only with imperfect competition and oligopolies, for under perfect competition the increasing part of marginal-cost curve must be reached by any working firm.) According to recent information,[1] this assumption seems to be realistic except, of course, for firms which—in prosperous times—work up to capacity. But since the percentage of such firms is usually small, we shall not much distort reality if we neglect their influence.

It is necessary to notice that by our assumption we confine our considerations to a dynamic process under conditions of less than full

[1] See e.g. the abstract of Prof. J. Dean's paper at the Philadelphia meeting of the Econometric Society, *Econometrica*, Apr. 1940, p. 188.

working capacity.[2] This 'special case' is, however, particularly interesting because it approximates closely to the type of economic development which happens to be in existence.

(iii) Finally, we assume that the workers do not save, and that the unemployed are supported out of the wages of the employed (either their employed relatives provide for them or their dole is financed by the contributions of employed workers). It follows that the aggregate working-class consumption is equal to the wage bill. This assumption is not quite realistic; but the resulting distortion is of minor importance, and it simplifies the argument very much.

II

1. The most important effects of technical progress upon economic development may be briefly described by the following five points:

(i) *Technical progress increases the productivity of labour.* This statement requires some comment because the average productivity of labour depends also on the utilization of the plant—i.e. on the ratio of actual output to its maximum capacity. The strict formulation is that the average productivity of labour corresponding to a given utilization of plant rises as a result of technical progress.

(ii) *Technical progress changes the ratio of the maximum capacity of a plant to the amount of capital it contains.* By the amount of capital is meant the 'real' capital—i.e. the reproduction cost of the plant deflated by the index of the prices of investment goods. If technical progress causes a fall in the ratio, c, of capacity of a plant to the 'real' capital it contains, we shall call it capital-using. In the reverse case technical progress will be called capital-saving, and if it does not affect c, neutral. It seems likely that on the whole technical progress has been capital-using.[3]

It must be stressed that c does *not* represent the ratio of output to capital. For the latter ratio depends also on utilization of plant—i.e. on the ratio u of output to maximum capacity. It is easy to see that the ratio of output to capital is uc.

(iii) *Technical progress increases the degree of oligopoly* because it promotes the concentration of industry.

(iv) *Technical progress tends to lower the general level of prices.* Indeed, with a given wage rate the marginal labour cost (in terms of money) corresponding to a given utilization of plant falls as a result of the rise in the productivity of labour; this tends to reduce prices corresponding to a given utilization of an industry's equipment. This tendency is counteracted by the rise of the degree of oligopoly, but is not likely to be fully offset by it.

(v) *Technical progress keeps the inducement to invest higher than it would be otherwise.* New inventions increase the prospective rate of profit of particular types of investment, and thus the rate of investment decisions in a given period is higher than it would be in the absence of the influence of inventions in this period. It should be noticed that, while the effects mentioned in the preceding points are cumulative—i.e. they depend on the pace of technical progress and on the period over which it has been taking place—the effect upon the inducement to invest depends only on the former.

2. It is easy to see that the effects of technical progress upon productivity of labour and the ratio of productive capacity to capital are of a different nature from those upon the degree of oligopoly, the general price level, and the inducement to invest. The former alter the technique of production and influence directly the volume of employment and the structure of capital equipment. The latter are, rather, by-products of technical progress, and they influence economic development in a rather indirect way. The increase in the degree of oligopoly tends to reduce the relative share of wages in the national income. The fall in the general level of prices as compared with what this level would be in the absence of technical progress tends to reduce the demand for cash, and thus to lower the rate of interest; it also tends to redistribute capitalist income from entrepreneurs to rentiers. The stimulus to investment coming from new inventions keeps the effective demand in a given period higher than it would be in the absence of the influence of inventions in this period.

It seems, therefore, proper to consider what would be the consequences of technical progress for economic development if only pure

[2] Some people may wonder whether this is possible in the 'long run'. However, 'surplus capacity' is compatible even with long-run equilibrium because the large-scale economies prevent firms from reducing the size of plant (cf. my *Essays in the Theory of Economic Fluctuations* [*Collected Works*, vol. i]).

[3] According to Prof. Douglas (*The Theory of Wages*, p. 130), the ratio of output to 'real' capital fell in the US manufacturing industry from 1899 to 1922 by 45%; the fall of the utilization of equipment, if any, could have been nothing of this order.

changes in the technique of production—i.e. the increase in productivity of labour and change in the relation of productive capacity to capital—were to take place.[4] To solve this problem we shall use the method of the 'reference system'.

III

1. Let us consider an economic system subject to a dynamic process in which technical progress is involved. We assume this to be of a capital-using type—i.e. tending to reduce the ratio of productive capacity to capital.

We make, as stated in section I, the following simplifying assumptions about our system:

(i) that it is closed;

(ii) that the short-period marginal-cost curves are horizontal over the relevant range of output;

(iii) that workers do not save, unemployed are supported out of the wages of employed, and thus the aggregate working-class consumption is equal to the wage-bill.

2. We are now going to construct a 'reference system' for the system under consideration. As a starting-point we assume it to be identical with the actual system. We assume further: (*a*) that to any stimulus to investment coming from inventions in a certain industry in the actual system there corresponds in the 'reference system' a quantitatively equivalent stimulus due to greater optimism of entrepreneurs in this industry; (*b*) that to any change of cost of a particular type of labour as a result of technical progress in the actual system there corresponds an equal proportional change in wage rates in the reference system;[5] (*c*) that the market imperfection and degree of oligopoly in any industry are equal at any moment in both systems so that to equal marginal costs there correspond in both systems equal prices.

[4] It is the problem which has been considered by Mrs Robinson for long-period equilibrium (*Essays in the Theory of Employment*, pp. 130–6). By assuming the rate of interest given, she eliminated the influence which the price level may exert through this channel. She also left out of account the problem of the shift in income from entrepreneurs to rentiers and that of the increase in the degree of oligopoly. The influence of inventions upon the rate of investment does not, of course, appear in long-run equilibrium analysis.

[5] Sometimes this may be, not a fall, but a rise; e.g. the average salary cost may increase as a result of technical progress.

In this way the reference system is endowed with the features of technical progress as regards the tendency to raise the degree of oligopoly, the pressure of the rising productivity of labour on the price level, and the influence of inventions upon investment; but it is not subject to the rise in productivity of labour and to the fall in the ratio of productive capacity to capital. Comparing the developments in the two systems, therefore, we are able to establish what is the 'pure' effect of the two latter factors.

We shall now demonstrate the following theorem: prices, output, and 'real' capital in any industry of the reference system are equal at any moment to those of the actual system.

From this theorem follow two corollaries.

The volume of employment in any industry of the reference system is at any moment larger than that in the actual system, to the extent corresponding to the increased productivity of labour in the latter. (The larger volume of labour employed in the reference system may be imagined as provided by a longer working day and/or smaller unemployment.)

The utilization of equipment in any industry of the reference system will be smaller than the corresponding utilization in the actual system, to the extent of the reduced ratio of capacity to capital in the latter. For the ratio of output to capital—which is equal to the product, uc, of the utilization of plant, u, by the ratio of its capacity to the 'real' capital it contains, c—is, according to the theorem, the same in both systems.

IV

1. Let us subdivide the dynamic process in the actual system into short periods 0, 1, 2 . . . . We assume that in period 0 the reference system is identical with the actual system—i.e. that it has identical capital equipment, output, wages, prices, rates of interest, etc.—except in one respect: the influence of new inventions upon investment decisions in any industry of the actual system is replaced in the reference system by an equivalent influence of more optimistic expectations. As a result, there is the same volume of investment decisions in any industry of either system, but those in the actual system are partly of a labour-saving and capital-using type, which is not the case in the reference system.

Turning to period 1, we have at its beginning exactly the same situation except for the difference in the *character* of past investment decisions just mentioned. Thus the only difference between the two systems in period 1 is in the character of investment. The volume of investment is the same, and so consequently is its influence upon effective demand. Similarly, investment decisions in any industry—after the influence of inventions in the actual system has been replaced by entrepreneurs' optimism in the reference system—are equal in volume but different in character.

2. Passing from period 1 to period 2, let us examine the capital equipment at the end of period 1 (or, what is the same thing, at the beginning of period 2). As a result of investment in period 1, any industry possesses the same real capital in both systems, but, because the inventions were capital-using, this capital represents a smaller capacity in the actual system than in the reference system. And because the inventions were labour-saving, this equipment requires less labour to produce the same output. Or a plant representing the same capital in both systems in order to produce the same output will have to employ more labour, and to be utilized in a smaller degree, in the reference system than in the actual system.

According to the conditions set out above for the reference system, the wage rates of various types of labour will be changed in period 2 in the same proportion as the cost of these types of labour in the actual system. It is now easy to see that to the same output produced by a plant in both systems there corresponds the same marginal cost of labour. True, apart from the change in technical productivity in the actual system 'imitated' by the change in wage rates in the reference system, the degree of utilization of equipment in the latter is smaller; but this does not matter, the marginal-cost curve having been assumed to be horizontal. Thus, since market imperfection and the degree of oligopoly have been assumed to be at any moment the same in both systems—so that the same marginal cost corresponds in both systems to the same price—the conditions in both systems are equal from the supply side.

Now the output of investment goods is the same in both systems because investment decisions in preceding periods, though different in character, were in both systems equal in volume. From the identity of supply conditions it follows that prices of investment goods in the actual and the reference systems are also equal.

It may also be shown that the 'demand side' of consumer goods is identical in both systems. It is true that the volume of any type of

labour associated with a certain output will be higher in the reference system, but its wage rates will be lower in inverse proportion. Any type of labour associated with a given output will have, therefore, the same wage (or salary) bill in both systems, and after deduction of these wage (or salary) bills from the total value of the product there remains the same amount of profit.

It is thus easy to see that the demand conditions for various consumer goods will be the same in both systems. For according to our assumption the consumption of both employed and unemployed workers is equal to the wage bill. And other classes having the same income in both systems will, with the same propensity to consume, exert the same demand for consumer goods.

It follows that, conditions of demand for and supply of consumer goods being the same in both systems, so are their output and prices.

3. We shall now show that investment decisions in period 2 are also of the same volume in both systems although of different character—provided that incentives from new inventions in the actual system are again replaced by entrepreneurs' optimism in the reference system. The position is more complicated in period 2 than in periods 0 and 1. Indeed, at the beginning of both these periods equipment in both systems was identical; at the beginning of period 2, as a result of differences in the character of investment in period 1, the equipment, although representing in any industry the same amount of 'real' capital in both systems, is different in character. But this will not affect the volume of investment decisions. Indeed, on the same amount of real capital there is earned in both systems the same amount of profit; the difference consists only in the fact that in the reference system it represents a greater capacity, whose utilization, however, is smaller in inverse proportion. Now profit per unit of capital being in any industry equal in both systems and investment goods prices the same, the objective basis for calculating the expected rate of profit in the reference system is equivalent to that in the actual system. And with equal output and prices, the demand for cash and consequently the rates of interest also continue to be equal in both systems. Thus the inducement to invest may be assumed to be the same, and the volume of investment decisions equal, in both systems.

4. We may now handle periods 3, 4, . . . in exactly the same way as we have period 2. And so we arrive at the conclusion that the reference system has at any moment in all its sections the same output, volume of real capital, prices, and rates of interest as the actual system. On the other hand, employment in the reference system is rising relative to that in the actual system, proportionally to the rise in the productivity of labour in the latter. (This may be imagined as being effected by a longer working day and/or smaller unemployment in the reference system than in the actual system.) Further, output and capital being at any moment the same in any industry of either system, so is their ratio. Thus denoting the utilization of equipment for the actual and the reference system u and u' respectively, and the corresponding ratios of maximum capacity to 'real' capital by c and c', we have:

$$uc = u'c'$$

And since c falls continuously relative to c' because of capital-using inventions, u' must fall in the same proportion relative to u. Or the utilization of equipment in the reference system falls relative to that in the actual system proportionally to the fall in the ratio of capacity to capital in the actual as compared to the reference system.

Finally, money wage rates in the reference system fall relative to those in the actual system in inverse proportion to the rise of productivity in the latter. Prices in both systems being at any moment equal, the same is true of real wages. But, as employment in the reference system rises relative to that in the actual system proportionally to the rise of productivity in the latter, the money and real wage bills in both systems are equal.

V

1. The theorem demonstrated above enables us to put certain problems of long-run dynamics into their proper perspective. It follows from it that, if we disregard the effect of technical progress upon the degree of oligopoly, the pressure of increasing productivity of labour on the general level of prices, and the stimulus to investment from inventions, we may say that the effect of technical progress is not to increase output but to save labour. For in the reference system output develops in exactly the same way as in the actual system.

Here, however, an important qualification is necessary. We imagined the increase in the volume of labour employed in the reference system as compared with the actual system to be provided by a fall in unemployment and/or lengthening of the working day in the former *relative* to the latter. (Since in the actual system the working day is

likely to shorten, this relative lengthening of the working day in the reference system may not amount to an absolute one.) But if output increases more rapidly than the available labour, unemployment in the reference system will disappear and an *absolute* lengthening of the working day will become necessary. This, however, would be resisted by trade unions, and a further rise in output would be prevented by scarcity of labour. This makes clear the point that, although technical progress does not promote by its 'pure' effect an increase in output, in certain cases it clears the ground for it by overcoming the scarcity of labour.

It is further important to state that the features of technical progress which we left aside in order to obtain its 'pure' effect are by no means unimportant. For instance, the Industrial Revolution did increase output because the tremendous outburst of new inventions and their applications created a 'secular boom'. (In our reference system there would correspond to it an equivalent wave of optimism.) But the significance of our theorem is to show that technical progress influences output only through the channels of invention stimulus, oligopoly, and the general price level (or by overcoming the scarcity of labour).

2. Another problem of this type is that of the ratio of output to capital. If in the actual system the utilization of equipment is not increasing—and such seems to be the case in reality—there must occur a permanent fall in the ratio of output to capital. But this does not mean that the capital-using type of technical progress is responsible for this change. For the same fall of the ratio of output to capital occurs in the reference system, taking there the form of diminishing utilization of equipment. Thus there must exist some factors other than the fall in the ratio of capacity to capital which account for the fall of the ratio of output to capital both in the actual and in the reference system.

One of these factors may be the rise in the degree of oligopoly. But it must be stated generally that the degree of utilization of the plant in the reference system is constant only in the case of uniform trend. If the pace of secular trend is permanently slowing down, then the utilization of equipment is in general declining.

It must be added that, if the ratio of output to capital were constant in the course of the dynamic process, so would be the utilization in the reference system, while in the actual system the utilization would rise.

(If in the latter the ratio of output to capital uc is constant and the ratio of capacity to capital c falls, the utilization u rises.) Thus after a certain time a point would be reached when the marginal-cost curves cease to be horizontal, and our assumption about the actual system would not hold good any more. The complete parallelism between the actual system and the reference system would then break down, and our theorem would cease to be true. It is likely (although it cannot be demonstrated quite rigorously) that the output in the actual system would then start diminishing as compared with that in the reference system because of the adverse influence of the 'shift to profit' upon effective demand. This case, however, is beyond the scope of this article.

Studies in Economic Dynamics[1]

(1943)

Contents

Foreword

These five interconnected essays present the results of further research into the subjects which I discussed in my *Essays in the Theory of Economic Fluctuations*. In particular, more attention has been paid in the present studies to the long-run aspect of the problems considered.

Although frequent use is made of formulae, the mathematics involved is of elementary character (elementary algebra and the beginnings of differential calculus).

The following essays are reprinted (with important alterations) by permission of the editors concerned:

'The Short-Term and the Long-Term Rate of Interest' partly from the *Review of Economic Statistics*, May 1941, partly from *Oxford Economic Papers*, No. 4; and 'A Theory of Profits' from *Economic Journal*, June–September 1942.

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M. KALECKI

Oxford Institute of Statistics,
November 1942

Part I

Prices, Interest, and Profits

I. Costs and Prices[2]

The percentage gross margins and monopolistic competition

1. The purpose of this essay is to discuss the relation between prime costs and prices of an industry under conditions of market imperfection and oligopoly. By an 'industry' is meant here manufacturing and selling of a certain group of products which fulfils the following conditions: (i) The price fixing for a product by a firm is influenced mainly by the prices of other products in the group and the expected price reactions of firms manufacturing them, and only to a much lesser degree by prices and price reactions outside the group. (ii) The proportional changes of the unit prime costs (unit costs of materials and wages) of the various products of an 'industry' are not very divergent.

It is obvious that this definition is not clear-cut. The broader the group the better condition (i) is fulfilled and the worse, in general, condition (ii). The group must thus be formed so as to achieve a compromise between these two requirements, and therefore the scope of the industry is within certain limits arbitrary.

We shall make certain assumptions as to the average prime costs of the products in question. We assume that—as is usually the case in manufacturing—the average prime cost changes little as output expands, and that the entrepreneur takes the average prime costs as a crude approximation of the marginal costs. The latter seems to be borne out by recent enquiries, which showed that entrepreneurs are really not familiar with the *exact* concept of marginal cost. In what follows we shall assume for the sake of simplicity that the average prime cost a_k of any product is *strictly* constant when output fluctuates. The marginal cost is equal to a_k and thus also constant until the firm reaches its maximum capacity. At this point the marginal cost has no definite value, and the price of the product is determined by the condition that output cannot be increased.

2. Imagine that in an industry a short-period equilibrium of the price system has been reached, and that no firm works to capacity. The average prime costs of the relevant products are $a_1, a_2 \ldots a_n$. The firms fix the prices of their products, taking into consideration the mobility of customers (market imperfection) and the influence of their own prices on those of their rivals (oligopoly). Each firm is satisfied that the price p_k fixed is more advantageous than a higher or a lower level.

Imagine now that a fall in material prices and wage costs reduces all average prime costs $a_1, a_2 \ldots a_n$ in the same proportion. It will be seen that this creates for entrepreneurs an inducement to cut their prices. For the fall of average costs $a_1, a_2 \ldots a_n$ with unchanged prices $p_1, p_2 \ldots p_n$ increases the profit + overheads margins $p_k - a_k$ (we shall call them gross margins) in relation to prices p_k, and thus a cut of the price p_k by a certain percentage means a smaller percentage cut of $p_k - a_k$ than in the initial position. Consequently, if the firms stick to their previous views about what are the expected percentage increases in their sales caused by a percentage cut in prices, they must consider it profitable to reduce them. Now as long as $(p_k - a_k)/p_k$ remain greater than in the initial position, the price fall goes on. For $p_k - a_k$ is then less affected by a given percentage cut in prices than in the initial position, and consequently the state of affairs is more favourable for price cutting than it was before the fall of average prime costs. The price system returns to equilibrium when prices have fallen in the same proportion as average prime costs because at this point $(p_k - a_k)/p_k$ reach their initial level.[1]

It has been assumed throughout that the conditions of market imperfection and oligopoly were unchanged. This may, however, not be the case. If, for instance, the market imperfection is due to transport costs and these remain unaltered while prime (production) costs decline, the fall in prices in relation to transport costs increases market imperfection. As a result, prices will fall here *less* than proportionally to prime costs. For if they *did* fall proportionally to prime costs, a

[1] In terms of individual demand curves, this process may be described as an iso-elastic downward shift of these curves reducing their ordinates in the proportion in which the unit prime costs have fallen.

given percentage rise in prices would increase the gross margin $p_k - a_k$ by the same percentage as in the initial position, while the expected fall in firms' sales would be smaller; consequently the firms would consider it profitable to raise prices. Thus the increased market imperfection caused by the rise in the relation of transport costs to prime costs is here reflected in the increase of percentage gross margins $(p_k - a_k)/p_k$.

3. It follows from the above argument that with a given relation of average costs within the industry, and on condition that no firm is working to capacity, the percentage gross margins $(p_k - a_k)/p_k$ reflect the changes in the state of market imperfection and oligopoly.

Let us now form a weighted average μ of the percentage gross margins, using as weights the respective values of sales $Q_k p_k$. We thus have

$$\mu = \frac{\Sigma Q_k p_k \dfrac{p_k - a_k}{p_k}}{\Sigma Q_k p_k} = \frac{\Sigma Q_k (p_k - a_k)}{\Sigma Q_k p_k}$$

It may be seen at once that $\Sigma Q_k (p_k - a_k)$ represents aggregate profits + overheads of the industry, and $\Sigma Q_k p_k$ its aggregate value of sales. μ is thus equal to the ratio of profits + overheads to sales of the 'industry'.

We may, according to the above, say that μ reflects the changes in the degree of market imperfection and oligopoly of an industry provided (i) the relations of average costs $a_1, a_2 \ldots a_n$ remain unchanged, and (ii) no firm is working up to capacity. Thus, for instance, we may expect μ to fall when customers become more sensitive to price differences between suppliers (fall of market imperfection) and to rise when transport costs rise relative to prime production costs (rise in market imperfection: see preceding subsection). On the other hand, if technical progress reduces the average prime costs of all firms in the same proportion, it does not affect μ (unless it alters the conditions of market imperfection and oligopoly). For the argument of the preceding subsection applies whatever the cause of the fall in prime costs, provided it is uniform.

It has been stressed throughout the argument that the percentage gross margins $(p_k - a_k)/p_k$ reflect changes in the state of market imperfection and oligopoly only under the assumption that the ratio of prime costs $a_1, a_2 \ldots a_n$ remains unaltered. If this condition is not fulfilled, $(p_k - a_k)/p_k$ may change, although nothing happens to alter the state of market imperfection and oligopoly. If, for instance, only the average cost a_1 falls, $a_2, a_3 \ldots a_n$ remaining unaltered, the price p_1 will be reduced for the same reason as in the case considered above when the fall in average prime costs is uniform; but in general the price p_1 will *not* fall here proportionally to a_1. For the fall of p_1 changes its relation to other prices $p_2, p_3 \ldots p_n$, and this in general affects the position with regard to the expected reaction of the sales Q_1 in response to a change in price p_1. Consequently the eventual level of $(p_1 - a_1)/p_1$ need not be the same as in the initial position, although no changes in conditions of market imperfection and oligopoly have occurred.[2]

[2] The theory of price formation when the average prime costs of firms of an 'industry' do not change proportionally may be developed as follows. Let us start from a certain basic position where average prime costs are $a_1, a_2 \ldots a_n$ and prices $p_1, p_2 \ldots p_n$. Let us denote the cost and price indices in any position related to the basic position by $a'_1, a'_2 \ldots a'_n$ and $p'_1, p'_2 \ldots p'_n$ respectively. For the basic position we have thus $a'_1 = a'_2 \ldots = a'_n = 1$ and $p'_1 = p'_2 \ldots = p'_n = 1$. Let us further denote the average of p'_k weighted according to the values of firms' sales in the basic position by $\bar{p}'$.

In accordance with the argument in the text, it may be assumed that, with a given state of market imperfection and oligopoly, p'_k, the price index of the firm k, is a function of a'_k and $\bar{p}'$. As a first approximation we shall assume, moreover, that it is a linear function over the relevant range of changes of a'_k and $\bar{p}$, and thus we have

$$p'_k = \alpha_k a'_k + \beta_k \bar{p}' + \gamma_k \tag{1}$$

If prime costs of all firms change in the same proportion, we have $a'_k = \bar{a}'$, and it follows that with a given state of market imperfection and oligopoly $p'_k = \bar{p}' = \bar{a}'$ because then all prices change in the same proportion as prime costs. It follows for this case from equation (1) above

$$\bar{a}' = \alpha_k \bar{a}' + \beta_k \bar{a}' + \gamma_k$$

whatever the value of $\bar{a}'$, which means that, provided the state of market imperfection and oligopoly does not alter,

$$\gamma_k = 0 \quad \text{and} \quad \alpha_k + \beta_k = 1$$

Consequently, the equation for p'_k may be written

$$p'_k = \alpha_k a'_k + (1 - \alpha_k)\bar{p}' \tag{2}$$

Imagine now that a'_k increases while prime costs and prices of all other firms remain unchanged; it is then plausible to assume that p'_k increases, but in a lesser proportion than a'_k. As all prices but p'_k are assumed to be unchanged, p'_k increases in a higher proportion than $\bar{p}'$. Such a state of affairs, i.e. that p'_k increases less than a'_k but more than $\bar{p}'$, is compatible with equation (2) only if $a_k > 0$ and $1 - \alpha_k > 0$. It follows

$$0 < \alpha_k < 1 \tag{3}$$

Let us now form an average weighted according to the values of firms' sales in the basic position of both sides of equation (2) for all firms. We obtain

$$\bar{p}' = \overline{\alpha a}' + (1 - \bar{\alpha})\bar{p}' \tag{4}$$

It follows that the percentage gross margins $(p_k - a_k)/p_k$ are affected not only by changes in the state of market imperfection and oligopoly, but also by those in the relation between average prime costs $a_1, a_2 \ldots a_n$. However, the influence of these changes upon the *average* percentage gross margin μ is most probably relatively small.[3] As further, according to our definition of industry (cf. p. 119), the relative changes in average prime costs $a_1, a_2 \ldots a_n$ are kept within rather narrow limits, it is plausible to assume that the movement of μ reflects mainly changes in the degree of market imperfection and oligopoly. This, however, is still subject to the qualification that the firms do not work up to capacity.

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where $\alpha a'$ is the weighted average of $\alpha_k a'_k$ and $\bar{\alpha}$ the weighted average of α. Hence we obtain the formula

$$\bar{p}' = \frac{\overline{\alpha a}'}{\bar{\alpha}} \tag{4a}$$

After substituting this value of $\bar{p}'$ into equation (2) we have

$$p'_k = \alpha_k a'_k + (1 - \alpha_k)\frac{\overline{\alpha a}'}{\bar{\alpha}} \tag{2a}$$

In this way price indices of all firms are fully determined by the indices of the average prime costs a' and the coefficients α.

It may be shown that the price equilibrium determined by equations (4a) and (2) is stable. Indeed, imagine that prices deviate from the equilibrium values determined by (2a), and as a result the average price index $\bar{p}'$ differs by Δ from the value determined by formula (4a). It follows from equation (2) that this leads to price indices p'_k differing from the equilibrium level determined by equation (2a) by $(1 - \alpha_k)\,\Delta$; and from this results a new $\bar{p}'$ which differs from the equilibrium level by $(1 - \bar{\alpha})\Delta$. As according to equation (3) $1 - \bar{\alpha} < 1$, the average price index $\bar{p}'$ will converge to its equilibrium level determined by equation (4a).

[3] This may be corroborated by a transformation of equation (4a) of the preceding note. From a known formula for the correlation coefficient it follows that

$$\overline{\alpha a}' = \bar{\alpha}\bar{a}' + r\sigma_\alpha \sigma_{a'}$$

$\overline{\alpha a}'$ is the weighted average of $\alpha a'$; $\bar{\alpha}$ and $\bar{a}'$ are the weighted averages of α_k and a'_k respectively; r the coefficient of correlation between α_k and a'_k; σ_α and $\sigma_{a'}$ the standard deviations of α_k and a'_k respectively. By substituting this value of $\overline{\alpha a}'$ into equation (4a) we obtain

$$\bar{p}' = \bar{a}' + r\frac{\sigma\alpha}{\alpha}\sigma_{a'} \tag{5}$$

or

$$\frac{\bar{p}'}{\bar{a}'} = 1 + r\frac{\sigma_\alpha}{\bar{\alpha}}\frac{\sigma_{a'}}{\bar{a}'} \tag{5a}$$

Now there is no particular reason for a positive or negative correlation between a'_k which is the average cost index in relation to the basic position and the coefficient α_k;

4. Let us start from a position for which this condition is fulfilled and imagine that the effective demand for the products of the 'industry' increases. As long as firms do not reach the point of full capacity, the percentage gross margins remain unaltered unless the rise in demand has some effect upon the state of market imperfection and oligopoly.[4] If, however, the increase in demand continues, one firm after another will reach its maximum capacity, beyond which it is unable to increase its output. It is obvious that if the demand for the firm's product rises while the supply is limited by the existing capacity, the prices charged by the firm will increase so as to bring into equilibrium the increased demand with the fixed supply—even though the average prime costs and the state of market imperfection and oligopoly are unaltered. This will result in the increase of the average percentage gross margin μ. We may thus conclude that the movement of μ mainly reflects changes in the degree of market imperfection and oligopoly and bottle-necks in the manufacturing of the products of the 'industry', appearing as the demand for these products increases in relation to available capacities.

5. In all the above argument we have left aside selling costs, and we must now allow for them. It may be assumed that the entrepreneur apportions a certain part of his selling costs to 'investment or overhead selling costs' (a considerable part of advertising is probably treated in this way) and the rest to 'prime selling costs'. The first may be included in overheads and profits, while the second plays in price formation a role similar to prime production costs.

The entrepreneur may now be imagined to fix his price on the assumption that it is profitable for him to spend a certain percentage of the proceeds σ on prime selling costs. σ may be called the rate of prime selling costs. It is easy to see that in our argument on pp. 120–1,

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thus r is likely to be rather low. If it is equal to nought, $\bar{p}'/\bar{a}' = 1$, and then the changes in the average price $\bar{p}'$ are independent of the relative changes of average prime costs a: the average price index $\bar{p}'$ is equal to the average prime cost index $\bar{a}'$.

In general, of course, r is not equal to zero. But it is likely to be lower in absolute value than, say, 0.30; further, even assuming a very wide dispersion in the coefficients α_k, it is unlikely that $\sigma_\alpha/\bar{\alpha}$ would be higher than, say, 0.5. On these assumptions the absolute value of $r\frac{\sigma_\alpha}{\bar{\alpha}}\frac{\sigma_{a'}}{\bar{a}'} < 0.15\frac{\sigma_{a'}}{\bar{a}'}$, and thus

$$1 - 0.15\frac{\sigma_{a'}}{\bar{a}'} < \frac{\bar{p}'}{\bar{a}'} < 1 + 0.15\frac{\sigma_{a'}}{\bar{a}'}$$

[4] In terms of individual demand curves this means an iso-elastic shift of these curves to the right.

attempting to establish that (with qualifications stated there) the movement of $(p_k - a_k)/p_k$ reflects changes in the state of market imperfection and oligopoly, $(p_k - a_k)/p_k$ must now be replaced by $[(p_k - a_k)/p_k] - \sigma$. It follows that if selling costs are allowed for, the average percentage gross margin μ reflects not only the changes in the degree of market imperfection and oligopoly and the bottle-necks in available capacities, but also changes in the rates of prime selling costs.

To summarize: the movement of the average percentage gross margin μ mainly reflects changes in the degree of market imperfection and oligopoly, changes in the rates of prime selling costs, and bottle-necks in available manufacturing capacities. (To a minor degree μ is influenced also by changes in the relation of prime production costs $a_1, a_2 \ldots a_n$ within the 'industry'.)

6. As shown on p. 121, the ratio of profits + overheads to proceeds is equal to the average percentage gross margin μ. It is easy to see that μ determines the distribution of the net output (or value added) between wages on the one hand and profits + overheads on the other, if in addition the ratio of the cost of materials to that of wages is given. If we denote the wage bill by W and the ratio of the material bill to the wage bill by m, the aggregate prime costs are $(1 + m)W$. As the ratio of overheads + profits to proceeds $= \mu$, the ratio of overheads + profits to prime costs $= \mu/(1 - \mu)$. It follows that overheads + profits $= \mu(1 + m)W/(1 - \mu)$. Further, the net output (or value added) is equal to the sum of overheads + profits and the wage bill, and thus we have

$$\text{net output} = \frac{\mu}{1-\mu}(1 + m)W + W$$

Thus the relative share of wages w in the net output is

$$w = \frac{W}{\dfrac{\mu}{1-\mu}(1 + m)W + W} = \frac{1-\mu}{1+\mu m}$$

It may be seen at once that w is a diminishing function of both μ and m. That means that if, e.g., a change in the state of imperfect competition and oligopoly, in the rates of prime selling costs, or in the 'bottle-neck factors' presses down the ratio of overheads + profits to proceeds μ, it tends to increase the relative share of wages in the net output w. But apart from this w depends on the ratio of material costs to wage costs m: it falls when the cost of materials rises in relation to that of wages and conversely.

Changes in the percentage gross margin of an industry

1. It has been shown above that changes in the average percentage gross margin of an 'industry', i.e. of the ratio of its overheads + profits to its proceeds μ, are determined chiefly by changes in the state of market imperfection and oligopoly, changes in the rate of prime selling costs, and by the bottle-neck factors. This section will examine how μ is affected through these channels by the business cycle and the long-run economic development. We shall deal first with the business cycle.

2. If market imperfection depends partly on transport costs, and the average prime costs a_k fall while transport costs remain unchanged or fall in a lesser proportion, the market imperfection and consequently the average percentage gross margin μ increases.[5]

Now it happens quite frequently that prime production costs fall more strongly than transport costs in the slump. Thus under this influence μ will tend to rise in a slump and to fall in a boom.

There exists, however, a reason for cyclical changes in market imperfection, and thus in μ in the opposite direction, which has been indicated by Mr Harrod. He calls attention to the fact that buyers are more careful in comparing prices charged by various sellers in the slump than in the boom. This would tend to cause a fall in market imperfection and the gross profit percentage margin μ in the slump, and its rise in the boom. It should perhaps be added that if the slump is deep the market imperfection is likely to be relatively low in the subsequent recovery also, because the habit of more careful buying acquired during the depression may persist for a certain time.

Probably more important than the effect of cyclical changes in market imperfection upon μ is the influence of 'tacit agreements' in a deep slump, which may be classified as changes in the degree of oligopoly.

Imagine a deep slump in which the average prime costs in an 'industry' have fallen considerably. If the percentage margins were unchanged, there would be an even stronger fall of what is left for overheads and profits of a single producer because output is reduced as well. The resulting deterioration in his financial position induces him to increase his percentage gross margin in the hope that other producers will act likewise. If they do not he is lost, but so would he be if he reduced his prices proportionally to average prime costs. If such is

[5] See pp. 120–1.

the prevailing attitude, a 'tacit agreement' is established and μ is higher than it otherwise would be.

It is important to note that the rise in a percentage gross margin does not mean here a high measure of profit, because it only partly compensates for the fall in average prime costs and output. The existing firms need not be afraid, therefore, that new enterprises will emerge; and even many 'high-cost producers' must close down in spite of the tacit agreement.

When the slump is over, the degree of oligopoly will fall for various reasons. First, the rise in average prime costs and output removes the very basis of the tacit agreement, the more so since, in the meantime, a certain cut in overhead expenditure has probably been achieved; second, because of the fear of newcomers, and even more so to prevent the reopening of establishments closed down in the slump.

On the basis of the above analysis, it seems probable that in a cycle showing no deep and prolonged slumps the changes of μ caused by fluctuations in the state of market imperfection and oligopoly or in prime selling costs are not likely to be important.

The position will be different in a deep and prolonged slump and also in the subsequent recovery. The most important factor in the slump is likely to be that the tacit agreement, and thus μ, may rise significantly. On the other hand, in the subsequent recovery μ is likely to fall below what would be its level after a moderate slump. Two factors will contribute to it: the careful buying which persists for a certain time after a deep and prolonged slump, and the tendency of entrepreneurs to prevent reopening of numerous establishments closed down in the slump.

3. We have yet to deal with the influence upon the percentage gross margin of the 'bottle-neck factors' which come into the picture when the volume of sales of an 'industry' increases in relation to its capacity beyond a certain point. The resulting rise in the percentage gross margin is likely to be significant only close to the top of the boom when the utilization of equipment is high. And, in the light of the data we give in the next section, it does not seem usually important even then for manufacturing industry as a whole. (It must be noted, however, that these data relate to the twentieth century only.)

It looks as if the influence of bottle-necks in manufacturing in a modern capitalist society becomes predominant only in 'abnormal' times, during wars or post-war periods. In such periods total employment, and consequently the wage bill, expressed in terms of wage units, remains unaltered or even increases. At the same time the production of consumer goods is strongly curtailed, chiefly owing to the scarcity of raw materials and labour in the industries concerned. As a result, if the consumption of non-wage-earners is not reduced sufficiently by increased propensity to save, taxation, and rationing to offset this divergence, prices will rise in relation to wage rates, i.e. the real wage rate will fall. This may happen in two ways: by the increase in prices of raw materials relative to wage rates, and by the rise in the percentage gross margins of the manufactured products. Usually these changes go hand in hand, although, if prices of raw materials are controlled and they are distributed among enterprises by a quota system, the equilibrium between demand for and supply of consumer goods is achieved only by the rise in percentage gross margins. The rise in money wage rates enforced by the workers who try to restore the 'old' real wages cannot remedy the situation, and results only in a new rise in prices; for at the root of the trouble lies the fall in the ratio of production of consumer goods to total employment. It is this that is the actual cause of the 'vicious spiral'.

The position in an 'ordinary' boom is different in that bottle-necks in plant and labour are not very significant. True, the supply of basic raw materials is sometimes inelastic, and their prices increase considerably in relation to wage rates. This, however, results only in a slight increase in the prices of finished goods relative to wage rates because, usually, the basic raw materials are a much smaller cost item than wages. And even this tendency of real wages to fall is often counterbalanced (i) by the institutional rigidity of certain items in the cost of living (rents, bus and railway fares, etc.), which often causes their fall relative to wage rates when these increase, and (ii) by technical progress which reduces the labour cost per unit of product relative to wage rates. As a result, the fall in real wage rates in an ordinary recovery is small if any, and does not initiate, therefore, a vicious spiral.

4. We shall now consider briefly the influence of long-run economic development upon the percentage gross margin μ.

The imperfection of the market will tend to diminish as a result of the fall of transport costs in relation to prime production costs, standardization of goods, spreading of commodity exchanges, etc.; the higher standard of living may tend to cause less careful buying (the 'Harrodian factor'), but this will probably be fully offset by a higher degree of knowledge and more free time for buying; finally, at a certain late stage of capitalist development the expansion of advertising may in many cases create an 'artificial' market imperfection. The progressive concentration of industry is likely to enhance the degree of oligopoly. The rates of prime selling cost are also likely to rise in the long run, particularly at a certain late stage of capitalist development.

As to the influence of bottle-neck factors, it seems that, at least in the twentieth century, they are effective in 'normal' times only close to the top of the boom, and even then are not very significant for manufacturing industry as a whole. Thus bottle-neck factors are probably not important in the long-run analysis of recent economic developments. This does not, however, exclude a possibility of significant long-run changes in μ caused by these factors.[6]

On balance it is impossible to say a priori how μ changes in the long run. But it follows clearly from the above that (if we leave aside bottle-neck factors) it is more likely to rise in the later than in the earlier stage of capitalist development.

Application to the US manufacturing industry

1. Apart from the causes of changes in the percentage gross margin of an 'industry' discussed in the preceding section, there will be a variety of other factors influencing that margin. However, the above analysis gives a more or less comprehensive list of important factors which affect the gross profit percentage margins of *all* industries simultaneously as a result of the business cycle or long-run economic development. If we consider the percentage gross margin of the manufacturing industry as a whole (i.e. the ratio of its aggregate overheads + profits to its aggregate proceeds), it is these influences that will be most important, while particular factors affecting percentage gross margins of thousands of industries will most probably cancel out. We therefore apply the results of the preceding discussion to the US manufacturing industry as a whole.

Two problems arise here, however. The first depends on the existence of industries which are dominated by one firm or a cartel. To such a case our analysis, which was concerned with an industry

[6] See p. 137 below.

working in conditions of imperfect competition and oligopoly, does not apply. It may be said, however, (i) that the predominant form of a manufacturing industry *is* that which works under conditions of imperfect competition and oligopoly, (ii) that even 'pure monopolists' must count with potential outsiders, and this makes their behaviour broadly similar to that of oligopolies. It is therefore likely that the existence of cartels, etc., does not invalidate the application of the apparatus built up above for the examination of the percentage gross margin of the US manufacturing industry as a whole.

The second difficulty is that changes in the ratio of aggregate overheads + profits of manufacturing industry to its aggregate proceeds are influenced not only by changes in such ratios of the particular industries but also by changes in the proportions of proceeds of these industries; indeed, μ may have different values for various industries and thus, for instance, the increased weight for industries with high μ may increase the ratio of overheads + profits to proceeds for the manufacturing industry as a whole, although such ratios for the component industries have not changed. As far, however, as could be ascertained by considering the changes of μ for industrial groups, this influence upon μ of the US manufacturing industry as a whole was of no importance.

2. In Table 23 we give the ratio of overheads + profits of the US manufacturing industry to its proceeds in the period 1899–1937, calculated from the census of manufactures.[7]

Fig. 11 represents the time-curve of μ. It may be seen at once that in the period 1899–1929 all points of it lie on a smooth curve formed by three straight lines: 1899–1909, 1909–21, and 1921–9. This may be

[7] As given in the *Statistical Abstract of the United States*, 1939. To make the figures for various years comparable, however, the following adjustments had to be made. (i) Prior to 1931 the tax on tobacco manufactures has been deducted from overheads + profits, where it was included by the census. (ii) Prior to 1935 the cost of work given out has been subtracted from overheads + profits, where it was included by the census. Up to 1923 this has been done according to census data; from then onwards the percentage of the cost of work given out in terms of total prime costs has been assumed the same as in 1923. (iii) In 1929, 1931, and 1933, in which years the work and shop supplies were included by the census in overheads + profits as opposed to other years, a corresponding correction has been introduced. In 1904 the work and shop supplies were—according to the census data—0.7% of total prime costs. In accordance with the rise of the value of capital equipment taken from Professor Douglas, *The Theory of Wages*, as compared with the value of prime costs, this percentage has been assumed 1% for the years 1929, 1931, and 1933. (iv) The change in the scope of the census in 1914 is accounted for by linking up the series.

Table 23. *Percentage Gross Margin μ in the US Manufacturing Industry*

1899	23.1	1919	22.4	1929	26.7
1904	23.3	1921	21.9	1931	28.1
1909	23.3	1923	23.2	1933	27.9
1914	22.5	1925	24.2	1935	25.0
		1927	25.3	1937	24.8

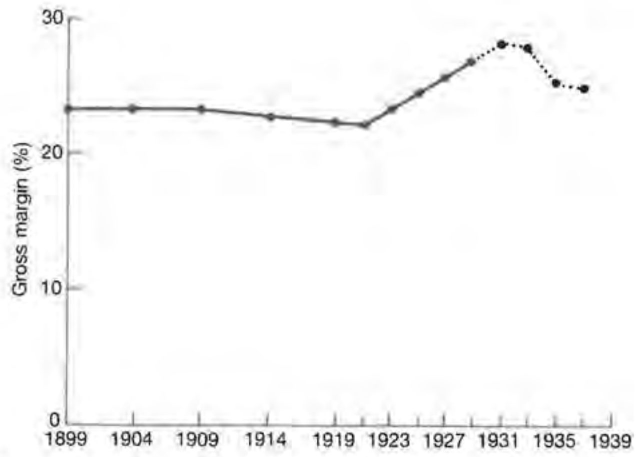

FIG. 11. *Percentage Gross Margin of US Manufacturing Industry, 1899–1937*

interpreted as showing the absence of any business cycle effects upon μ, inclusive of the influence of bottle-neck factors. The long-period trend of μ, as represented by the curve 1899–1909–1921–1929, shows stability of μ in the period 1899–1909 and a slow fall in 1909–21. This may be accounted for as a balance between conflicting tendencies, described in the last section (pp. 128–9). We see then a rather sharp rise in μ in the period 1921–9. This is probably caused by what may be called a 'commercial revolution' which took place in that period. The dramatic development of modern selling methods (advertisement, 'invention' of new products, etc.) both caused an increase in prime selling costs and created an 'artificial' market imperfection.

The changes of μ in the period 1929–37 show quite a different pattern from those in the period 1899–1929. While cyclical changes were not noticeable in the latter period, after 1929 we see a strong

Table 24. *Percentage Gross Margin μ in Manufacturing Industry, Wholesale Trade, and Retail Trade in the USA*

Year	Manufacturing industry[a]	Wholesale trade[a]	Retail trade[b]
1929	26.7	14.3	29.6
1931	28.1	15.0	30.9
1933	27.9	15.2	32.8
1935	25.0	12.5	29.0
1937	24.8	12.9	28.7

[a] Taken from Table 23.

[b] Difference between sales and purchase costs of goods sold expressed as a % of sales. Thus prime costs are here identified with purchase costs of goods, which is approximately correct. The figures relate to wholesale and retail trade in consumer goods only.

Source: B. M. Fowler and W. H. Shaw, 'Distributive Costs of Consumption Goods', *Survey of Current Business*, July 1942.

increase in μ in the slump (1931, 1933) and a still stronger fall in the subsequent recovery (1935, 1937). This may be explained by the effects of a deep and prolonged slump as described in the preceding section: tacit agreement in the slump, and in the recovery its reversal, strengthened by the tendency to prevent the reopening of establishments closed down in the slump, and by the habit of careful buying persisting for a certain time as an after-effect of the slump.

In this connection it is interesting to notice that changes in the percentage gross margins μ (i.e. the ratios of overheads + profits to proceeds) in the wholesale and retail trade in the USA show a similar pattern as in manufacturing in the period 1929–37 (see Table 24).

The above cannot, of course, provide a full proof of the correctness of our theory. It shows only that this can supply a plausible interpretation of changes in pricing in the USA manufacturing industry (and wholesale and retail trade in that country in the period 1929–37). It will therefore be useful to examine to what extent the alternative theories of price formation are capable of explaining the phenomena in question.

3. We may distinguish two theories of price formation alternative to ours: the perfect-competition theory, and the 'full-cost' theory.

The supporters of the perfect-competition theory do not deny the existence of market imperfection and oligopoly. But they consider them to be factors of minor importance and thus maintain that

the assumption of perfect competition is justified to the first approximation.[8]

One of the important corollaries of the free-competition theory is that the relative share of wages in the value added (net output) falls in the boom and rises in the slump. Indeed, price being equal to short-period marginal costs, the average value added (i.e. price – average cost of materials) is approximately equal to the marginal wage cost, since it may be assumed that the average cost of materials is independent of the firm's output, and the marginal cost of salaries and depreciation is small. Further, under perfect competition the relevant branch of the marginal wage cost curve is upward sloping; also the average wage cost increases from a point onwards but (unless the shape of its curve is very peculiar) it increases in a smaller proportion than the marginal wage cost; so that the ratio of average to marginal wage cost falls when the utilization of plant increases. It follows directly that the relative share of wages in value added falls in the boom when the utilization of the plant increases, and rises in the slump when the utilization of the plant diminishes. This consequence of free-competition theory may be tested by statistical data (see Table 25).[9]

The only instance when the theory accords with fact is the slump year 1921, when the relative share of wages in value added is higher than in 1919 and 1923. It falls, however, after 1923—in 1925 and 1927—although in both these years the degree of utilization of equipment was definitely lower than in 1923. (1923 was the year of highest degree of utilization in the period 1921–37.) Further, in the slump years 1931 and 1933 w remains at the level of the boom year 1929, and rises in the subsequent recovery in 1935 and 1937. Thus the facts are rather against the perfect-competition theory.

[8] See e.g. J. R. Hicks, *Value and Capital* [Oxford, Clarendon Press, 1939]: 'If we can suppose that the percentages by which prices exceed marginal costs are neither very large nor very variable, and if we can suppose (what is largely the consequence of the first assumption) that *marginal* costs do generally increase with output at the point of equilibrium (diminishing marginal costs being rare), then the laws of an economic system, working under perfect competition, will not be appreciably varied in a system which contains widespread elements of monopoly' (p. 84). The only justification of these assumptions is that 'a universal adoption of the assumption of monopoly must have very destructive consequences for economic theory' (p. 83).

[9] Based on the data from census of manufactures, as given in the *Statistical Abstract of the USA*, 1939, with the same adjustments as described in n. 7. The comparable figures for the period 1899–1914 are: 1899: 42.7; 1904: 42.5; 1909: 41.0; 1914: 42.1.

Table 25. *Relative Share of Wages w in Value Added in the US Manufacturing Industry, 1919–1927*

	%		%
1919	41.8	1929	37.5
1921	45.0	1931	37.4
1923	42.9	1933	36.7
1925	40.4	1935	39.4
1927	39.8	1937	40.2

It should be added that changes in the relative share of wages in value added w are fully determined by those in the gross-profit percentage margin μ and the ratio of the material bill to the wage bill m (see p. 125). Thus if the above interpretation (pp. 130–2) of changes in μ in US manufacturing in terms of our theory is accepted, this theory of itself provides an explanation for changes in w.

4. The full-cost theory in its familiar version maintains that the firm fixes its price by adding to average prime cost the overheads per unit of actual output or per unit of 'standard' output (i.e. per unit of output corresponding to what is considered reasonably full employment of firms' plant) and 'something' for profit. This statement has no precise theoretical meaning, because the amount that is added for profit makes quite a lot of difference to the price and more still to the gross margin.

The full-cost theory has actually been derived from the replies of entrepreneurs to enquiries about their pricing methods.[10] But it is not unlikely that the procedure described by them is not the actual process of fixing prices but only a check applied to prices fixed in another way to see whether they make any net profit. Indeed, if the 'something' which is the difference between price and the full cost calculated per unit of actual output is positive, the firm knows that it makes a net profit on the product in question. If overheads are calculated per unit of 'standard' output, the positive difference means that losses, if any, are due to the fall in output only, and if the slump is not too deep and prolonged they have no importance from a longer point of view; while

[10] See e.g. R. L. Hall and C. J. Hitch, 'Price Theory and Business Behaviour', *Oxford Economic Papers*, May 1939.

if the slump *is* deep and prolonged, the 'standard' output is being appropriately reduced. In the case both of calculation with actual and with 'standard' output, the calculator seems not so much to fix the price as to translate the price fixed by other considerations into the 'full-cost language'. In a modern cotton-spinning mill, the manager once described to me at great length the work of their calculating department. To my question, however, how the results are used to fix the prices, he replied: 'Oh, the prices are fixed by the market'.

Nevertheless, in certain circumstances the calculator's analysis may have some bearing upon fixing of prices. In a deep slump it helps to make clear the precarious position of the firm and thereby initiates the attempts to increase the percentage gross margin, and so may lead to the establishment of a 'tacit agreement'.

Percentage gross margin and capital intensity

1. We have shown in the preceding sections that both short-term and long-term changes in the ratio of overheads + profits to proceeds μ are determined chiefly by changes in the state of market imperfection and oligopoly, by changes in the rates of prime selling costs, and by 'bottle-neck factors'. True, μ is influenced also by relative changes in the average prime costs as between firms, but this influence is not likely to be very important. It follows that if in the long run the state of market imperfection and oligopoly and the rates of prime selling costs remain stable and bottle-neck factors do not come into the picture, the ratio of profits + overheads to proceeds μ is more or less constant.

This contradicts the widely accepted view that in the long run the relative share of overheads and profits in the price increases owing to the rising capital intensity of production. We must therefore analyse the basis of this contention, and then examine also what effect the increase of capital intensity has upon the percentage gross margin according to our theory.

2. The argument in favour of μ rising with capital intensity of production runs roughly as follows. As a result of technical progress, more capital is used per unit of output, and therefore the value of capital (at reproduction prices) rises relative to the value of production. Now the rate of depreciation being stable or increasing, and the rate of profit more or less stable, profit + depreciation must rise in relation to the value of production. The salary bill usually rises with capital intensity in relation to wage bill + material bill. Hence the relative share of overheads + profits in the value of production μ must be expected to increase. Two objections may be raised, however, to this argument.

First, the assumption that the rate of profit in the long run is rather stable is, in fact, quite arbitrary. It is based on the idea that the rate of profit in long periods tends to be equal to the long-term rate of interest + 'normal profit', and that both these components change rather slowly. But this long-period equilibrium approach is not justified, because long-run economic development is a complicated dynamic process, and the rate of profit may very well fall in the long run, although the long-term rate of interest remains constant (or even increases).[11] Thus the ratio of overheads + profits to proceeds may remain constant in spite of the fall of the value of production in relation to the value of capital. A striking example of such a situation is provided by the developments in US manufacturing industry in the period 1899–1914 (see Table 26).

There is, however, still another objection to the argument on which the statement is based—that the percentage gross margin μ increases

Table 26. *Ratio of Value of Production to Value of Capital and Percentage Gross Margin in the US Manufacturing Industry*

Year	Reproduction cost of fixed capital[a] (1)	Value of products[b] (1899 = 100) (2)	Ratio (2):(1) (3)	Long-term rate of interest[c] (4)	Percentage gross margin μ^d (5)
1899	100	100	100	3.1	23.1
1904	137	130	95	3.5	23.3
1909	216	182	84	3.6	23.3
1914	280	212	76	4.0	22.5

[a] Obtained by multiplying the index of real fixed capital by the price index of investment goods. Both series are taken from Douglas, *The Theory of Wages*, p. 121. Douglas's series extends to 1922, but his post-war figures are not quite reliable because he did not take into account the possible revaluation of capital by firms in connection with the 'price revolution'. I am indebted for this point to Mr E. Rothbarth.

[b] Taken from the census of manufactures (the changes in the scope of the census in 1914 are accounted for by linking up the series).

[c] Douglas, *The Theory of Wages*, p. 469.

[d] See p. 131 above.

[11] The determinants of the rate of profit are discussed below in the essay 'A Theory of Profits'.

with capital intensity of production. The rise in the latter means that capital contained in equipment increases relative to its maximum productive capacity. The ratio of actual output to capital depends in addition on the degree of utilization of equipment, i.e. the ratio of actual output to maximum capacity. If, therefore, the rise in capital intensity is accompanied by an increase in the degree of utilization, the value of production does not necessarily fall relative to the value of capital.

It follows that rising capital intensity, even if the rate of profit remains stable, is compatible with a constant percentage gross margin μ: the rise in the degree of utilization of equipment may offset the influence of the increase in capital intensity. It should be noticed, however, that if this increase lasts for a certain time, there will be reached a point of the degree of utilization where bottle-neck factors appear and then μ starts to rise.

We may thus formulate the interrelation between μ and the rise in capital intensity according to our theory as follows. Let us start from a situation where bottle-neck factors are absent, and thus μ is determined by the state of market imperfection and oligopoly (and by the rates of prime selling costs). If there is a rise in capital intensity of production and the degree of utilization does not increase, the rate of profit falls, while the percentage gross margin is stable.[12] If, however, the degree of utilization increases sufficiently to offset the influence of increased capital intensity, the rate of profit can be maintained; and if the rise in the utilization of equipment has not brought bottle-neck factors into the picture, the percentage gross margin is also stable here. But if this development—rising intensity of capital, stable rate of profit, rising utilization of equipment—continues for some time, a point will be reached where bottle-necks do appear. It is only after this stage has been reached that increasing capital intensity must cause either a fall of the rate of profit or a rise in the percentage gross margin.

3. On p. 125 we have deduced the following formula for the relative share of wages in the value added by manufacturing:

$$w = \frac{1-\mu}{1+\mu m}$$

[12] This situation corresponds roughly to that assumed by Marx in his law of the falling rate of profit.

where μ is the percentage gross margin and m the ratio of the material bill to the wage bill. Now, as long as bottle-neck factors do not come into the picture, changes in μ depend chiefly on changes in the state of market imperfection and oligopoly (and in the rates of prime selling costs). Thus if these determinants are unchanged, technical progress can affect w only by influencing the ratio of the material bill to the wage bill. A fall in the wage cost, for instance, in relation to the raw-material cost will raise m and thus reduce the relative share of wages in value added. But if technical progress reduces in the same proportion the cost of labour and the prices of raw materials, w remains unchanged—provided that bottle-neck factors do not cause any change in μ.

2. The Short-Term and the Long-Term Rate of Interest[3]

The short-term rate

1. Before we discuss the problem of the formation of the short-term rate of interest it is necessary to establish a functional connection between the short-term rate of interest and the velocity of cash circulation. By the latter we mean the ratio of turnover, T, to the stock of cash (current accounts or notes), M. It is clear that the smaller, with a given turnover, the amount of cash possessed, say, by a firm, the greater the convenience derived from the marginal unit of cash in managing transactions. Moreover, after cash-holding is reduced to a certain level, its further curtailment involves a very strongly rising marginal inconvenience. On the other hand, if cash is very plentiful with a given turnover, the marginal convenience falls to nought and remains at this level if the amount of cash, M, increases further. The marginal convenience of holding cash, therefore, is an increasing function of the velocity of circulation, T/M, and may be represented by a J curve.

The short-term rate of interest is closely connected with the marginal convenience of holding cash. Indeed, if the short-term rate is higher than this marginal convenience, there is an inducement for lending additional cash; if the short-term rate is lower, it becomes profitable to withdraw from short-term assets and acquire cash. Thus equilibrium is reached when the short-term rate of interest is equal to the marginal convenience of holding cash.

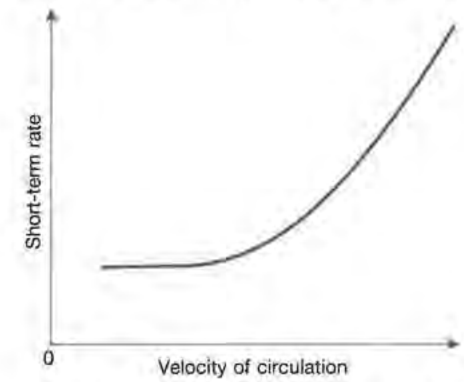

FIG. 12. *Hypothetical Relationship between Velocity of Circulation and the Short-Term Rate of Interest*

The above requires a certain qualification. The operation of short-term lending as such involves some costs and inconveniences, or 'investment costs'. The short-term rate is thus equal to the sum of the marginal convenience of holding cash—'investment costs'. Thus when the marginal convenience of cash-holding falls to zero, the short-term rate is equal to investment costs. As a result we may say that a priori grounds exist for postulating a connection between the short-term rate and the velocity of circulation of the shape represented by the curve in Fig. 12.[13] That this curve must not be assumed to be absolutely stationary through time is obvious. Habits of cash-holding, etc., may change in the long run, and a financial panic may cause higher requirements for cash at the same turnover and the same short-term rate; this will be reflected in a shift of the curve.

2. We shall now try to verify statistically the relationship under consideration. Since 1930 the London clearing banks have published figures of turnover (debit entries to current accounts). The ratio of these figures to current accounts may seem to be just what we need for our investigation; but unfortunately the case is not so simple.

[13] There arises here the problem whether in this context the short-term rate of interest must be understood gross or net of income tax. If the marginal inconvenience of curtailment of the cash-holding is supposed by a manager to be finally reflected in a corresponding reduction of profits, then it is the interest gross of tax which should be taken into account. This seems likely to be the case. However, the subsequent empirical enquiry which relates to the UK in the period 1930–8 is independent of this assumption, because the rate of income tax was fairly stable over that period.

The turnover consists of two parts, each of a very different character: financial and non-financial transactions. For 1930, the latter were estimated to have constituted only 15% of the total turnover.[14] On the other hand, the financial current accounts are unlikely to be more than one-third of the total.[15] This disproportion reflects the obvious fact of the much greater velocity of circulation of financial, compared with non-financial, accounts. As a result, changes in the velocity of circulation of financial accounts are reflected in the ratio of turnover to current accounts too heavily in relation to the share of financial accounts in the latter. This defect can be remedied in the following way. We divide the turnover into the non-financial and financial components; we reduce the financial component in a proportion which brings its ratio to financial accounts in the base year 1930 to the level of the ratio of the non-financial component to non-financial accounts, i.e. to the level of the non-financial velocity of circulation. Finally, we add the 'reduced financial component' to the non-financial component and divide the sum by total current accounts. This ratio may be considered an adequate index of changes in the velocity of circulation.

The calculation is described in detail in my paper on 'The Short-Term Rate of Interest and the Velocity of Circulation'.[16] The results obtained there[17] are given in Table 27 and plotted in Fig. 13.

As we see, all points except 1931 lie around a curve of a shape which we deduced on a priori grounds in the preceding paragraph. Point 1931 is considerably above the curve. This is explained by the financial crisis in the second half of that year, which caused an upward shift of the curve considered, i.e. increased the amount of cash required at a given turnover and a given short-term rate of interest.[18] The period examined is rather short, and further enquiries are necessary to confirm the theory.

[14] E. H. Phelps Brown and G. L. S. Shackle, *Statistics of Monetary Circulation in England and Wales*, 1919–1937 (Royal Economic Society, Memorandum No. 74), p. 28.

[15] Ibid., p. 33.

[16] *Review of Economic Statistics*, May 1941.

[17] Slightly revised; allowance having been made for: (i) a change in the working practice of town clearings in Nov. 1932 which increased the volume of total clearings by about 2%; (ii) a change in the scope of current accounts in Jan. 1938 which caused an increase of about 2%.

[18] The point for 1938 is also slightly raised by the increase of the short-term rate in the autumn, due to political events.

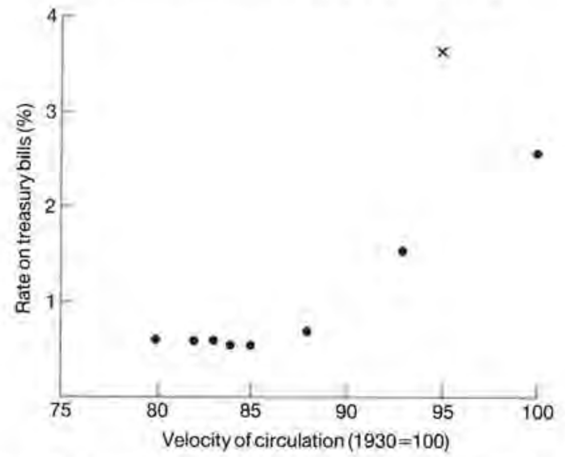

FIG. 13. *Velocity of Circulation and Rate on Treasury Bills, UK, 1930–1938*

Table 27. *Index of Velocity of Circulation and Rate on Treasury Bills*

Year	Velocity of circulation (1930 = 100)	Rate on treasury bills (%)
1930	100	2.48
1931	95	3.59
1932	93	1.49
1933	83	0.59
1934	88	0.73
1935	85	0.55
1936	82	0.58
1937	84	0.56
1938	80	0.61

3. The relation examined above may be written

$$T/M = V(\rho) \tag{1}$$

where T is the money volume of transactions (turnover), M the stock of cash and $V(\rho)$ the velocity of circulation, being an increasing function of the short-term rate of interest ρ. Formula (1) may also be written

$$MV(\rho) = T \tag{1a}$$

In this form it is nothing else but the quantity of money equation.[19] The significance of it is, however, quite different here from that quantity theory of money. It shows simply that with a *given* volume of transactions T, an increase in the supply of cash M by the banking system causes a fall in the short-term rate of interest. One can, of course, argue that this fall tends to increase the rate of investment, and thus through this channel it influences T. But, as we shall see in the following sections of this essay, changes in the short-term rate have a fairly small immediate effect upon the long-term rate; and it is chiefly the latter which is relevant for investment activity. Thus, only after the new level of the short-term rate of interest has been maintained for a quite prolonged time will it appreciably affect the rate of investment. Therefore the *immediate* influence of the increase in the supply of cash will be, not to raise the money volume of transactions, but to reduce the velocity of circulation and the short-term rate of interest.

4. It is still interesting to discuss the mechanism of the increase in the supply of current accounts by the banking system. Imagine that banks decide to reduce their cash ratio (the ratio of the amount of their notes and accounts in the central bank to deposits, i.e. current and deposit accounts) and buy bills. Let us first assume that the rate on deposit accounts follows the discount rate. Thus when the discount rate starts to fall there will be no inducement to sell bills and open deposit accounts instead. The rate of discount must consequently fall to a level at which people will be prepared to add to their current accounts the amount for which the banks buy bills. With a given turnover T_0, this level of the short-term rate may be obtained easily by means of formula (1a). Indeed, if the initial state of current accounts is M_0 and the banks bought bills for the amount B, then

$$(M_0 + B)V(\rho) = T_0$$

If the rate on deposit accounts remains unchanged, the process is more complicated. For a fall in the discount rate then induces some people to sell bills and acquire deposit accounts. The fall in the discount rate is therefore smaller than in the case previously considered: it will fall to the level at which the sum of the increases in current *and* deposit accounts is equal to the amount B of bills bought by the banks.

[19] T is the *money* volume of transactions and thus stands for PT in the Fisher equation.

The short-term rate and the long-term rate

1. It has been shown in the preceding section that the short-term rate of interest is determined by the volume of transactions and the supply of cash by the banking system. We shall now examine the problem of the determination of the long-term rate.

In order to establish a connection between the short-term and the long-term rate, we shall examine the problem of substitution between a representative short-term asset, say a bill of exchange, and a representative long-term asset, say a consol. Imagine a person or enterprise considering how to invest its reserves. It will be, I think, a frequent case that the security-holder compares the result of holding one or the other type of security over a few years. Thus in comparing the yields he takes into account the expected average discount rate over this period, which we denote by ρ_e and the present long-term rate (yield of consols) r. We must now consider the advantages and disadvantages of both types of security which account for the difference $r - \rho_e$.

There is first to be considered the possibility of a capital loss if at some time consols have to be converted into cash. It should be taken into account, however, that the holder need not actually sell bonds in order to obtain the cash required: he may take bank credits against their security up to a high percentage of their value.[20] There still remains the disadvantage, as compared with bills, that this percentage is less than 100%, and that the interest on such credits is slightly higher than the rate of discount. (When the holder converts bills into cash, his income is reduced by the interest which the bills yield; when he borrows against the security of bonds, by the interest he pays on bank credit.) On the other hand, the holding of bills which must be rebought every three months involves various inconveniences and costs, and this often causes money to be invested in the short term, not in bills, but in loans to the discount market.[21] If, therefore, we denote by β the value corresponding to the net disadvantages of bond holding from this point of view, it follows from the above that β is not

[20] I am indebted for this point to Mr P. W. S. Andrews.

[21] In other words, 'costs of investment' in bills (cf. p. 139) are relatively high.

necessarily positive and that it is normally small, say of the order of 0.5%.[22]

There is, however, yet another, more important, factor contributing to the difference $r - \rho_e$. The holding of bills guarantees the integrity of the principal. On the other hand, bonds may depreciate during the period for which the results of investment are considered. Short-period fluctuations of the value of securities owned may be disregarded[23] by the holder, but if the capital loss proves to have a permanent character it must be reckoned as such. Therefore a provision for the risk of depreciation γ must be taken into account when the yields r and ρ_e are compared. We thus have

$$r - \rho_e = \beta + \gamma \tag{2}$$

2. We may still say something more about the value of γ. If the present price of consols is p, and the holder has a certain more or less definite idea, based on past experience, about the minimum to which this price may fall, $p_{\min}$, it is plausible to assume that γ is proportional to $(p - p_{\min})/p$, i.e. to the maximum percentage by which the price of consols is considered apt to fall. We thus have

$$\gamma = g\frac{p - p_{\min}}{p} = g\left(1 - \frac{p_{\min}}{p}\right) \tag{3}$$

If the period for which the calculation is made is 1 year and the depreciation was considered certain, g would be equal to 100. But since the period is normally longer and the maximum depreciation not very probable, g may be expected to be rather small as compared with 100.

As the price of consols is in inverse proportion to their yield, expression (3) may be written

$$\gamma = g\left(1 - \frac{r}{r_{\max}}\right) \tag{3a}$$

[22] The margin between the rate on loans to the discount market and the discount rate is, say, 0.5–1%; that between discount rate and the rate on credits against the security of bonds, say 1–2%. It does not, however, follow that β is necessarily, or even normally, positive; because the latter margin, unlike the first, applies only to the periods during which the purchaser expects to be using his assets to obtain cash. β may therefore be regarded as tending to equal a fraction of the second margin minus the first.

[23] In so far as short-period fluctuations affect the amount of cash obtainable on the security of the bonds they will tend to raise the value of β.

where $r_{\max}$ is the yield corresponding to the 'minimum price' $p_{\min}$. By substituting this expression for γ in equation (2) we obtain, after simple transformations,

$$r = \frac{\rho_e}{1 + \dfrac{g}{r_{\max}}} + \frac{\beta + g}{1 + \dfrac{g}{r_{\max}}} \tag{4}$$

If the coefficients β, g, and $r_{\max}$ are stable, this equation expresses the long-term rate r as a linear function of the expected short-term rate ρ_e. It is easy to see that (g, β, and $r_{\max}$ being stable) r always changes by a smaller amount than ρ_e, since $1 + g/r_{\max} > 1$. This is the result of our assumption that as r increases the risk of the depreciation of consols declines (equation (3a)).

We thus have *two* factors explaining the stability of the long-term rate as compared with the short-term rate of interest. (i) The short-period changes of the short-term rate ρ are only partly reflected in the estimates of ρ_e. (ii) The long-term rate r changes by a smaller amount than the average short-term rate ρ_e expected over the next few years.

3. It is important to notice that the 'risk coefficient' (which is a marginal concept) may increase not only when the depreciation of bonds is considered more likely but also when the proportion of long-term assets held to short-term assets + cash rises. For then with the same probability of bond depreciation the latter, if it happens, means a greater loss relative to the value of all liquid assets. This 'increasing risk' is accounted for by a higher g. Thus if, *ceteris paribus*, the amount of long-term assets relative to all liquid assets held by the public rises, g tends to increase. Moreover, if income tax—which we have so far ignored—is in existence, g is not a pure risk coefficient, but depends on the rates of income tax as well. Indeed, the difference between the long-term rate and the short-term rate is subject to tax, but the depreciation in bonds is not allowed for in tax assessment.[24] Thus, if g were the pure risk coefficient, $\gamma = g(1 - r/r_{\max})$ would cover only the difference $r - \rho_e$ after taxation. To cover the *actual* difference $r - \rho_e$, the coefficient g must be correspondingly higher.[25] If, for instance, the tax is

[24] This is true of the UK; in the USA, however, a part of the loss from sales of bonds *is* allowed for in income tax assessment, and therefore our subsequent argument does not apply strictly to that country.

[25] This problem does not arise with regard to β, because this represents a loss in income which is allowed for in taxation.

5s. in the £ and there is no surtax, $g = 4/3$ of the pure risk coefficient. If surtax exists, it is not possible to establish such a simple relation, because the tax incidence is then not even.

Application to the yields of consols, 1849–1938

1. We shall now apply the results arrived at in the last section to the analysis of yields of consols in the period 1849–1938. Their time-curve is given in Fig. 14. It may be seen that it is possible to subdivide this period into 10 very unequal intervals, in each of which the long-term rate undergoes relatively small fluctuations round the average as compared with the changes between the intervals: 1849–80; 1881–7, 1888–93, 1894–1900, 1901–9, 1910–14, 1915–18, 1919–21, 1922–31, 1932–8. This may be accounted for by a hypothesis that within each of these intervals the expected short-term rate ρ_e and the coefficients g, $r_{\max}$, and β fluctuated only slightly around certain values while they underwent long-run changes from interval to interval. Let us turn our attention to such changes of the expected average discount rate ρ_e. Within each of our intervals the discount rate ρ in fact underwent strong fluctuations which did not, however, cause important fluctuations of ρ_e. This may be accounted for by the following hypothesis:

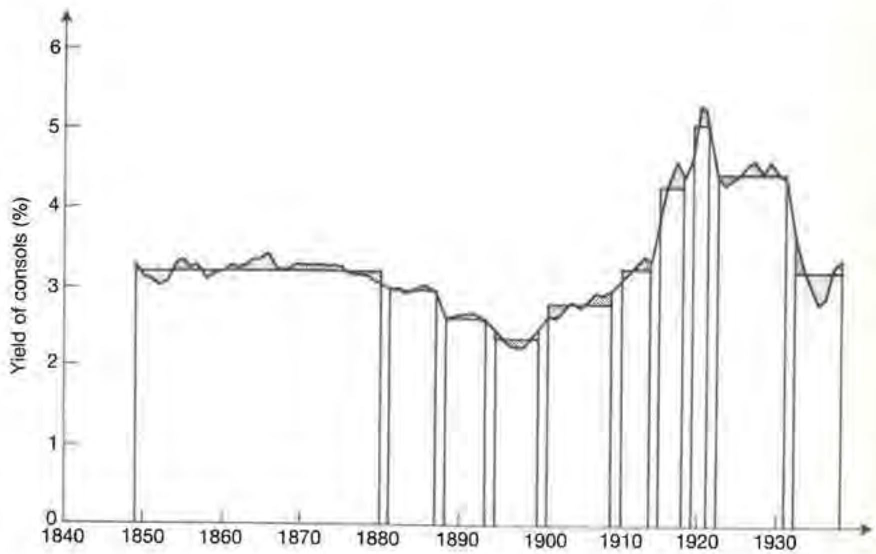

FIG. 14. *Yield of Consols, UK, 1849–1938*

the investors disregarded to a great extent in their estimates of ρ_e the 'high' and 'low' levels of the discount rate within the intervals, classifying them as temporary, and based their expectations chiefly on the last 'medium' position; and the spread of these 'medium values' was rather small within each period. If this hypothesis is correct, it follows that the average ρ_e in each period does not differ much from the average of the actual rate of discount ρ in that period. This is very important for our enquiry. For on this assumption we may take the average discount rate in each period to be the first approximation of the average ρ_e. Thus we may correlate the average yields of consols and average discount rates in our periods, and analyse the regression equations by means of our formula (4).

2. The data are given in Table 28. We now plot these figures on a scatter diagram (Fig. 15). It will be seen that most of the points lie very close to two straight lines AB and A_1B_1. The points corresponding to the intervals before the First World War lie close to AB except those corresponding to 1881–7 and 1910–14. The points corresponding to the post-war periods lie close to the line A_1B_1, which is considerably above AB. Finally, the war period 1915–18 is represented by a point lying between AB and A_1B_1. It must be noticed at once that the position of the point 1881–7 above AB is fully accounted for by the fact that the yield of consols in this period did not reflect the level of the 'pure long-term rate', being 'too high' because of the expected conversion.[26]

Table 28. *Yield of Consols and Discount Rate*

Interval	Average yield of consols (%)	Average discount rate (%)
1849–80	3.21	3.66
1881–7	2.98	2.82
1888–93	2.63	2.68
1894–1900	2.38	2.18
1901–9	2.82	3.09
1910–14	3.27	3.4
1915–18	4.30	4.3
1919–21	5.07	5.09
1922–31	4.48	3.76
1932–8	3.25	0.82

[26] See R. G. Hawtrey, *A Century of Bank Rate* [London, Longmans, 1938].

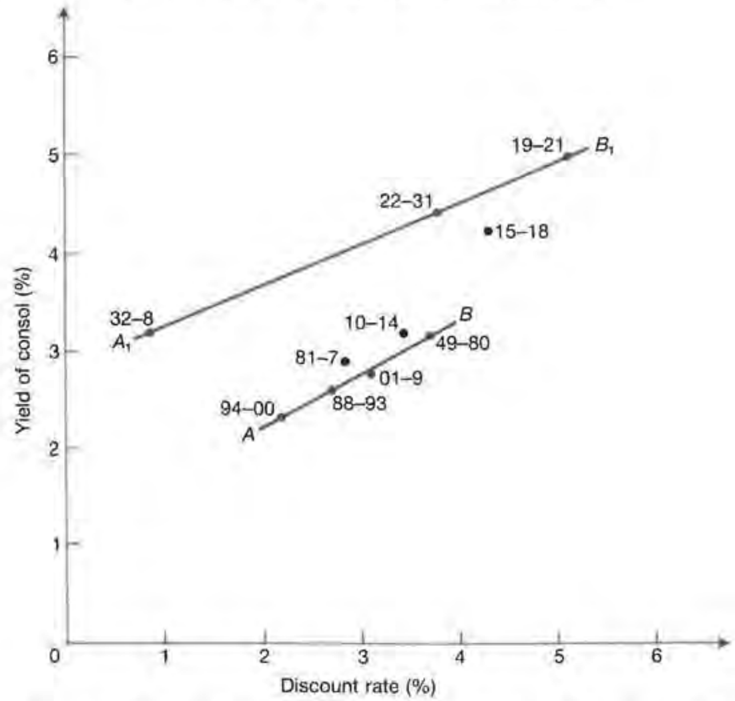

FIG. 15. *Discount Rate and Yield of Consols, UK, 1849–1938*

The results obtained may be plausibly interpreted in terms of our formula (4). In the period 1849–1909 the coefficients g, r_{max}, and β were more or less stable, and therefore we have a linear functional relation between r and ρ_e represented by AB. After this period these coefficients underwent a strong change, chiefly during the last war, and then became stable again in the post-war period, so that the points ρ_e, r are in this period again situated on the straight line A_1B_1. The points 1910–14 and 1915–18 lying between AB and A_1B_1 represent the period during which the shift from AB to A_1B_1 occurred.

3. From the equations of the lines AB and A_1B_1 the coefficients g and β may now be obtained for the pre-war and post-war periods respectively.

The equation of AB (pre-war period) is

$$r = 0.550\,\rho_e + 1.17$$

If we compare it with our formula (3),

$$r = \frac{\rho_e}{1 + \dfrac{g}{r_{max}}} + \frac{\beta + g}{1 + \dfrac{g}{r_{max}}},$$

we obtain 2 equations

$$\frac{1}{1 + \dfrac{g}{r_{max}}} = 0.550 \quad \text{and} \quad \frac{\beta + g}{1 + \dfrac{g}{r_{max}}} = 1.17$$

Now as to the expected maximum long-term rate we may assume that it is approximately 3.4, for this was the maximum rate in the period in question and the level of r at the beginning of it was not much lower. It is then possible to obtain from the last equations the coefficients g and β. We have $g = 2.78$, $\beta = -0.65$.

The equation for the post-war period is

$$r = 0.425\,\rho_e + 2.90$$

and consequently

$$\frac{1}{1 + \dfrac{g}{r_{max}}} = 0.425 \quad \text{and} \quad \frac{\beta + g}{1 + \dfrac{g}{r_{max}}} = 2.90$$

Here r_{max} may be assumed equal to 5.1, this being the level reached at the beginning of the period and never exceeded afterwards. Thus we obtain $g = 6.9$, $\beta = -0.07$.[27]

We may now put together the results of our calculation:

Period	g	r_{max}	β
1849–1909	2.78	3.40	−0.65
1919–38	6.90	5.10	−0.07

From the point of view of the confirmation of our theory, the most important result is that β (the balance of disadvantages and advantages of bonds as compared with bills, apart from the risk of depreciation) is small, as we expected it to be for theoretical reasons. If the

[27] It is perhaps more correct to assume that in the interval 1932–8 r_{max} was lower than 5.1, say 4.5. We then obtain for this interval $g = 6.03$, $\beta = 0.73$. The positive value for β in this interval is quite plausible in view of the unusually low margin between the discount rate and the rate on loans to the discount market (see pp. 143–4).

coefficient of ρ_e in the post-war period had been not 0.425 but, say, 0.25, we should, *ceteris paribus*, have obtained for β the value -3.7, which would be obviously absurd and so disprove our theory.

The coefficient g is—again in accordance with a priori argument—small as compared with 100, both in the pre-war and the post-war periods. (The 'pure' risk coefficient is even smaller because g is inflated by income tax: see p. 145.) The tremendous rise in g (about 2.5 times) between these 2 periods is explained by the much stronger fluctuations in r after 1914, and by the rise in income tax and surtax. The strong rise in g, in combination with the increase in r_{max}, accounts for the shift of the line AB to the position A_1B_1.

4. It is interesting to notice that during this war the movement of the long-term rate conforms to the 1919–38 formula. The average discount rate ρ was 1.04% in 1940 and 1.03% in 1941. This was probably also the level expected for the next few years. Substituting these values into the 1919–38 formula,

$$r = 0.425\,\rho_e + 2.90$$

we obtain about 3.34% for both years. The actual average yields of consols were: 3.40% in 1940 and 3.13% in 1941. The agreement between the calculated and the actual values is thus very close. This is the more surprising in that the increase in income tax tended to increase g.

It must be noted here that g depends *inter alia* on the ratio of long-term assets held to short-term assets + cash (see p. 145), and thus government borrowing policy determines within certain limits the long-term rate of interest. If the government borrows a part of the amounts required on long term at a certain fixed rate and the rest on short term—as was in fact the case during this war—the long-term rate is actually fixed by the government. This is, however, only the case if this rate is chosen so that the government is able to sell *some* amount of its long-term issues. If the government's long-term rate of borrowing is so low that nobody is prepared to lend at this rate, the government must finance all the budget deficit by floating debt. It then loses the control of the long-term rate, unless it is prepared to borrow short over and above the deficit requirements and buy long-term securities from the public.

3. A Theory of Profits[4]

Determinants of profits

1. In this essay we attempt to investigate the determinants of profits in short and long periods. The short-period analysis will consist in relating the profits in a given short period to certain factors operating in the preceding periods. From this we shall pass to the examination of the level of the rate of profit in long periods, in particular, in relation to the rate of interest.

We leave aside the influence on profits of the balance of foreign trade and the budget deficit (or surplus). We therefore assume a closed system and a balanced state budget. It is, consequently, quite clear that our conclusions are by no means applicable to a war economy. Our aim is, on the contrary, to examine the problem of profits in a closed *laissez-faire* system. As well as leaving aside the budget deficit, we also assume that no interest on the national debt is paid.

By gross profits we shall mean depreciation and maintenance,[5] net undistributed profits, dividends, interest, rent and also managerial salaries, all *after payment of direct taxes.*[28] The receivers of this type of income we call capitalists. The rest of incomes (also taken net of direct taxes) are wages, small salaries (for the sake of brevity we shall use below 'salaries' for small salaries),[6] and doles. The saving out of these incomes is assumed to be small as compared with total saving, and is neglected for the sake of simplicity—i.e. equated to zero.

2. We shall now establish the fundamental equation between profits on the one hand and capitalist consumption and private investment on the other. We must, however, first define certain concepts. By gross investment we shall mean the value of all sales of newly produced fixed capital equipment + increase in working capital and stocks; and by gross national income the sum of total personal consumption and gross investment. We shall distinguish private and government investment (armaments, government buildings, etc.). The gross national income so defined is, as may easily be seen, also equal to profits gross of depreciation and net of direct taxes + wages, salaries, and doles (also net of taxes) + government investment. For the proceeds of

[28] However, taxes accruing but not yet paid, i.e. increase in tax reserves, *are* included in profits.

sales of consumer and investment goods[29] will be received by capitalists and workers employed by them, or passed by means of indirect and direct taxes to the government, which will in turn spend the revenue either on wages and salaries of government employees and doles or on government investment. We thus have the following balance sheet of national income and expenditure:

Gross profits (gross of depreciation but net of direct taxes).	Total gross investment
	Capitalist consumption
Wages, salaries and doles (net of direct taxes)	Workers' consumption
Gross government investment	
Gross national income	*Gross national income.*

Now, since wages, salaries, and doles are, as assumed above, fully spent on consumption, and total gross investment – gross government investment = gross private investment, it follows directly that

$$\text{Gross profits} = \text{Gross private investment} + \text{Capitalist consumption} \tag{1}$$

What is the proper meaning of this equation? Does it mean that profits in a certain period determine capitalist consumption and investment, or the other way round? The answer to this question depends on which of these items is directly subject to the decisions of capitalists. Now, it is clear that they may decide to consume and to invest more in a certain short period than in the preceding period, but they cannot decide to earn more. It is therefore their investment and consumption decisions which determine profits, and not vice versa.

If the period which we consider is short, we may say that capitalist investment and consumption are determined by decisions formed in the *past*. For the execution of investment orders takes a certain time, and as to capitalist consumption, it is only with a certain delay that the capitalists' standard of living reacts to the change of factors which influence it.

If capitalists decided always to consume and to invest in a given period what they have earned in the preceding period, the profits in the given period would be equal to those in the preceding one. In such case they would remain stationary, and the problem of how to read the

[29] The latter includes the increase in working capital and stocks. When this type of investment does not actually involve a sale, it may be considered as a firm's sale to itself.

above equation would lose its importance. But such is *not* the case. Although profits in the preceding periods are one of the important determinants of capitalist consumption and investment, capitalists in general do *not* decide to consume and invest in a given month what they have earned in the preceding one. This explains why profits are *not* stationary, but fluctuate in time.

3. The above argument requires a certain qualification. The past investment decisions may not fully determine the volume of investment in a given period, owing to unexpected accumulation or running down of stocks. The importance of this factor seems, however, to have been frequently exaggerated.

A second qualification arises out of the fact that these decisions will usually be in real terms, and in the meantime prices may change. For instance, a piece of ordered capital equipment may cost more than at the time when the order was given. To get over this difficulty, it will be convenient to deflate both sides of the equation by appropriate price indices. We thus obtain an equation between real gross profits and real capitalist consumption + real gross private investment.

We may now conclude that the real gross profits in a given short period are determined by decisions of capitalists as to their consumption and investment formed in the past, subject to the correction for unexpected changes in the volume of stocks.

There arises here the problem of what will be the place of the factors determining the distribution of the national income in this theory. Since profits in a given short period are determined by capitalists' decisions as to their consumption and investment formed in the past, the factors determining the distribution of income will affect, not real profits, but the real wage and salary bill—and consequently the national output. If, for instance, the degree of market imperfection or oligopoly increases,[7] and, as a result, so does the ratio of profits to wages, real profits do not change, but the real wage bill falls, first because of the fall in real wage rates and secondly because of the consequent reduction in demand for wage goods, and thus of output and employment in the wage good industries. (If salary rates do not rise relative to wage rates, the real salary bill falls as well.)[8] Percentage gross margins increase, but the national output falls just so much that, as a result, the real total profits remain the same. However great the margin of profit on a unit of output, the capitalists cannot make more in total profits than they consume and invest (including accumulation of unsold goods).[30]

4. The above analysis obviously cannot answer the question why the rate of profit taken as an average for longer periods is higher than the rate of interest. It only relates profits in a given short period to capitalist consumption and investment in this period determined by factors which operated in the preceding periods. To say something about the actual level of profits it is necessary to apply a different type of analysis.

Rate of profit in the long period

1. The long-run analysis is often conducted under the assumption of long-run equilibrium *sensu stricto* (i.e. in the sense that the system is at rest). This is entirely unjustified, because we *know* that, apart from cyclical fluctuations, the economic system is subject to a complex process of long-run development. We shall therefore approach the problem from a different angle: we shall simply consider connections between averages of variables in a period extending over a full business cycle, and chosen so that its beginning and end are positioned half-way between boom and slump.

We shall assume that the average change of any variable per year of our period is small as compared with the average of this variable over this period. That means that if the period considered consists of years 1, 2, 3, . . . n, and is preceded by a year 0, we assume for any variable X that $(X_n - X_0)/n$ is small as compared with $(X_1 + X_2 + X_3 + \dots + X_n)/n$. This condition is likely to be fulfilled in reality, since our period covers a full cycle, and economic development after elimination of the trade cycle is usually slow.

The assumption of the slowness of long-run economic development is of great significance for long-period analysis. Indeed, when short periods are considered, any relation between two variables involves time-lags. For instance, investment at a given moment is a function of factors which operated some time ago. Now, if these time-lags are short—say, not greater than a year—they may be disregarded

[30] The theory of profits presented here is closely allied to Lord Keynes's theory of saving and investment. It has been, however, developed independently of Lord Keynes in my 'Essai d'une théorie du mouvement cyclique des affaires', *Revue d'économie politique*, Mar.–Apr. 1935, and 'A Macrodynamic Theory of Business Cycles', *Econometrica*, July 1935. [See *Collected Works*, vol. i.]

in our long-period analysis. For, since $(X_n - X_0)/n$ is small as compared with $(X_1 + X_2 + \dots + X_n)/n$, the latter differs little from $(X_0 + X_1 + \dots + X_{n-1})/n$; thus, when the influence of X upon the situation in a given long period is examined, we shall make only a small error by taking into consideration the former instead of the latter.

2. In every year of our period, gross profit is equal to capitalist consumption + private gross investment. (For the sake of brevity we shall from now on use 'investment' to mean private investment.) Thus the average gross profit is equal to the average capitalist consumption + average gross investment. If we deduct from both sides of this equation the average depreciation and maintenance, we find that the average net profit $\bar{P}$ is equal to the average capitalist consumption $\bar{C}$ + the average net investment $\bar{I}$,

$$\bar{P} = \bar{C} + \bar{I} \tag{2}$$

where $\bar{C}$ and $\bar{I}$ are understood here to be expressed in real terms—namely, calculated at prices prevailing at the beginning of the period considered, and also $\bar{P}$ is the average 'real' profit.

We may make the following assumption, plausible as a first approximation, about the 'real' capitalist consumption C_t in a given year: that it consists of a stable part A and a part proportional to the real profit $P_{t-\psi}$ of some time ago:[31]

$$C_t = A + \lambda P_{t-\psi} \tag{3}$$

ψ indicates thus the delay of the reaction of capitalist consumption to the change in current income; it is probably of the order of a year or less. λ is positive and < 1.[32] Finally, A is the result of habits acquired by capitalists as a result of past long-run development. It changes, therefore, slowly in time, and in the period considered, but the time-lags involved are very long, and therefore we shall assume A in the period considered (which, covering a full cycle, is about 10 years) to be determined by factors which operated prior to it. We take now the average of both sides of our equation (3) over our period. Since the time-lag ψ is relatively short, it may be neglected, the argument of

[31] We ignore the influence of the rate of interest upon capitalist consumption, as it is not very important.

[32] A tentative estimate of λ for the USA during 1925–35 suggests that it was < 0.33. (Undistributed profits were, of course, included in capitalist incomes.)

the preceding section. We thus obtain

$$\bar{C} = \bar{A} + \lambda\bar{P} \tag{4}$$

and from this equation and equation (2) it follows

$$\bar{P} = \frac{\bar{A} + \bar{I}}{1 - \lambda} \tag{5}$$

where $\bar{A}$ depends on the development preceding the period considered.[33]

3. In order to obtain a formula for the average *rate* of profit in our period, we shall now consider the average volume of total capital in this period. Let K_0 be the value of total capital equipment at current prices of investment goods at the beginning of this period. Since $\bar{I}$ is the average net 'real' investment in our period at prices prevailing at the beginning of our period, the 'real' capital at the end of the period is $K_0 + n\bar{I}$, where n is the length of the period.

Now, the deviations of the annual rate of investment from the average annual rate of investment $\bar{I}$ throughout the period may be assumed small (say, of the order of 2 or 3%) as compared with the initial volume of capital equipment K_0. It may be shown that if this is the case then with $n = 10$ years, say, the average volume of capital $\bar{K}$ will differ little from the average of its volume at the beginning and at the end of the period. We have thus as a good approximation

$$\bar{K} = K_0 + \frac{n}{2}\bar{I} \tag{6}$$

4. We shall now obtain a formula for the average rate of profit in our period which we may determine as the ratio of average *money* profit to average *money* value of capital at current prices. Thus, before dividing $\bar{P}$ by $\bar{K}$, which are 'real' values calculated at prices at the beginning of the period, they should be multiplied by appropriate price indices. It

[33] It must be noted that equation (3), and consequently equations (4) and (5), cease to be plausible in the case where taxation is heavy, and its system is such that the tax on profits increases much quicker than profits (for instance, excess profits tax). For although profits $P_{t-\psi}$ are net of taxes paid, they include taxes accruing but not yet paid—i.e. the increase in tax reserves; and if this part of profits is considerable it may affect capitalists' consumption decisions. Now, as long as the tax is on a proportional basis, it may be shown that our formula still holds good approximately, although λ and ψ will have then a more complex meaning. However, if taxation is strongly disproportionate, the formula becomes invalid.

is, however, easy to see that this correction will be important only if the average of the price index of consumer goods related to the beginning of the period as basis differs considerably from that of investment goods. Since, however, the beginning of the period has been chosen in such a way it represents a half-way position between boom and slump, this is unlikely to be the case, and therefore $\bar{P}/\bar{K}$ may be taken as a first approximation to the average rate of profit π in our period. We thus obtain

$$\pi = \frac{1}{1 - \lambda} \frac{\bar{A} + \bar{I}}{K_0 + \frac{n}{2}\bar{I}} \tag{7}$$

If we denote $\bar{A}/K_0$ by α, and $\bar{I}/K_0$ by i, we have after simple transformations

$$\pi = \frac{2}{n(1 - \lambda)} \frac{\alpha + i}{\frac{2}{n} + i} \tag{7a}$$

Since both $\bar{A}$ (the average of the stable part of capitalist consumption) and K_0 (the value of capital at the beginning of the period) are fully determined by development prior to this period, $\alpha = \bar{A}/K_0$ may be considered given. Thus the average rate of profit π is represented as a function of i—i.e. of the ratio of average investment $\bar{I}$ to the initial value of capital K_0.[34]

As will be seen in the last essay, $\bar{I}$ depends on a variety of factors. We shall try to arrive here at certain results from the discussion of formula (7a) without going into the problems of the determination of i.

Rate of profit and rate of interest in the long period

The problem which concerns us here is what causes the rate of profit to be higher than the rate of interest in the long period, and whether this must be the case under all circumstances.[35]

[34] It may seem from equation (7) that π falls when the length of the full cycle n increases. But it must not be forgotten that, since A, the stable part of capitalist consumption, changes within this period, its average $\bar{A}$ depends on its length. Therefore π may not be affected by the change in n.

[35] As profits are understood throughout the argument to be after taxation, the rate of interest, when compared with the rate of profit as given by formula (7a), must also be taken after deduction of income tax.

1. It may be seen directly from formula (7a) that, if $\alpha \geqslant 2/n$, the average rate of profit $\pi \geqslant 2/n(1-\lambda)$. Since n is about 10 years, it follows at once that the rate of profit is greater than 20%.

In this case, the fact that the rate of profit is higher than the rate of interest would be very simply explained. The rate of profit, whatever the rate of investment, is above a certain level. The rate of interest determined by the volume of transactions and supply of cash by banks[36] is below this limit. The latter is subject to the qualification that no 'over-full employment' is then involved; for in such a state the increasing volume of transactions and thus the increasing demand for cash may drive the rate of interest to a very high level. It is unlikely, however, that it will reach the level of the rate of profit, because this would imply a very low rate of investment and thus most probably a low level of employment.

We shall now consider the case of $\alpha < 2/n$, which is of much greater practical importance.

2. In this case, the average rate of profit $\pi < 2/n(1-\lambda)$. It is also easy to see from formula (7a) that π is an increasing function of i. For if i increases by a certain amount, the numerator of the fraction $(\alpha + i)/[(2/n) + i]$ increases if $\alpha < 2/n$ in a higher proportion than the denominator.

It follows directly that to obtain the lower limit of the rate of profit we must substitute into formula (7a) the lowest level to which i may fall. Now, i is the ratio of the average net investment in our period to the value of capital at its beginning. If investment activity is at a complete standstill, $i = -d$, where d is depreciation and maintenance as a percentage of capital. But because some repairs are always carried out, $i_{\min} > -d$.[37] We thus obtain the lowest limit for the rate of profit,

$$\pi \geqslant \pi_{\min} = \frac{2}{n(1-\lambda)} \frac{\alpha + i_{\min}}{\dfrac{2}{n} + i_{\min}} \tag{8}$$

[36] These factors determine directly the *short-term* rate of interest (see p. 143). The *long-term* rate of interest is determined by the expected short-term rate and by certain risk factors and income tax (see pp. 144 and 145). It should be remembered that it is the interest *net* of tax which is relevant for our argument.

[37] As capital consists not only of fixed capital but of working capital and stocks as well, $i_{\min}$ may be lower than $-d$ if inventories are being run down at more than d% p.a.

Let us assume now that the short-term rate of interest, and in consequence also the long-term rate of interest, is kept by banking policy at a certain definite level, r. The condition for the rate of profit being always higher than the rate of interest is then

$$\frac{2}{n(1-\lambda)} \frac{\alpha + i_{\min}}{\dfrac{2}{n} + i_{\min}} > r \tag{9}$$

From this inequality may be obtained the level above which α must be in order that the rate of profit shall always be higher than the rate of interest. If, for instance, $\lambda = 0.3$, $n = 10$, $i_{\min} = -0.04$ and $r = 0.04$, we obtain from (9) $\alpha > 5\%$. Thus if α is higher than 5%, the average rate of profit is always higher than the long-term rate of interest, which is kept at the level of 4%.[9]

3. It follows from the argument in the last two paragraphs that, if α is above the 'critical level', the rate of profit is *always* higher than the rate of interest.

On the other hand, if α is at the critical level (which makes the expression on the left-hand side equal to the rate of interest), the rate of profit may fall to the level of the rate of interest if $i = i_{\min}$. There arise here two problems. (i) Is it possible that investment activity may remain in our long period at the minimum level so that i is actually equal to $i_{\min}$? (ii) If this happened in one of our periods, and thus the average rate of profit was equal to the rate of interest in that period, can this position persist in the next long period?

Let us consider the first question. If investment activity is maintained throughout the period at its minimum level, the average rate of profit is equal to the rate of interest. Investment I being stable (at the minimum level throughout the period), the rate of profit undergoes only small changes within the period because both the stable part of capitalist consumption and the volume of fixed capital K change slowly. Therefore the rate of profit does not differ much throughout the period from the average, and thus is close to the rate of interest. But if the rate of profit is close to the rate of interest throughout the period, investment activity is likely to be maintained at the minimum level because no margin to cover rent on land, management costs, and risk is provided. Thus $i = i_{\min}$ *is* a possible state of affairs.[38]

[38] In this case there are actually no cyclical fluctuations; see p. 176 below.

Let us now consider the second problem. Imagine that α is at the critical level and in one of our long periods $i = i_{min}$; the average rate of profit in that period is consequently equal to the rate of interest. Do developments in this period prepare the ground for a higher rate of profit in the next full-cycle period? Certainly i, which $= i_{min}$ in the period considered, is negative, therefore the capital K_0 at the beginning of the next period will be smaller. And this will tend to increase α of the next period, which is the ratio of the average of the stable part of capitalist consumption $\bar{A}$ to the capital K_0 at the beginning of the period. However, dis-saving, which takes place in the period considered, will certainly tend to depress the stable part of capitalist consumption in the next period: the less wealthy the capitalists feel, the less they are apt to consume, irrespective of their current income. Also, the persistence of a very low capitalist income in the period considered will tend to press down the capitalists' customary standard of living, and this will be reflected in the fall in the stable part of their consumption A in the next period.

Thus not only will K_0 at the beginning of the next period be smaller, but so also is $\bar{A}$ likely to be in that period. It is thus not at all certain that $\alpha = \bar{A}/K_0$ will increase. And if it remains at the same level as in the period considered, nothing has happened to push upwards the rate of profit, which may thus continue to be equal to the rate of interest.

If α falls *below* the critical level, the rate of profit will be below the rate of interest when investment activity is at the minimum level. It may be demonstrated in the same way as above that this state of affairs is possible and may persist over a number of long periods.

4. So far we have assumed that the rate of interest is given. If, however, investment activity falls—as was assumed in the last section—to its minimum level, total output and employment must shrink considerably; the demand for cash for transactions is greatly reduced, and, as a result, the short-term rate of interest tends to fall, and is followed by the long-term rate. However, the short-term rate cannot fall below zero, and the long-term rate, because of the risk involved in the fluctuations of the price of bonds, cannot fall below a positive value r_{min}. Thus, if α is sufficiently low, the fall of the rate of interest cannot prevent the possibility of the rate of profit reaching the level of the rate of interest. Indeed, there is always such a value of α at which the lower limit of the rate of profit π_{min} is equal to the lower limit of the rate of interest r_{min}.

5. In the light of the above argument, the relation between the rate of profit and the rate of interest in long periods depends to a great extent on the value of α (the ratio of the average of the stable part of capitalist consumption over the period $\bar{A}$ to the volume of capital K_0 at the beginning of the period). If α is above the critical level (which depends on the rate of interest), the rate of profit is *always* higher than the rate of interest. If α is at the critical level (or below it), and investment activity is at its minimum level, the rate of profit is equal to the rate of interest (or falls short of it). Such a state of 'long-period deadlock' is by no means impossible, and may even last for a number of long periods.

Part II

Business Cycle and Trend[10]

4. The 'Pure' Business Cycle

The theory of the business cycle presented below is in many respects similar to that given in my *Essays in the Theory of Economic Fluctuations* and my earlier writings. The justification for this new version is that (i) I now tackle the problem from a new angle and introduce new factors into the explanation of the business cycle; (ii) with this new treatment it is possible to drop some of my simplifying assumptions and to achieve some new results; (iii) I do not now consider only the problem of the 'pure' business cycle, but deal in the last essay with the trend superimposed on the cycle.

Investment and profits

1. We make the same assumptions as in the preceding essay, i.e. we consider a closed economic system with a balanced state budget and leave aside working class savings. We thus have the equation

$$P = C + I \tag{1}$$

where P are net real profits, C real capitalist consumption, and I real net investment. If we denote by R the real depreciation and maintenance (i.e. replacement required to maintain capital intact, which we shall call 'required replacement'), $I + R$ is the real gross investment. As in the preceding essay, we assume the following interrelation between capitalist consumption C and profits P (see p. 155):

$$C_t = A_t + \lambda P_{t-\psi} \tag{2}$$

A_t, the stable part of capitalist consumption, is the result of habits acquired by capitalists in long-run development in the past. (A_t changes slowly in time but is not subject to cyclical fluctuations. We shall consequently assume it constant for the discussion of the 'pure'

business cycle, and shall reintroduce this factor only in the next essay where the trend problem will be considered.) λ, which is the capitalists' marginal propensity to consume, is positive and substantially less than 1. Finally, ψ indicates the delay of the reaction of capitalist consumption to the change in their current income.

2. From equations (1) and (2) it follows

$$P_t - \lambda P_{t-\psi} = A_t + I_t \tag{3}$$

Now it may be shown that if the change of P_t can be assumed approximately linear in a period of a length of the order of ψ, we may write

$$P_t - \lambda P_{t-\psi} = (1 - \lambda) P_{t+\kappa} \tag{4}$$

where κ is determined by the formula $\kappa = \lambda\psi/(1 - \lambda)$.[39]

It follows directly from equations (3) and (4)

$$P_{t+\kappa} = \frac{A_t + I_t}{1 - \lambda}$$

or, which amounts to the same,

$$P_t = \frac{A_{t-\kappa} + I_{t-\kappa}}{1 - \lambda} \tag{5}$$

This is nothing else than the 'multiplier equation' for profits which involves a time-lag κ. The 'multiplier' $= 1/(1 - \lambda)$.

Determinants of the rate of investment decisions

1. We shall now discuss the much more intricate problem of the determinants of the rate of investment decisions. Let us consider a short period dt. The investment plans undertaken before this period have been pushed up to a point where they cease to be profitable owing to the imperfection of the market for products on the one hand

[39] Equation (4) is equivalent to

$$P_t = \lambda P_{t-\psi} + (1 - \lambda) P_{t+\kappa}.$$

Under the above assumption, κ fulfils approximately the condition

$$\lambda(t - \psi) + (1 - \lambda)(t + \kappa) = t$$

from which follows $\kappa = \lambda\psi/(1 - \lambda)$. If ψ is shorter than a year and λ smaller than 1/3 (See n. 32 above), κ is shorter than half a year.

and to the imperfection of the capital market and 'increasing risk'[40] on the other. What happens, then, in the period dt to cause new investment plans to emerge?

A rise may of course occur in the prospective rate of profit (or a fall in the rate of interest) owing to the change in the economic situation in dt, and this would cause an expansion of the investment plans at the end of this period as compared with its beginning. We shall consider this reason for new investment later on in some detail. But provided that such a change has not occurred, will new investment decisions—taking the objective form of investment orders—not be forthcoming at all in the period dt? What is the factor which may cause new investment decisions in the absence of a change of the prospective rate of profit (or the rate of interest)? This factor is the inflow of new gross savings (i.e. of net saving + depreciation and maintenance) which will push forward the barriers set to investment plans by the limited accessibility of the capital market and 'increasing risk'.

2. Before we proceed to a detailed consideration of this influence, it should be remembered that real gross savings in any period of time are equal to the real gross investment, i.e. required replacement R + real net investment I. Thus in the period dt real gross savings $= (R + I)dt$. (The rate of real gross investment $R + I$ in the period dt must not, of course, be confused with the rate of investment *decisions* in that period; the actual investment in dt is the result of *past* investment decisions.)

A part of the new savings $(R + I)dt$ accrues to 'entrepreneurs', i.e. directly to enterprises (undistributed profits) or to people ready to absorb the new issues of shares of enterprises. The remainder accumulates in the hands of 'pure rentiers' holding their savings exclusively in deposits or bonds.[41] If we denote the real rentiers' savings by s, the gross real savings of the entrepreneurs are $R + (I - s)$. Let us first consider a special case when $I - s = 0$. The gross saving of entrepreneurs in the period dt is then equal to the required replacement Rdt, and if they reinvest this amount in fixed capital they do not come up against the barriers of the limited accessibility of the capital market

[40] See my *Essays in the Theory of Economic Fluctuations*, 'The Principle of Increasing Risk' [*Collected Works*, vol. i]. According to this principle, the larger the investment in fixed equipment undertaken by an entrepreneur with given own capital, the greater its marginal risk. See also J. Steindl, 'On Risk', *Oxford Economic Papers* No. 5 [1941].

[41] In fact there does not exist such a sharp line of division: what we consider here is rather a simplified model, a first approximation to the real world.

or 'increasing risk' because they do not increase their commitments. Thus the rate of investment decisions is here R. We shall now consider the general case where $I - s$ is not equal to zero.

Prima facie it looks as if what was said about reinvestment of R remains true of $R + (I - s)$. For the entrepreneurs as a body when deciding to invest anew, $[R + (I - s)]dt$ will not increase their indebtedness at the end of the period as compared with the level at its beginning. Two factors must, however, be taken into consideration. First, what is relevant is not absolute but relative commitments. If the ratio of the fixed entrepreneurs' capital to their own capital is δ, they can invest $[R + \delta(I - s)]dt$ (where $\delta > 1$) without increasing their *degree* of commitment. Secondly, a decision to invest not only Rdt but also $\delta(I - s)dt$ means (when $I - s$ is positive) a decision to expand equipment. Now if the objective factors determining the profitability of investment are unchanged and the investment is in the line of the entrepreneur's production, this means, because of market imperfection for his products, a smaller prospective rate of profit although the economic situation has not changed. And shifting to new fields means a higher risk. Thus new investment decisions may be represented by the formula $[R + \eta\delta(I - s)]dt$ where $\eta < 1$ and $\delta > 1$. The same formula will hold good for the case when $I - s$ is negative.

Since $\eta < 1$ and $\delta > 1$, it is uncertain whether $\eta\delta$ is higher or lower than 1. We shall make a plausible assumption that the degree of indebtedness of entrepreneurs towards rentiers is not very high and thus that δ only moderately exceeds 1, and, on the other hand, that the limitation in reinvestment imposed on entrepreneurs' savings by market imperfection and the high risk of investment in alien fields make for a rather low η. In these conditions $\eta\delta$ is likely to be lower than 1, and this will be assumed throughout the argument. We shall denote $\eta\delta$ by $1 - c$ where c is positive and < 1.

3. We have assumed so far that in the period dt there was no change in the economic situation which would influence the prospective rate of profit (or the rate of interest). We shall now consider this problem. The two most important determinants of the prospective rate of profit may be considered to be the real profits P and the volume of capital equipment. The larger P and the smaller the existing capital equipment, the larger in general will be the prospective rates of profit on new investment.[42] The influence of the prices of new investment goods upon the prospective rates of profit is roughly accounted for by taking

[42] See my *Essays* [*Collected Works*, vol. i, pp. 308–13].

into consideration the *real* profits P. This allowance for changes in the prices of investment goods may prove insufficient for two reasons: (i) the prices of investment goods may not change in the same proportion as the prices which are used to deflate profits; (ii) more important, the entrepreneur takes into account in his investment decisions not only the current situation but also the uncertain future; the present money profits cannot be expected to last over all the life of the investment, but only in the near future; but the price he pays for investment goods is a determinant of the prospective rate of profit which is fixed once and for all. Therefore the rise in prices of investment goods usually accompanying the rise in real profits will weaken the effect of the latter upon investment decisions.

If the real profits P increase in the period dt by dP, we can say, according to the above, that this will push the investment plans by adP. a is here by no means a constant, but a positive coefficient susceptible to various types of changes and reflecting, *inter alia*, the influence of changes in the prices of investment goods as discussed above.

Further, the rise in fixed capital equipment in the period dt is equal to Jdt where J is the rate of excess of deliveries of fixed capital equipment over the required replacement R; and the negative influence upon the volume of new investment decisions in dt may be represented by $-bJdt$ where b is again a positive, but not necessarily a constant, coefficient. Thus, in so far as we would take into account only the factors enumerated above, we could write for the volume of new investment decisions in the period dt: $[R+(1-c)(I-s)]dt + adP - bJdt$.[43]

4. We have not yet taken into account the influence of the rate of interest which must be deducted from the prospective rate of profit in order to obtain the net profitability. The rise in the rate of interest in the period dt will thus clearly reduce the volume of investment decisions in that period. This influence can be accounted for in the same way as prices of investment goods in the coefficient a, but because of the stability of the long-term rate of interest[44] as compared with the rate of profit it seems to be not very important.

[43] This formula has a close affinity with that arrived at in my 'Principle of Increasing Risk', *Economica*, Nov. 1937, p. 447. [See *Collected Works*, vol. i.]

[44] See pp. 144–5.

We may thus consider as an approximate formula for new investment decisions $Rdt + (1-c)(I-s)dt + adP - bJdt$. And the *rate* of investment decisions (both for replacement and extension), which we shall denote by D, may be obtained by dividing this expression by dt. We must yet, however, take into account that the phenomena inducing investment decisions do so with a certain time-lag which we may denote ω. We thus have

$$D_{t+\omega} = R_t + (1-c)(I_t - s_t) + a\frac{dP_t}{dt} - bJ_t$$

or

$$D_{t+\omega} - R_t = a\frac{dP_t}{dt} - bJ_t + (1-c)(I_t - s_t) \qquad (6)$$

It must be stressed that all the above argument applies to investment decisions with regard to fixed capital, and thus D represents the rate of this type of decisions only. J is the net addition to fixed capital equipment, i.e. the difference between deliveries of finished fixed equipment over required replacement. I is the total net investment, and consequently differs from J in that it includes the increase in working capital (*inter alia*, in fixed capital under construction) and stocks.

The coefficients a, b, and $1-c$ are positive. In the extreme case when $b=0$ and $1-c=0$, equation (6) would amount to saying that the excess of the rate of investment decisions over the level of maintenance and depreciation is proportional (if a is constant) to the rate of change in profits. That would be nothing other than the so-called 'acceleration principle', in the narrow sense which has been definitely disproved by statistical enquiries.[45] The acceleration principle requires that the rate of investment decisions is highest when profits (or output) pass through their medium position in the cycle on the way upwards. The facts, however, show that most investment decisions are reached in a much more advanced stage of the boom. This state of affairs may be accounted for by formula (6) if the coefficients b and $(1-c)$ fulfil a certain condition. Indeed, if $1-c>b$ one can say that investment decisions are, roughly speaking, in a double positive correlation with the rate of change of profits and the

[45] See e.g. J. Tinbergen, 'Critical Remarks on Some Business-Cycle Theories', *Econometrica*, Apr. 1942.

level of investment. (Real rentiers' savings s_t are fairly stable in the course of the trade cycle.) Further, through the 'multiplier equation' (see p. 163) profits are—with a short time-lag—positively correlated with investment. Thus the rate of investment decisions is in a double positive correlation with the rate of change in profits and the level of profits,[11] and that means that it reaches its maximum somewhere between the medium position of recovery and the top of the boom.

5. It may easily be seen that involved in equation (6) is what one can call a 'trend component'. For it follows from it that long-run equilibrium of the system is impossible unless special assumptions are made about the rentiers' savings s. Indeed, in a long-run equilibrium profits P are constant, and net additions to fixed capital J and total net investment I are constant and $= 0$. The rate of gross-investment decisions D is constant and $=$ required replacement R. Thus equation (6) becomes in such a state

$$0 = -(1-c)s_t$$

Consequently, long-run equilibrium is possible only if the latter equation is fulfilled, which need not in general be the case because rentiers' savings s_t do not fall automatically to zero if net investment is at a zero level. If rentiers do some saving, the system will thus be subject to a negative trend. Thus, to obtain a model of the pure business cycle we assume for the present that in the business cycle period considered the rentiers do no saving, so that $s = 0$. We shall reintroduce this factor in the last essay where we consider the problem of trend. For the purpose of discussion of the pure business cycle, equation (6) is thus

$$D_{t+\omega} - R_t = a\frac{dP_t}{dt} - bJ_t + (1-c)I_t \tag{6a}$$

Fundamental equation for a simplified model

1. In addition to equation (6a), we have the following relations between the variables entering it.

There exists first a simple relation between the rate of investment decisions D and the deliveries of finished capital equipment. The rate of the latter follows the former, with a time-lag θ which is equal to the average period of construction.

Thus to the rate of gross investment decisions $D_{t+\omega}$ in the last equation there corresponds an equal rate of deliveries at time $t+\omega+\theta$. As the latter is the sum of required replacement and of the net investment in fixed capital at the time $t+\omega+\theta$, we have

$$D_{t+\omega} = R_{t+\omega+\theta} + J_{t+\omega+\theta}$$

Bearing in mind that required replacement varies slowly in time, and that the combined time-lag $\omega+\theta$ is rather small (something like a year), we may write as a good approximation

$$D_{t+\omega} - R_t = J_{t+\omega+\theta} \tag{7}$$

where J is net investment in finished fixed capital (i.e. the excess of deliveries of finished fixed capital over the required replacement), the time-lag ω is related to the delay with which investment decisions are taken under the influence of inducements, and θ is the average construction period. From equations (6a) and (7) we obtain

$$J_{t+\omega+\theta} = a\frac{dP_t}{dt} - bJ_t + (1-c)I_t \tag{8}$$

2. As mentioned above, I and J differ in that the latter represents the rate of net investment in finished fixed capital equipment only, while I is the total rate of investment and thus includes the increase in working capital and stocks as well. Now while working capital rises with output, stocks usually move in the opposite direction. As a first approximation we shall assume that these changes cancel each other, and thus

$$I = J \tag{9}$$

A second approximation, based on a more general assumption about the movement of working capital and stocks, will be given at the end of the essay.

Taking into account equation (9), we obtain from equation (8)

$$I_{t+\omega+\theta} = a\frac{dP_t}{dt} + (1-b-c)I_t \tag{10}$$

and after subtracting from both sides I_t,

$$I_{t+\omega+\theta} - I_t = a\frac{dP_t}{dt} - (b+c)I_t$$

If the change of I_t over a period $\omega+\theta$ may be assumed not far from linear, the difference $I_{t+\omega+\theta} - I_t$ may be represented as the derivative of the medium value $dI_{t+(\omega+\theta/2)}$ multiplied by the length of the period $\omega + \theta$. If we denote $\omega + \theta$ by 2ε, we thus have

$$I_{t+\omega+\theta} - I_t = 2\varepsilon \frac{dI_{t+\varepsilon}}{dt}$$

and equation (9) may be written

$$2\varepsilon \frac{dI_{t+\varepsilon}}{dt} = a\frac{dP_t}{dt} - (b + c)I_t \qquad (10a)$$

If we integrate this equation (assuming that a, b, and c are constants or functions of P_t and I_t respectively), we find that investment I is an increasing function of the real profits P and a decreasing one of the volume of capital equipment some time ago, which is the basis of the business cycle theory presented in my *Essays in the Theory of Economic Fluctuations.*

It should be noted, however, that the significance of the integral of the negative member $-(b + c)I_t$ is now different from that which it had in my theory in the *Essays*. The negative influence of the level of investment I upon the increase in investment in the subsequent period in equation (10a) expresses: (i) the adverse influence of the increase in capital equipment (coefficient b); (ii) the effect of entrepreneurs reinvesting only a part of their current savings, even though the objective determinants of the profitability of investment are unchanged (coefficient c). In my theory in the *Essays*, however, the latter factor was left out, and thus c was assumed to be zero.

The present theory includes as special cases the 'acceleration principle' theory ($b = 0$; $c = 1$; see p. 167) and my old theory ($c = 0$).

3. Equation (10a) expresses the change in investment as a function of the change in real profits and of the level of investment some time previously. But according to the 'multiplier' equation (5), profits are in turn a function of investment with a time-lag

$$P_t = \frac{A_{t-\kappa} + I_{t-\kappa}}{1 - \lambda} \qquad (5)$$

From this follows, if the stable part of capitalist consumption is assumed strictly constant for the 'pure' business cycle discussion,

$$\frac{dP_t}{dt} = \frac{1}{1 - \lambda}\frac{dI_{t-\kappa}}{dt} \qquad (5a)$$

By substituting this value of dP_t/dt into equation (10a) we obtain the fundamental equation

$$2\varepsilon\frac{dI_{t+\varepsilon}}{dt} = \frac{a}{1-\lambda}\frac{dI_{t-\kappa}}{dt} - (b + c)I_t$$

or

$$\frac{dI_{t+\varepsilon+\kappa}}{dt} = \frac{a}{2\varepsilon(1-\lambda)}\frac{dI_t}{dt} - \frac{b + c}{2\varepsilon}I_{t+\kappa} \qquad (11)$$

This equation tells us that, with a given a the change in investment today induces a proportional change after a time $\varepsilon + \kappa$ which, however, will be retarded by the positive level of investment I in the intermediate period ($t + \kappa$ lies between t and $t + \varepsilon + \kappa$); while if this item is negative its influence will be accelerating.

The retarding influence of I reflects (i) the adverse effect of the increase in capital equipment upon the rate of profit (coefficient b); (ii) the consequences of the fact that entrepreneurs reinvest only a part of their current savings even though the objective determinants of the profitability of investment are unchanged (coefficient c).

Mechanism of the business cycle

1. Let us now divide the time into periods equal to the time-lag $\varepsilon + \kappa$. The points 0, 1, 2 . . . in Fig. 16 show the rate of real net investment I in successive 'unit periods'. (The horizontal distance between two successive points is $\varepsilon + \kappa$.) The rate of change from one unit period to another is then given by the inclination of the segments

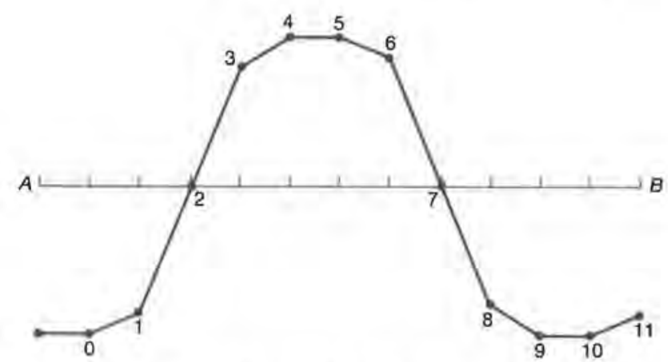

FIG. 16. *Hypothetical Time-Curve of Net Investment (A − B corresponds to zero net investment)*

0–1, 1–2, etc. It follows directly from equation (11) that the change in period 0–1 induces that in 1–2; the change in 1–2 induces in turn that in 2–3, etc., and that the coefficient of this influence is $a/[2\varepsilon(1-\lambda)]$. When discussing the process we must, of course, take into account (i) variations in the coefficient a which measures the strength of the influence of the change in real profits upon investment and is *not* constant; (ii) the retarding influence of the rate of net investment I when it is positive or its accelerating influence when it is negative. It follows from equation (11) that the time-lag between the influence of I and the corresponding change in the rate of investment is ε. If one remembers that periods 0–1, 1–2, etc., are of the length $\varepsilon + \kappa$, the relevant I for the change of investment in period 1–2 is somewhere between the middle of 0–1 and 1–2, for the change in investment in period 2–3 somewhere between the middle of 1–2 and 2–3, etc.

2. Let us start our discussion of the mechanism of the business cycle from point 1, being the end of period 0–1 in which a moderate recovery from the bottom of the slump has taken place. The positive change in investment in 0–1 induces a positive change in 1–2. The coefficient a may be assumed here very high. The entrepreneurs know that 'the recovery is on'. The change in profits is therefore an inducement to them, not only because the rate of profit as calculated on the basis of current profits has increased, but also because they anticipate a further considerable rise in profits in the near future. Further, the relevant net investment I is negative here, which contributes to the increase in the rate of change in 1–2 as compared with 0–1. As a result, the rise in investment in period 1–2 is considerably larger than in period 0–1.

In the subsequent period, a will fall sharply because the anticipations of entrepreneurs about a *further* rise in profits in the near future will be less optimistic: they have already a part of the boom behind them. This and the retarding influence of the positive I will finally reduce the rate of change. This need not, however, necessarily have happened already in period 2–3. If $a/[2\varepsilon(1-\lambda)]$ for period 1–2 was much higher than 1, then even after a has fallen considerably it may produce in 2–3 a greater or equal change in investment to that in 1–2. (In Fig. 16 it is assumed to be equal.) But after some time the rate of change in investment will slacken. (In Fig. 16 it is assumed to have happened in period 3–4.) This leads finally to the end of the rise in investment (period 4–5 in Fig. 16).

In the subsequent period, 5–6, the rate of investment must begin to fall. For the change in investment 4–5 was zero, which without the influence of I would mean a stationary level of investment in 5–6; but the net addition to fixed capital equipment and the incomplete reinvestment of entrepreneurs' savings[46] cause a *reduction* in investment in 5–6.

Now the 'slump is on' and a for the subsequent period, 6–7, is very high because the entrepreneurs discount the *further* fall in profits in the near future while I is still positive, which accelerates the slump. The gradual reduction in a as these anticipations lose in strength and the negative value of I slackens the rate of fall in investment and finally brings it to a standstill in the period 9–10.

Next the negative I extricates the system from the slump just as its positive value made for the turning-point in the boom. We have thus a moderate recovery in the subsequent 10–11, which starts the boom in the next period as described above.

3. This description of the mechanism of the business cycle has left out of consideration the changes in prices of investment goods. As mentioned above (pp. 165–6), these should be accounted for in the variations of the coefficient a. The greater the change in the prices of investment goods accompanying the change in real profits dP, the smaller is a. It follows that in the advanced stage of the boom, when raw materials and wages in investment goods industries rise rather sharply, a is likely to be reduced by this factor and so to contribute another reason for its fall from the high level it has at the beginning of the recovery.

The bottle-neck in the existing capacities in investment goods industries may also contribute to the rise of prices of investment goods and thus hamper the advance of investment. Here, however, an even more important factor may be the 'stretching' of orders, which will work as follows. The time-lag between investment orders and deliveries θ will increase and so, as a result, will the time-lag $\varepsilon = (\omega + \theta)/2$ (ω is the delay in the influence of 'inducements to invest' upon investment decisions). As the coefficient of influence of the change in investment in a 'unit period' upon that in the next unit period is $a/[2\varepsilon(1-\lambda)]$, the rise in ε contributes to slowing down the

[46] The importance of the 'incomplete reinvestment' factor for the explanation of the turning-point in the boom was emphasized for the first time by E. Rothbarth in a lecture to the Economic Society of the London School of Economics in 1939.[12]

increase of investment in the same way as the fall in a considered above.

It must be added that in the advanced stage of the boom investment decisions may be affected by the difficulty of finding suitable labour for employment in the new plant. This may also be accounted for in our scheme by the fall in the coefficient a. This factor will prevent investment from rising to the level at which full employment in the strict sense is reached.

4. The period of the trade cycle as described above depends on the time-lag $\varepsilon + \kappa$ and on the values of the coefficients $a/[2\varepsilon(1-\lambda)]$ and $(b+c)/2\varepsilon$ in the course of the trade cycle. One can say roughly that with a given time-lag $\varepsilon + \kappa$ the cycle is the shorter (i) the more sharply a falls with the increasing level of profits in the boom or with the decreasing level of profits in the slump, (ii) the stronger the rise or fall in the rate of investment decisions at the beginning of the boom or slump (periods 1–2 and 6–7); (iii) the higher the coefficient $(b+c)/2\varepsilon$. For all these factors tend to shorten the duration of the boom and slump, and thus the period of the business cycle. (If $b = 0$ and $c = 0$, there would be no fall at all from the high level reached in the boom nor a rise from the low level reached in the slump.)

An important point about any trade cycle theory is whether the cycle may be damped down or not. Indeed, the course of the cyclical fluctuations as determined by the fundamental equation may be such that the amplitude diminishes from cycle to cycle so that the system gradually approaches a state of equilibrium. It is true that it has been shown that a combination of a damping mechanism with erratic shocks (due to the fact that the economic relations as represented by the fundamental equation are rather loose) produces cycles with an amplitude which has no tendency to decline.[47] But if damping is strong, such cyclical movements would be of extremely irregular character. Thus, because it is difficult to prove why the coefficients of the fundamental equation should be such as to exclude strong damping, these theories have a serious loophole.[48] Our present theory is free of this difficulty. It may be shown that the type of variation assumed for the coefficient a prevents the cycle from being damped down.

[47] See Prof. R. Frisch, 'Propagation Problems and Impulse Problems in Dynamics', *Economic Essays in Honour of Gustav Cassel* [London, Cass, 1933], and unpublished work.

[48] This may also be said of my theory in the *Essays*. [*Collected Works*, vol. i.]

In period 1–2 after the beginning of recovery in 0–1, $a/[2\varepsilon(1-\lambda)]$ is much greater than 1, and this accelerates the rise of investment in 1–2. If, however, the recovery in 0–1 was slight, the increase in investment in period 1–2 may be not very considerable in spite of a high a. But then the entrepreneurs do not have much of the boom behind them, and therefore a does not fall strongly, and $a/[2\varepsilon(1-\lambda)]$ still remains greater than 1. Thus the acceleration in the rise of investment continues, and so a high level of investment is reached. Then, however, $a/[2\varepsilon(1-\lambda)]$ does fall below 1, the increase of investment is slowed down and is finally brought to a standstill (by this variation of a and by the retarding influence of the positive I, i.e. by the rise in fixed capital equipment and incomplete reinvestment of entrepreneurs' savings). From this description it is clear that investment must rise appreciably above the zero line A–B because it is only at a relatively advanced stage of the boom that $a/[2\varepsilon(1-\lambda)]$ declines considerably below 1.

The amplitude of the cycle depends, therefore, chiefly on the level of investment at which $a/[2\varepsilon(1-\lambda)]$ begins to fall below 1, on how strongly it falls with the further rise of investment, and also on the coefficient $(b+c)/2\varepsilon$ which measures the intensity of the retarding influence of the level of I. The higher the level of investment at which $a/[2\varepsilon(1-\lambda)]$ begins to fall below 1, the slower it falls with the further rise of investment, and the smaller the coefficient $(b+c)/2\varepsilon$ the higher the amplitude.[49]

5. One query must still be answered. Our business cycle mechanism seems to imply that there is always recovery from a slump. On the other hand, it has been shown in the essay on the theory of profits that investment activity can persist over long periods at its minimum level. How can this apparent contradiction be reconciled? The answer is

[49] With regard to the fact that the business cycle cannot be damped down and that its amplitude is determined by the parameters of the system, the above theory has a certain affinity to that of Mr Kaldor (*Economic Journal*, Mar. 1940). He obtained his results by examining a special case of my theory in the *Essays* which I have failed to consider. His theory is therefore based on the assumption of a particular shape of the functional relation between income and the rate of investment decisions; and it is difficult to advance any satisfactory a priori reasons for this shape being necessarily such as he assumes. In my present theory the cycle is prevented from being damped down by variations in a (the coefficient of the influence of profits upon the rate of investment decisions), and the pattern of these changes in variations seems to me much better founded than the shape of Mr Kaldor's curve.

that a situation is conceivable in which the factors causing a recovery from the slump in our business cycle model will prove inadequate.

With a given rate of interest—and the long-term rate of interest cannot fall below a certain minimum (see p. 159)—there will always be a level of the rate of profit at which all investment activity (both extensions and replacements except for necessary repairs) will stop because no investment plan appears profitable. If the rate of profit is at this level or below it, the rate of investment is at its minimum.

Imagine now that, in a slump, I has reached its minimum level $I_{\min}$. According to our formula (5) we may write for profits in this situation

$$P = \frac{A + I_{\min}}{1 - \lambda}$$

Moreover, assume that the value of the stable part of capitalist consumption in relation to the volume of capital equipment is such that the rate of profit is then appreciably *below* the level at which all investment plans become unprofitable. It is easy to show that the system is then unlikely to extricate itself from the slump. True, the volume of capital shrinks with lapse of time because depreciation is not made good, and thus the rate of profit increases because A is assumed here to be constant. But this rise is very slow, and it will take a number of years before the level of the rate of profit is reached at which any investment plans begin to become profitable. In such a situation, however, the assumption that A is constant cannot be upheld any more: the capitalists' 'standard of living' will be adversely affected by the protracted slump, and thus the system is likely never to reach the position where investment would start to recover from its minimum level.

6. So far we have dealt only with the fluctuations in net investment I. But since net 'real' profits P are connected with I by equation (5),

$$P_t = \frac{A + I_{t-\kappa}}{1 - \lambda}$$

their fluctuations follow those of net investment. And as the required replacement R fluctuates only slightly in the course of the trade cycle, the changes in gross profits $P + R$ are also roughly determined by those in net investment I. Further, the fluctuations in the national output will be determined by those in gross real profits and by factors determining the distribution of the gross national income (see p. 153).

However, the fluctuations in distribution are much smaller than those in gross profit $P + R$, and therefore output moves in the same direction as $P + R$.

The factors which cause a relative shift from gross profits to other incomes in the slump and from other incomes to gross profits in the boom tend to reduce the amplitude of output fluctuations, and vice versa. For instance, if the salary bill rises relative to gross profits in the slump, this tends to mitigate the decline in output. The fall in the ratio of material costs to wage costs in the slump tends to raise the relative share of wages in the national income (see p. 125) and thus works in the same direction. But the rise in the degree of oligopoly in a deep slump tends to reduce the relative share of wages in the national income (see pp. 126–7) and thus to accentuate the fall in output.

The problem of stocks and working capital

1. All our argument so far has been based on the very special assumption that changes in working capital and stocks cancel each other out. We shall now introduce a more general hypothesis.

Let us recall that, before making any assumption about the movement of working capital and stocks, we arrived on p. 169 at the equation

$$J_{t+\omega+\theta} = a\frac{dP_t}{dt} - bJ_t + (1 - c)I_t \tag{8}$$

Now, however, we do *not* assume that total investment I is equal to the investment in finished fixed capital J, which is equivalent to changes in working capital being always just offset by that in stocks. Instead we shall assume that the balance of these influences is proportional to the derivative of profits dP/dt; this is justified by the fact that the increase in working capital and the running down of stocks are caused by the increase in output, the movement of which is closely correlated with that of profits (see p. 176). We thus say that the change in working capital and stocks at time t is $e\,dP_t/dt$.[50]

The coefficient e (not necessarily a constant) is positive if the increase in working capital is less than offset by the running down of stocks and negative if it is more than offset by it. Statistical data

[50] There may be involved here a short time-lag which we leave out of consideration for the sake of simplicity; this does not significantly affect the results of our subsequent argument.

suggests that it is the former case which is of practical importance. Now as the total investment I_t is equal to that in finished fixed capital J_t plus the change in working capital and stocks, we have

$$I_t - J_t = e\frac{dP_t}{dt} \tag{12}$$

and from this and equation (8) we obtain

$$I_{t+\omega+\theta} - e\frac{dP_{t+\omega+\theta}}{dt} = a\frac{dP_t}{dt} - b\left(I_t - e\frac{dP_t}{dt}\right) + (1-c)I_t$$

or

$$I_{t+\omega+\theta} - I_t = (a+be)\frac{dP_t}{dt} + e\frac{dP_{t+\omega+\theta}}{dt} - (b+c)I_t$$

After adding and subtracting $e\,dP_t/dt$ on the right-hand side we have

$$I_{t+\omega+\theta} - I_t = (a+be+e)\frac{dP_t}{dt} + e\left(\frac{dP_{t+\omega+\theta}}{dt} - \frac{dP_t}{dt}\right) - (b+c)I_t.$$

By applying the transformation described on pp. 169–70 to $I_{t+\omega+\theta} - I_t$ and to $(dP_{t+\omega+\theta}/dt) - (dP_t/dt)$ and denoting $(\omega+\theta)/2 = \varepsilon$, $a + be + e = a'$ we obtain

$$2\varepsilon\frac{dI_{t+\varepsilon}}{dt} = a'\frac{dP_t}{dt} + 2\varepsilon e\frac{d^2P_{t+\varepsilon}}{dt^2} - (b+c)I_t \tag{13}$$

Further, we have the 'multiplier equation' for profits

$$\frac{dP_t}{dt} = \frac{1}{1-\lambda}\frac{dI_{t-\kappa}}{dt} \tag{5a}$$

After substitution of this value of dP_t/dt into equation (13) we arrive at

$$2\varepsilon\frac{dI_{t+\varepsilon}}{dt} = \frac{a'}{1-\lambda}\frac{dI_{t-\kappa}}{dt} + \frac{2\varepsilon e}{1-\lambda}\frac{d^2I_{t+\varepsilon+\kappa}}{dt^2} - (b+c)I_t$$

or

$$\frac{dI_{t+\varepsilon+\kappa}}{dt} = \frac{a'}{2\varepsilon(1-\lambda)}\frac{dI_t}{dt} + \frac{e}{1-\lambda}\frac{d^2I_{t+\varepsilon}}{dt^2} - \frac{b+c}{2\varepsilon}I_{t+\kappa} \tag{14}$$

2. This equation differs from equation (11)—obtained on the basis of the special assumption of the changes in working capital and in stocks cancelling each other—only by the member $e/(1-\lambda)(d^2I_{t+\varepsilon}/dt^2)$ and

by a' having a different significance from a ($a' = a + be + e$). The business cycle mechanism described above was based on the fact that—according to equation (11)—given the coefficient a and $b + c$, the rate of change of investment $dI_{t+\varepsilon+\kappa}/dt$ is an increasing linear function of the rate of change of investment some time ago, dI_t/dt, and a diminishing one of the level of investment in between, $I_{t+\kappa}$. (Some plausible assumptions about the variation of the coefficient a were also made.) At present the rate of change of investment $dI_{t+\varepsilon+\kappa}/dt$ is in addition an increasing linear function of $d^2I_{t+\varepsilon}/dt^2$, i.e. of the acceleration of the increase in investment in between ($t + \varepsilon$ lies between t and $t + \varepsilon + \kappa$). It follows that the acceleration of the increase in investment at the beginning of recovery in our mechanism and its slowing down in the advanced stage will now be accentuated because $d^2I_{t+\varepsilon}/dt^2$ will be positive in the first stage and negative in the second. At the top of the boom $d^2I_{t+\varepsilon}/dt^2$ will be negative and will thus contribute to the breakdown of the boom alongside the adverse influence of the positive investment (component $-(b+c)I_{t+\kappa}/2\varepsilon$). The position in the downward movement and at the bottom of the slump is symmetrical. Thus the pattern of the business cycle is not fundamentally changed by our new hypothesis about the changes in working capital and stocks.[51]

It must be stressed that even our second approximation to the movement of working capital and stocks is still very far from giving an accurate picture of the processes in question. From the scanty information we have, changes in working capital and stocks are much too complex to be accounted for by a simple formula. But it is likely that the deviations of the actual state of affairs from our second approximation are not sufficiently important to require fundamental changes to our pattern of the business cycle.

[51] This, however, is subject to a certain qualification. The component $e/(1-\lambda) \times (d^2I_{t+\varepsilon}/dt^2)$ and the fact that $a' = a + be + e$ may cause, if e is not sufficiently low, the boom (or slump) in investment to continue in spite of the fall in the coefficient a and the retarding influence of the component $-(b + c/2\varepsilon)(I_{t+\kappa})$. With regard to the *boom*, however, it may be shown that in this case a stage is finally reached where e falls to a very low level. Indeed, the rate of change of working capital and stocks has been assumed to equal $e\,dP/dt$ because it is positively correlated with the change in output, and this in turn is positively correlated with the change in real profits P. Now if the system approaches the state of full employment the national output almost ceases to grow, even though investment and profits continue to rise. As a result the increase in working capital and stocks almost stops as well, and thus e must fall to a very low level.

The argument does not apply to the *slump*, and here a sufficiently high level of e *could* cause a downswing of a cumulative character.

5. The Trend

General remarks on trend

1. We shall now discuss the influence of factors which were left aside in the preceding essay in order to obtain a 'pure' business cycle in a trendless economy. We must, however, first deal briefly with the general problem of trend in relation to our 'business cycle equation':

$$\frac{dI_{t+\varepsilon+\kappa}}{dt} = \frac{a}{2\varepsilon(1-\lambda)}\frac{dI_t}{dt} - \frac{b+c}{2\varepsilon}I_{t+\kappa} \tag{11}$$

(For the sake of simplicity we take as a basis of our enquiry into the problem of trend the equation which involves the assumption that the volume of working capital and stocks is constant. By this we ignore the influence of the long-run changes in working capital and stocks upon the development of the system. This may be justified as a first approximation on the grounds that, in long-run development, changes in working capital and stocks play a subordinate role as compared with the accumulation of fixed capital.)

Suppose that, as a result of the preceding long-run development of the economy, there will appear on the right-hand side of the above equation an additional member $L(t)$,

$$\frac{dI_{t+\varepsilon+\kappa}}{dt} = \frac{a}{2\varepsilon(1-\lambda)}\frac{dI_t}{dt} - \frac{b+c}{2\varepsilon}I_{t+\kappa} + L(t) \tag{15}$$

and thus the rate of change of investment $dI_{t+\varepsilon+\kappa}/dt$ will have an additional determinant depending on the preceding evolution of the system. If such is the case, the economy cannot be trendless any more. Moreover, this current trend, being the result of the preceding developments, contributes in turn to the future long-run development of the economy. It is in this way that a long-run dynamic process arises. We shall next examine briefly the influence of the features of function $L(t)$ upon the character of the trend.

2. Let us assume first that over the period considered $L(t)$ is a constant which we shall denote by L. Our equation is then

$$\frac{dI_{t+\varepsilon+\kappa}}{dt} = \frac{a}{2\varepsilon(1-\lambda)}\frac{dI_t}{dt} - \frac{b+c}{2\varepsilon}I_{t+\kappa} + L \tag{15a}$$

Imagine now that over a certain business cycle the average of the rate of investment I is I_0 and that this value fulfils the condition

$$\frac{b+c}{2\varepsilon}I_0 = L \tag{16}$$

Let us further denote the deviations of I from its average by I' so that we have

$$I = I_0 + I'$$

By substituting this value into equation (15a) and taking into account equation (16), we obtain

$$\frac{dI'_{t+\varepsilon+\kappa}}{dt} = \frac{a}{2\varepsilon(1-\lambda)}\frac{dI'_t}{dt} - \frac{b+c}{2\varepsilon}I'_{t+\kappa} \tag{17}$$

This equation means the same with regard to I' as equation (11) meant with regard to I. It follows that I' now fluctuates round the level I_0 in the same way as in the case of the 'pure' business cycle it fluctuates round zero.

Now it may be seen that this is *the* solution of the business cycle and trend problem when $L(t)$ is a constant. Indeed, let us assume that the average of I over the cycle period, I_0, does *not* fulfil condition (16). Imagine, for instance, that

$$\frac{b+c}{2\varepsilon}I_0 < L$$

Then, as it is easy to see, equation (17) would contain a positive trend component $L - (b+c)I_0/2\varepsilon$. But that would mean that the average of I' over the cycle period could not be zero, and thus the average of I would *not* be equal to I_0. It follows that I_0 must fulfil condition (16).

Consequently, if L is constant and positive, the rate of investment after elimination of the business cycle is positive (as $b + c > 0$) and stable. Capital accumulates but the rate of investment does not rise. If $L(t)$ is an increasing function, the rate of investment also increases in the long run, while it falls if $L(t)$ is a decreasing function. Positive long-run investment may thus be rising, stable, or falling. The rising trend in the volume of capital need not be accompanied by a similar trend in the rate of investment. Statistics of net investment in fixed capital in the USA in 1881–1914 show a very good example of this state of affairs (see Fig. 17).

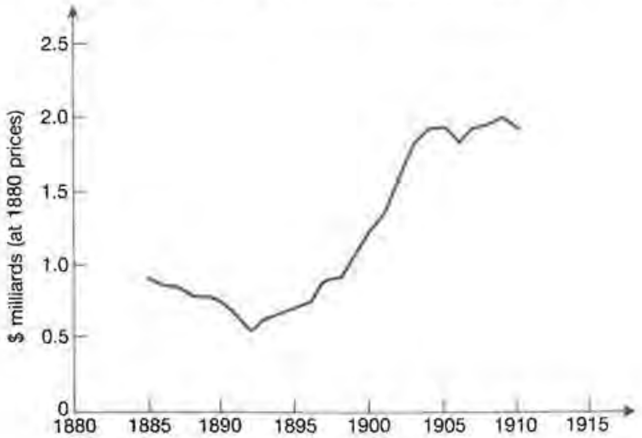

FIG. 17. *Nine-Year Moving Average of Net Investment in Fixed Capital (except Dwelling Houses) in the USA at 1880 Prices, 1881–1914*
Source: Douglas, *The Theory of Wages*

3. As long-run expansion of capital equipment may be accompanied by a fall in the rate of net investment, it is also uncertain whether net profits P will rise with the accumulation of capital. Indeed, according to equation (5), $P_t = (A_{t-\kappa} + I_{t-\kappa})/(1-\lambda)$ and thus, if I falls, P increases only if the stable part of capitalist consumption A rises sufficiently to offset the decrease in I. The gross profits $P + R$ have a greater chance to rise with the expansion of capital equipment than the net profits P, because the required replacement R rises in the long run more or less proportionally to the stock of capital. (For the same reason, gross investment $I + R$ has a greater chance to rise with the volume of capital equipment than net investment I.)

The position of the salary bill is similar to that of required replacement. It will usually tend to increase with the volume of capital equipment. For this reason net profits + required replacement + salaries, i.e. profits + overheads, have a much greater chance of increasing in real value with the rise of the volume of capital equipment than net profits P.

Finally, the changes in the wage bill will be determined by changes in profits + overheads and in factors determining the distribution of the gross national income. For instance, the long-run rise in the degree of oligopoly will make the wage bill fall relative to other incomes.

It follows that it is not quite certain whether the gross national income or national output will increase in the long run with capital

equipment. But, if there is no important change in the relative share of wages in the gross national income, such an increase is in any case much more likely than that in net profits. For the expansion in capital equipment tends to increase overheads (depreciation and maintenance, and the salary bill). And with no important changes in the relative share of wages the national output changes more or less proportionally to profits + overheads.

Long-run changes in capitalist consumption

1. On p. 162 we assumed, for the sake of the 'pure business cycle' discussion, that the stable part of capitalist consumption A_t is a constant, although in fact it varies slowly in time as a result of preceding long-run development which has influenced the capitalists' standard of living. We shall now remove this assumption and thus we must take into account that dA_t/dt is not in general equal to zero.

On p. 170 we obtained from the formula

$$P_t = \frac{A_{t-\kappa} + I_{t-\kappa}}{1-\lambda}$$

the derivative of profits

$$\frac{dP_t}{dt} = \frac{1}{1-\lambda}\frac{dI_{t-\kappa}}{dt}$$

under the assumption that A is constant. If $dA/dt \neq 0$ we have

$$\frac{dP_t}{dt} = \frac{1}{1-\lambda}\left(\frac{dA_{t-\kappa}}{dt} + \frac{dI_{t-\kappa}}{dt}\right)$$

It may be easily found from the argument on p. 171 that as a result an additional member $a/[2\varepsilon(1-\lambda)](dA_t/dt)$ will appear on the right hand of equation (11). In other words, we have here a trend component

$$L(t) = \frac{a}{2\varepsilon(1-\lambda)}\frac{dA_t}{dt}$$ [52]

[52] The problem is actually a little more complicated because of the fact that the coefficient a undergoes cyclical fluctuations. However, a may be represented as $a_0 + a'$, where a_0 is the average a over the cycle period and a' the deviation of a from a_0. Thus $\frac{a}{2\varepsilon(1-\lambda)}\frac{dA_t}{dt} = \frac{a_0}{2\varepsilon(1-\lambda)}\frac{dA_t}{dt} + \frac{a'}{2\varepsilon(1-\lambda)}\frac{dA_t}{dt}$. The actual trend component is $\frac{a_0}{2\varepsilon(1-\lambda)}\frac{dA_t}{dt}$. The member $\frac{a'}{2\varepsilon(1-\lambda)}\frac{dA_t}{dt}$ is of cyclical character; it will have a certain influence upon the course of the trade cycle.

2. The trend component is here positive if $dA_t/dt > 0$, because the coefficient $a/[2\varepsilon(1-\lambda)]$ is positive. Thus, according to the results arrived at in the last section, a positive change in the stable part of capitalist consumption causes a long-run accumulation of capital. This is quite plausible because a positive dA/dt means a positive trend in profits P because $P_t = [1/(1-\lambda)](A_{t-\kappa} + I_{t-\kappa})$. A system which we rendered stationary in the essay on 'The Pure Business Cycle' by the assumption that $dA/dt = 0$ will be an expanding one—at least with regard to capital equipment—if dA/dt is positive.

Now, what factors in the past long-run development cause the rise (or fall) of the stable part of capitalist consumption A? A secular rise in wealth and income of capitalists tends to raise, with rather a long time-lag, their 'standard of living', i.e. the amount they are apt to consume irrespective of the level of their current income. Thus an increase in capital and profits in the past tends to cause a positive dA/dt. But these are not the only factors in question. For the long-run rise in capital and profits may be associated with the concentration of both, and this tends to reduce A.

It follows that the trend caused by a positive dA/dt in a certain period need not be 'self-continuing'. True, a positive dA/dt causes an accumulation of capital which tends to cause A to increase in the future. It is, however, not certain if a positive dA_t/dt causes a rise in profits[53] which are the other link with the future changes in A. Moreover, the possible increase in the concentration of capitalist wealth and income may induce a fall in A even though capital and profits were rising over the past long period.

Rentiers' savings

1. To render our system trendless we also ignored rentiers' savings (see p. 168). If they are taken into consideration, it follows from page 167 and the subsequent argument (pp. 168–71) that an additional member $-(1 - c/2\varepsilon)s_{t+\kappa}$ appears on the right-hand side of equation (11). We have thus a trend component,

$$L(t) = -\frac{1-c}{2\varepsilon}s_{t+\kappa}$$

[53] We have for them the formula $P = (A_{t-\kappa} + I_{t-\kappa})/(1-\lambda)$. Now, if dA/dt is positive, so is the long-run rate of investment, but as shown in the preceding section, I may be constant, rising, or falling. And thus in the latter case it is not certain that the profits P rise even though A increases.

where $s_{t+\kappa}$ is the 'real' value of rentiers' savings. $L(t)$ is here always negative. Indeed, the coefficient $1-c$ is positive (see p. 165); so, of course, is the time-lag ε, and the real rentiers' savings may be assumed always to be positive because their real incomes are fairly steady (except in abnormal cases of hyper-inflation), and on the average sufficiently large to make them savers. Consequently, according to the preceding section, the existence of rentiers' savings causes a negative long-run investment, i.e. long-run shrinking of capital equipment. This is not surprising. By the assumption $s = 0$ we obtained in the essay on 'The Pure Business Cycle' a trendless system. But such a stationary situation (from the long-run point of view) is incompatible with positive rentiers' savings because this causes a continuous increase in the entrepreneurs' indebtedness towards rentiers which depresses investment activity (see pp. 164–5). Therefore the rentiers' savings—if taken in isolation from other trend factors—create a negative trend.

2. If prices are falling over a certain long period, it causes the real value of rentiers' savings to increase over this period and thus accelerates the negative trend caused by them. If, because of the existence of positive trend factors, the total $L(t)$ is positive, the long-run fall in prices tends to decrease $L(t)$. But, as shown in the preceding section, a decreasing $L(t)$ causes a long-run fall in the rate of net investment I. It follows that the long-run fall in prices will, through this channel, affect adversely the long-run rate of net investment.

Rise in population and increasing productivity of labour

1. It is frequently maintained that the main reason for trend is the rise in population or the increase in productivity due to technical progress. No doubt one or the other is a *necessary* condition for a long-run expansion of output of an economy which has no large reserve army of unemployed. But are they also a *sufficient* condition? Does the rise in population or the increase in labour productivity due to technical progress *induce* the trend movement?

Let us first consider the influence of the rise in population. If population increases while output remains stable in the long run there will be a secular increase in unemployment. This exerts a pressure on money wages which consequently tend to fall. The problem is thus reduced to the question: how will a long-run fall in money wages affect our trend analysis? Now money wages do not appear at all in our fundamental equations. That may be traced to the fact that real profits P are fully determined by past consumption and investment decisions of capitalists, and that into their current decisions enter again current real profits and the volume of capital equipment (or changes in these elements). This is in line with the Keynesian theory of money wages. There is, however, one influence of money wages which should enter our fundamental equation and was omitted only for our 'pure business cycle' analysis. Indeed, a long-run fall in money wages causes a fall in prices and thus, with stable output, a fall in the money volume of transactions. If the supply of cash by banks is not proportionally reduced, this leads in turn to a long-run fall of the short-term rate of interest, which results in a fall of the long-term rate of interest. Now such a fall will make for the appearance of a positive component $L(t)$ on the right-hand side of our fundamental equation and cause a positive trend movement. The increase in output in such a movement cannot, however, be so great as to prevent the long-run increase in unemployment, for in such a case the very cause of the trend would disappear.

2. Let us now consider the effects of the increase in the productivity of labour due to technical progress. The immediate effect, as in the case of a wage cut, is to reduce wage costs and prices. This causes a fall in turnover (money volume of transactions) and consequently a decline in the rate of interest, which creates a tendency for a positive trend. If as a result output increases in the same proportion as productivity of labour, no unemployment arises.

If, however, the increase in output is smaller, 'technological unemployment' must appear. This (as in the case of the increase in population) will depress wages. As a result, an additional fall in the rate of interest will ensue which will induce an additional positive trend. But the latter cannot lead to a full absorption of 'technological unemployment', for then the very cause of the additional trend would cease to exist.

3. The functioning of the mechanisms described seems, however, to be of very doubtful character. The connection between the rise in unemployment and the fall of money wages is rather loose if strong trade unions exist. Even more uncertain is the connection between the fall in turnover and that in the short-term rate of interest in the long run. If the fall in turnover continues over a long period, the banking policy may easily adapt itself to this secular fall in such a way that the

supply of balances shrinks *pari passu* with turnover, and thus no fall in the short-term rate of interest occurs. In any case, if growth of population and increase in productivity of labour were the main causes of trend, the turnover would have a secular tendency to fall, which is by no means generally the case. Moreover, as we have seen in the last section, the secular fall in the price level exerts a negative influence upon the expansion of the economy by increasing the real value of rentiers' saving, and this counteracts the positive effect of the pressing down of the rate of interest.

To conclude: although growth of population or increasing productivity are a necessary condition for the long-run expansion of output if no large reserves of labour are available, these factors seem not to play an important role in *inducing* the trend movement.[54]

It follows that growing population and increasing productivity of labour may well cause long-run unemployment without setting to work forces which would absorb it.

Innovations

1. We tried to show above that the increase in productivity of labour due to technical progress is not likely *as such* to be an important factor in creating a trend movement. This does not mean, however, that technical progress as a whole is an insignificant phenomenon in this respect. On the contrary, some aspects of technical progress, by which we mean innovations, are probably one of the main forces behind long-run economic development.

The influence of new inventions upon investment consists in making the profitability of a certain type of investment higher than it would be otherwise. A new invention will therefore be another factor—

[54] It is sometimes maintained that the increase in population encourages investment because entrepreneurs anticipate a broadening market. What is important, however, in this context is the increase, not in population, but in purchasing power. The increase in the number of paupers does not broaden the market. For instance, increased population does not mean necessarily a higher demand for houses: without an increase in the purchasing power, the result may well be crowding of more people into the existing dwelling space. On the other hand, it should be noticed that our conclusions are valid only if our simplifying assumptions that the system is closed and the state budget balanced are fulfilled. In an open system, the fall in wage rates resulting from unemployment growing as a result of the increase in population will stimulate exports and so contribute to the upward trend. The payment of doles for the unemployed, if financed by government borrowing, will constitute another channel through which the rise in population may cause a positive trend of the system.

alongside the change in current profits and capital equipment (see pp. 165–6)—which causes the emergence of investment decisions in a given period. With the replacement of old equipment by modern, the additional profitability of investment caused by the invention is gradually reduced, and this has a negative effect upon investment decisions. The appearance of new inventions has a similar effect in the sphere of investment activity as a rise in current profits; the repercussions of the 'spreading' of inventions by replacing old by modern equipment may be compared with those of a fall in current profits.

Thus in any period we have the positive influence of new inventions on the one hand, and the negative effect of the gradual 'liquidation' of past ones on the other. We shall call the technical progress uniform with regard to investment if these two effects upon an economy of a given size cancel out. If the effect is on balance positive or negative, we shall speak of accelerated or retarded technical progress.

2. It may seem from the definition of uniform technical progress that the corresponding trend component $L(t) = 0$ because the effects of new inventions on investment are exactly offset by the 'liquidation' of past ones. That may be so, but need not necessarily be the case.

We stressed in our definition that the positive and negative effects cancel out with regard to an economy of a *given size*. Now, the larger the economy, the larger the positive effect of new inventions upon investment; it may be considered roughly proportional to the volume of capital equipment. Further, the negative effect of replacements 'liquidating' the old inventions may be assumed roughly proportional to the volume of old equipment at the time when the respective inventions emerged. It follows clearly that if we have a uniform technical progress, and if in the longer period preceding the period considered the equipment was steadily growing, the positive effect will be larger than the negative effect, i.e. $L(t) > 0$. And only in the case when the equipment was stationary in the preceding long period is $L(t) = 0$. Thus uniform technical progress will cause the development of the preceding long period to continue; for, as shown above, a positive trend component $L(t)$ causes a long-run accumulation of capital. While if the system was stationary in the preceding long period, uniform technical progress will not induce expansion because then $L(t) = 0$.

A stationary economy is thus not incompatible with uniform technical progress. But if the economy expanded prior to the period

considered, the uniform technical progress will cause this expansion to continue.

3. In the latter case the positive trend component $L(t)$ depends on two factors. (i) It is the greater the larger the rate of capital accumulation, i.e. of net investment, in the preceding long-run period, because the stronger the preceding expansion the greater the difference between the positive effect of new inventions and the negative effect of the liquidation of past inventions. (ii) In addition, $L(t)$ depends on the speed of the uniform technical progress, i.e. on the magnitude of the 'investment effect' of new inventions. With the increase of the speed of the uniform technical progress, both the positive and the negative effect rise in the same proportion and, consequently, so does $L(t)$, being the balance of these two effects.

From the latter it follows that the relation of the long-run net investment caused by $L(t)$ to the net investment in the preceding long period increases with the speed of technical progress. For $L(t)$ rises with the latter, and the greater $L(t)$, the larger the net investment caused by $L(t)$ (see p. 181). There will thus be a certain speed of technical progress which makes current long-run investment equal to past long-run investment. The uniform technical progress then causes the capital accumulation of the past period to continue at the same rate. If the speed of technical progress is higher, the current long-run investment will be higher than that in the past, and thus the technical progress causes here a secular growth of the rate of investment. Finally, if the speed of technical progress is lower than that necessary to maintain the rate of net investment, this will cause a long-run fall in the latter, and the system will then approach asymptotically a stationary situation in which long-run net investment is zero.

4. So far we have discussed only technical progress which is uniform with regard to investment. According to our definition, an accelerated technical progress takes place if the balance of the effect of new inventions and 'liquidation' of past inventions on investment is positive for an economy of a given size. In such a case, the trend component $L(t)$ is positive, and consequently so is the resulting net investment, even if in the preceding long-run period the system was stationary (i.e. the long-run net investment was equal to zero). While, if the economy was previously expanding, $L(t)$ consists of 2 components, one resulting from the acceleration of technical progress and the other from the preceding expansion of the system. If technical progress is retarded with regard to investment, $L(t)$ is negative if the economy was stationary in the preceding long-run period; while if the economy was previously expanding, $L(t)$ is the balance of the positive component resulting from this expansion and a negative one due to the slowing down of the technical progress.

Imagine, now, that in the initial long period technical progress is accelerated, and that this causes $L(t)$, and consequently net investment, to be positive. Imagine, further, that after this period technical progress is uniform but the speed which it has reached is sufficient at least to maintain the rate of net investment of the preceding period. We shall then have a continuous trend created entirely by technical progress. This pattern is likely to have played an important role in the development of capitalist economies.

Imagine, now, on the other hand that, after a period of expansion, technical progress is slowing down (with regard to investment) over the period considered. This may occur, for instance, because of the formation of industrial monopolies which hamper the application of new inventions; or it may be the result of concentrating technical progress on 'scientific organization' of labour. This retardation of technical progress with regard to investment depresses $L(t)$ and thus the net investment in the period considered. In addition, the speed of technical progress is reduced; if it has fallen appreciably below the level which is necessary to maintain the rate of net investment in the future at the level of the period considered—net investment will rapidly approach zero in the subsequent period and the expansion of the system will come to a standstill.

5. There emerge out of our analysis, as the chief determinants of investment in the long run, changes in capitalist consumption, rentiers' savings, and innovations.

It should be noted that the limitations imposed on our analysis by simplifying assumptions prevented such factors as capital exports, budget deficits, and gold production from being taken into consideration, although they played a very important role in the development of single capitalist economies.

A New Approach to the Problem of Business Cycles[1]

(1950)

In recent years many business cycle models have been constructed. Generally speaking, they are based on (i) the interrelation between investment and income (resulting from the relation between income and saving and the equality of saving and investment); and (ii) the interrelation between the level of income or the rate of change of income and investment decisions. The most controversial of the assumptions underlying such models are those concerning the determinants of investment decisions. The rate of investment decisions is assumed in some theories to be determined by the rate of change in income (or output) and in some by the level of income. Indeed, the problem of determinants of investment belongs probably to the least explored subjects of modern economics.

It is for this reason that I propose in this paper to reverse, in a way, the usual course of constructing a business cycle model. I shall assume the interrelation between investment and income (based on the relation between income and saving, and the equality of saving and investment). But I shall make no assumption about the determinants of investment decisions. I shall assume instead, in agreement with facts, that a business cycle is in existence, that its period is no less than 8 years, and that the time-lag between investment decisions and actual investment is on the average no more than 1 year. On this basis we shall try to find out something about the determinants of investment. It will be seen, in fact, that this slender empirical foundation will enable us to apply the correlation analysis to our problem.

Basic Assumptions and Equations

1. We assume a closed system and a balanced government budget. In such a system, saving S is equal to private investment I

$$S = I \tag{1}$$

I is conceived of as measured in real terms, and S stands thus for 'real saving'.

2. I consists of investment in fixed capital (deliveries of plant and equipment) and of investment in inventories (in which is included fixed capital under construction).

In investment in fixed capital, the time-lag between plans and deliveries is largely due to the construction period. Investment in inventories in many instances follow the rate of change in output only with a fairly considerable delay.[1] The time-lag involved seems on average of an order of magnitude similar to that of the average construction period. Both lags may be safely assumed to be, on average, shorter than 1 year.

We may easily conceive of a time-curve of fixed capital investment decisions per unit of time D_f. Further, we may project investment in inventories into the time of the rate of change in output which caused it. This time-curve lags behind that of actual investment in inventories by the delay with which the latter follows the change in output. We shall call it the time-curve of inventory investment decisions per unit of time D_i. Adding the ordinates of these two curves D_f and D_i we shall obtain what may be called 'the time-curve of investment decisions' $D = D_f + D_i$.

3. We assume that the time-curve of investment I follows that of investment decisions D with a stable time-lag of no more than 1 year. This time-lag will be taken as a unit of time. We thus have:

$$I_{t+1} = D_t \tag{2}$$

where I is the rate of investment at time $t+1$ and D the rate of investment decisions at time t.

From equations (1) and (2) it follows:

$$S_{t+1} = D_t \tag{3}$$

4. We denote real private income after tax by Y and real personal consumption by C. We thus have:

$$Y = C + S$$

We assume that saving S is a linear function of Y. If, for the sake of simplicity, all variables under consideration are supposed to mean deviations from cycle averages, the relation between Y and C may be written

$$S = \mu Y \tag{4}$$

[1] See, for instance, Moses Abramovitz, *The Rôle of Inventories in Business Cycles* [New York, NBER, 1948].

5. We assume finally that the business cycle is in existence and its period T is no less than 8 years. Since the time-lag between investment decisions and investment has been assumed to be less than 1 year and has been taken as a unit of time, we have:

$$T \geqslant 8 \tag{5}$$

The Correlation Analysis

1. We can write equation (3) in the form:

$$D_t = S_{t+1} \tag{3}$$

It is perfectly clear that this equation has no causal significance because S_{t+1} follows D_t in time. The equation may be interpreted, however, as the derivation of the series D_t from the available *ex post* series of S_t. We may call it perhaps a 'historical' equation. We shall use it for examining the double correlation of the rate of investment decisions D_t with the level of the real private income Y_t and its rate of change dY_t/dt which we denote by $Y't$. As according to equation (4) $S = \mu Y$, this is equivalent to examining the double correlation of D_t with the level of savings S_t and its rate of change $dS_t/dt = S'_t$. Before we proceed any further, it should be remembered that all variables under consideration are supposed to mean deviations from the cycle averages so that the averages of D, S, etc., over the cycle $= 0$.

2. We now shall establish the correlation of $D_t = S_{t+1}$ with S_t and $dS_t/dt = S'_t$ over the range of a cycle. For this purpose we first subdivide the time-curve S into unit intervals in each of which the curve is approximated by a straight line segment (Fig. 18). S_t for the

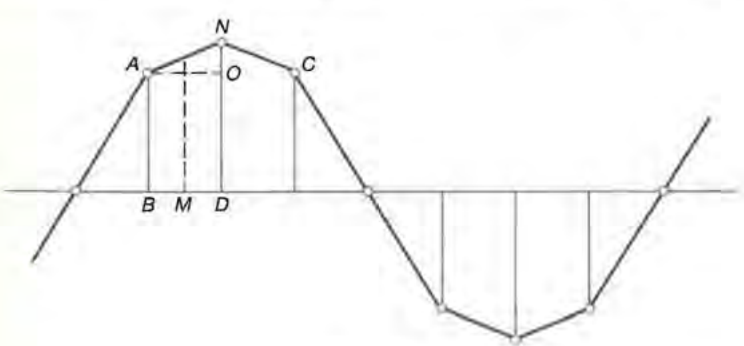

FIG. 18

interval t is equal to the average MN of its sides AB and CD. S'_t is equal to the difference CO of CD and AB.

From the periodicity of the S curve it follows (see appendix, p. 199) that S_t and S'_t are not correlated with each other, i.e. that the sum $\Sigma S_t S'_t$ taken over the range of a cycle = 0. Thus the regression coefficients a and b of a double correlation of $D_t = S_{t+1}$ with S_t and S'_t may be obtained from single correlations of S_{t+1} with S_t and with S'_t respectively. We thus have:

$$a = \frac{\Sigma S_{t+1} S_t}{\Sigma S_t^2} \tag{6}$$

$$b = \frac{\Sigma S_{t+1} S'_t}{\Sigma S_t'^2} \tag{7}$$

From the periodicity of curve S it follows moreover (see Appendix) that: $a < 1$; $b < 1$.

3. In order to be able to say more about a and b we now have to introduce condition (5) for the period of the business cycle: $T \geqslant 8$.

On Fig. 19 two extreme positions of curve S are drawn for $T \geqslant 8$. It appears that for both of these extreme curves: $a = 0.70$; $b = 0.75$.

It appears that for $T \leqslant 8$, a and b are higher for the extreme positions. Moreover, for any intermediate position (such as shown on Fig. 19), both a and b are higher than for the extreme positions. It follows that 0.70 and 0.75 are minima for a and b respectively for $T \geqslant 8$. This, however, is subject to certain qualifications indicated in subsection 5 below. Since both a and b are < 1 (see preceding

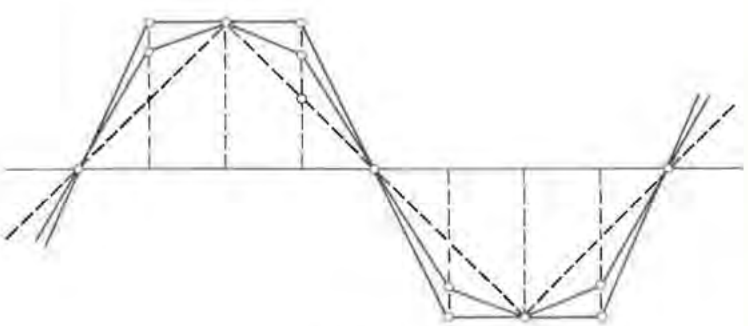

FIG. 19

subsection) we have:

$$\begin{aligned} 0.70 &\leqslant a < 1 \\ 0.75 &\leqslant b < 1 \end{aligned} \tag{8}$$

4. The results obtained so far may be summarized as follows. Investment decisions $D_t = S_{t+1}$ are correlated positively with savings S_t and the rate of change of savings S'_t:

$$D_t = S_{t+1} = aS_t + bS'_t + r \tag{9}$$

where r is the residual which is not correlated with either S_t or S'_t. The regression coefficients a and b fulfil the conditions:

$$\begin{aligned} 0.70 &\leqslant a < 1 \\ 0.75 &\leqslant b < 1 \end{aligned} \tag{8}$$

We shall now calculate the double correlation coefficient ρ. Since S and S' are not correlated (see subsection 2 above), we have:

$$\rho^2 = a^2 \frac{\Sigma S_t^2}{\Sigma S_{t+1}^2} + b^2 \frac{\Sigma S_t'^2}{\Sigma S_{t+1}^2} \tag{10}$$

From the periodicity of curve S it follows (see appendix):

$$\rho^2 = a^2 + 2b(1-a) \tag{11}$$

It may be easily shown that for:

$$\begin{aligned} 0.70 &\leqslant a \\ 0.75 &\leqslant b \end{aligned}$$

the smallest value of ρ^2 is:

$$\rho^2_{\min} = 0.94$$

and thus:

$$\rho_{\min} = 0.97 \tag{12}$$

The partial correlation coefficient with regard to S_t is equal to a. The partial correlation coefficient with regard to S'_t is equal to $\sqrt{2b(1-a)}$ (see Appendix). It follows that the partial correlation coefficient with regard to S_t is $\geqslant 0.70$. Of the partial coefficient with regard to S'_t it can be said merely that it is positive.

5. In the above argument some tacit assumptions have been made which have some bearing on the results obtained. It was assumed, as may be seen in Figs. 18 and 19, that curve S is symmetrical, and this had some influence upon the lower limits of a and b as calculated in subsection 3 above. However, it appears that these limits change only slowly when the shape of the curve is made asymmetrical, and therefore, if the asymmetry of the actual S curve is not very pronounced, as is likely to be the case in fact, the result of our calculations may be considered a good first approximation.

The second assumption consists of drawing the time-curve S as a 'smooth' line. This is certainly unrealistic, because the actual time-curve is to some extent irregular, being influenced by random factors. However, we can imagine that the curve with which we are dealing is the 'average curve' of many cycles. That is, that the ordinate at time t of our curve is not the actual ordinate at time t, but the average of the ordinates at time $t, t + T, t + 2T \ldots t + kT$, where T denotes the period of the cycle. This procedure, however, involves the difficulty of the period of the cycle T being not exactly determined as the result of the irregularity of the curve S. In fact, whatever T we choose, the 'average curve' will in general not be periodical. Even if the number of cycles taken into consideration is very large, we can in general choose T only in such a way as to make our 'average curve' as periodical as possible. However, if the actual curve shows a rather regular pattern of fluctuations, as is likely to be the case in fact, the aperiodicity of our 'average curve' will be rather small. Thus, here again it may be said that the results obtained above are good first approximations.

This discussion also sheds some light upon the factors which will cause the correlation coefficient to be less than 1. Firstly, there will be in general other determinants of investment decisions than those that have been postulated (*inter alia* the fact that the relation with the variables taken into consideration may be non-linear). This will be reflected in the shape of time curve in Fig. 19. Secondly, the inter-relation between investment decisions and their determinants is of stochastic character. This will be reflected in some aperiodicity of the actual 'average time-curve'.

The Economic Interpretation of the Results

Taking into consideration equation (4) which represents the relation between savings and income Y, the regression equation (9) may be represented as:

$$D_t = a\mu Y_t + b\mu Y'_t + r \tag{13}$$

where Y' represents the rate of change in income Y in the unit interval.

Thus the regression equation represents the investment decisions D as a function of the level of income Y and its change per unit of time Y'.

It follows directly from the preceding section that:

(i) The partial correlation coefficient of investment decisions D with regard to the level of income Y is greater than 0.70. This shows immediately that no business cycle theory should neglect, provided our assumptions are correct, the *level* of income as a determinant of the rate of investment decisions. On this basis, any theory of the business cycle based on the pure-acceleration principle, which makes investment decisions dependent on the rate of change in income only, should be rejected.

(ii) As coefficient b in the regression equation is positive, it follows that a better approximation is obtained if investment decisions are considered an increasing function both of the level and of the rate of change in income, rather than of the level of income only. It should be recalled in this connection that the lower limit for the partial correlation of investment decisions in relation to the level of income is 0.70, while the lower limit for the double correlation with the level of income and the rate of change in income is 0.97.

What is the economic interpretation of the regression equation (13)? The level of income Y is frequently considered to be a direct determinant of investment decisions. This is the case, for instance, in Keynes's *General Theory*, if properly interpreted. Keynes's idea is that investment is pushed up to the point where prices of investment goods equate the marginal efficiency of capital with the rate of interest (allowing for risk). As the marginal efficiency of capital depends considerably on the current level of income because this affects to a great extent the expectation of future yields, the higher the level of current income the higher the level of investment decisions. The most important objection to this theory is that it presupposes a rising supply curve in production of investment goods which is unrealistic, at least for a considerable range of output. Sometimes Y is considered a direct determinant of investment decisions, because the higher the level of income the higher the difference between the expected profitability of investment and the rate of interest which encourages investment. However, this argument, which seems plausible at first glance, becomes immediately doubtful when it is realized that we are concerned here with investment per unit of time. Indeed, if in a given period there is a high level of profitability which induces investment, this will not continue for the subsequent period because all investment plans will have already been undertaken under the influence of high profitability in the initial period. As a matter of fact, it appears that it is the *new* high level of income that makes for higher investment. In this way, however, we really are back to the acceleration principle (although interpreted in a different way), for it is the *rate of change* in income that thus becomes the determinant of investment. A reasonable interpretation of the interrelation between the level of income and investment decisions should be based, I think, on the fact that with the high level of income there is correlated a high level of savings, and that the stream of new savings stimulates investment because it makes it possible to undertake investment without increasing indebtedness.[2]

If this theory is taken as a basis of interpretation, it is convenient to write the first member on the right-hand side of equation (13) as it was written in equation (9):

$$D_t = aS_t + b\mu Y'_t + r \tag{14}$$

Thus, investment decisions are now represented as a function of current savings and of the rate of change in income. We have already explained this second determinant in the above argument. That, however, as did the whole of the above argument, really applied to investment in fixed capital. It is plausible to assume that investment decisions in inventories per unit of time are a function of the rate of change in income. Thus the second member on the right-hand side of equation (14) stands for these two factors.

In this form the regression equation comes fairly close to my theory of investment as presented in the *Studies in Economic Dynamics*. The gist of it consists of the dependence of fixed-capital investment decisions per unit of time (i) on the stream of current saving and (ii) on the rates of change in factors determining the profitability of investment, in particular on the rate of change in the level of income. In addition, however, I consider there the change in the volume of fixed capital equipment as affecting adversely the profitability of investment. The corresponding equation may be written:

$$D_t = \alpha S_t + \beta Y'_t - \gamma K'_t$$

where K' is the change in the volume in capital equipment per unit of time. K' is equal to the level of investment in fixed capital per unit of time which we denote by F. Thus the equation may be written:

$$D_t = \alpha S_t + \beta Y'_t - \gamma F_t$$

It could be shown that, on certain plausible assumptions, this equation would also stand the test of a correlation analysis similar to that carried out above. However, such an analysis would be even more complex than that given in the preceding chapter, and we shall not therefore include it in the present article.

[2] See my *Studies of Economic Dynamics*, p. [164]. In my earlier *Essays in Economic Fluctuations*, the rate of investment decisions appears to be an increasing function of the difference between the expected profitability of investment and the rate of interest. However, this is derived from the specific assumptions made there. In fact, the theory is a special case of that presented in the *Studies*. Indeed, I assume in the *Essays*: (i) that the system is closed, the budget is balanced, and the volume of inventories remains constant in the course of the business cycle; thus savings are equal to investment in fixed capital; (ii) that with the difference between the expected profitability of investment and the rate of interest remaining constant, the full amount of savings is being reinvested. Thus the rate of investment decisions remains constant at a given difference between profitability and the rate of interest; and it rises to a new level when this difference increases.

Appendix

1. We shall first show that S_t and S'_t are not correlated with each other, i.e. that the sum $\Sigma S_t S'_t$ taken over the range of a cycle $= 0$. Let us denote the side AB of the interval t on Fig. 18 by δ_t and accordingly the side CD by δ_{t+1}. It is easy to see that $\delta_t = S_t - \frac{1}{2}S'_t$ and that $\delta_{t+1} = S_t + \frac{1}{2}S'_t$. Now because of periodicity of the S curve we have:

$$\Sigma \delta_t^2 = \Sigma \delta_{t+1}^2$$

(all sums Σ are taken over the range of a cycle) or:

$$\Sigma(S_t - \tfrac{1}{2}S'_t)^2 = \Sigma(S_t + \tfrac{1}{2}S'_t)^2$$

from which follows:

$$\Sigma S_t S'_t = 0 \tag{15}$$

2. Since S_t is not correlated with S'_t, the regression coefficients a and b of a double correlation of S_{t+1} with S_t and S'_t may be obtained from single correlations of S_{t+1} with S_t or with S'_t respectively. We thus have:

$$a = \frac{\Sigma S_{t+1} S_t}{\Sigma S_t^2} \tag{6}$$

$$b = \frac{\Sigma S_{t+1} S'_t}{\Sigma S_t'^2} \tag{7}$$

3. We show next that $a < 1$. Indeed:

$$\Sigma(S_{t+1} - S_t)^2 = \Sigma S_{t+1}^2 - 2\Sigma S_{t+1} S_t + \Sigma S_t^2 > 0$$

Owing to the periodicity of the S curve:

$$\Sigma S_{t+1}^2 = \Sigma S_t^2 \tag{16}$$

Thus:

$$\frac{\Sigma(S_{t+1} - S_t)^2}{\Sigma S_t^2} = 2(1 - a) > 0 \tag{17}$$

and:

$$a < 1$$

4. It may also be shown that $b < 1$. Indeed, it will be seen from Fig. 18 that:

$$S_{t+1} = S_t + \frac{S'_t}{2} + \frac{S'_{t+1}}{2} \tag{18}$$

Thus:

$$\Sigma S'_t S_{t+1} = \Sigma S'_t\left(S_t + \frac{S'_t}{2} + \frac{S'_{t+1}}{2}\right)$$

As according to equation (15):

$$\Sigma S'_t S_t = 0$$

we have:

$$\Sigma S'_t S_{t+1} = \tfrac{1}{2}\Sigma S_t'^2 + \tfrac{1}{2}\Sigma S'_t S'_{t+1}$$

It follows:

$$b = \frac{\Sigma S'_t S_{t+1}}{\Sigma S_t'^2} = \tfrac{1}{2} + \tfrac{1}{2}\frac{\Sigma S'_t S'_{t+1}}{\Sigma S_t'^2}$$

but it may be shown that:

$$\frac{\Sigma S'_t S'_{t+1}}{\Sigma S_t'^2} < 1$$

in the same way as this was demonstrated for $(\Sigma S_t S_{t+1})/\Sigma S_t^2$. It follows then that $b < 1$.

5. We shall also demonstrate the equality:

$$b = \frac{\Sigma S'_t S_{t+1}}{\Sigma S_t'^2} = \frac{\Sigma(S_{t+1} - S_t)^2}{\Sigma S_t'^2} \tag{19}$$

which will be used in the further argument. According to equation (18):

$$\Sigma S'_t S_{t+1} = \tfrac{1}{2}\Sigma S_t'^2 + \tfrac{1}{2}\Sigma S'_t S'_{t+1}$$

Owing to periodicity of the S curve:

$$\Sigma S_t'^2 = \Sigma S_{t+1}'^2 \tag{20}$$

It follows that:

$$\Sigma S'_t S_{t+1} = \left(\tfrac{1}{4}S_t'^2 + \tfrac{1}{4}S_{t+1}'^2 + 2\frac{S'_t}{2}\frac{S'_{t+1}}{2}\right) = \Sigma\left(\frac{S'_t}{2} + \frac{S'_{t+1}}{2}\right)^2$$

However, according to equation (18):

$$\frac{S'_t}{2} + \frac{S'_{t+1}}{2} = S_{t+1} - S_t$$

or

$$\Sigma S'_t S_{t+1} = \Sigma(S_{t+1} - S_t)^2$$

6. Taking into consideration that S_t is not correlated with S'_t, we have the following equation for the double correlation coefficient ρ of S_{t+1} with regard to S_t and S'_t:

$$\rho^2 = a^2\frac{\Sigma S_t^2}{\Sigma S_{t+1}^2} + b^2\frac{\Sigma S_t'^2}{\Sigma S_{t+1}^2} \tag{10}$$

where a and b are the respective regression coefficients.

As according to equation (16):

$$\Sigma S_{t+1}^2 = \Sigma S_t^2$$

$$\rho^2 = a^2 + b^2\frac{\Sigma S_t'^2}{\Sigma S_t^2}$$

Taking further into consideration that, according to equation (19),

$$b = \frac{\Sigma(S_{t+1} - S_t)^2}{\Sigma S_t'^2}$$

we have:

$$\Sigma S_t'^2 = \frac{\Sigma(S_{t+1} - S_t)^2}{b}$$

and

$$\rho^2 = a^2 + b\frac{\Sigma(S_{t+1} - S_t)^2}{\Sigma S_t^2}$$

As further, according to equation (17),

$$\frac{\Sigma(S_{t+1} - S_t)^2}{\Sigma S_t^2} = 2(1 - a)$$

we have finally:

$$\rho^2 = a^2 + 2b(1 - a) \qquad (11)$$

7. It follows easily from the argument in the preceding subsection that the partial correlation coefficient of S_{t+1} with regard to S_t is equal to a and that with regard to S'_t is equal to $\sqrt{2b(1 - a)}$.

PART 3

THEORY OF ECONOMIC DYNAMICS

Theory of Economic Dynamics: An Essay on Cyclical and Long-Run Changes in Capitalist Economy[1]

(1954)

Contents

Foreword

This volume is published in lieu of second editions of my *Essays in the Theory of Economic Fluctuations* and my *Studies in Economic Dynamics*. Nevertheless, this is essentially a new book. Although it covers the same ground as the previous two books and the basic ideas are not much changed, the presentation and even the argument have been substantially altered. Moreover, in some instances, especially in chapters 13 and 14, new subjects have been introduced. The scope of statistical illustrations has also been considerably widened, and statistical material which has become available in the meantime has been utilized.

It may be noticed at this point that in the statistical analysis the least-squares method is used. This may appear somewhat crude in the light of recent developments in statistical technique. It should be observed, however, that the purpose of the statistical analysis here is to show the plausibility of the relations between economic variables arrived at theoretically rather than to obtain the most likely coefficients of these relations. It is hoped that the precautions taken in the application of our simple statistical tools (especially in the analysis of the determinants of investment) are adequate to obtain first approximations for illustrative purposes.

Frequent use is made of formulae, but an effort has been made—in some instances even at the expense of precision—to apply elementary mathematics only.

I am very much indebted to Mrs Ting Kuan Shu-Chuang and to Mr Chang Tse-Chun for valuable suggestions with respect to improvement of presentation and for assistance in statistical research.

M. KALECKI

Foreword to the Japanese Edition[2]

I am very glad that the *Theory of Economic Dynamics* is being published in Japan, which is known for its keen interest in economic problems. On this occasion I should like to say a few words about my book.

The book is full of formulae, statistical data, scatter diagrams, and the like. This may mislead the reader into believing that the main subject of the book is the application of mathematics and statistics to economic analysis. This, however, is by no means the case. Mathematical formulae are applied merely in order to shorten the argument and to make it more precise. And statistical data are used to show that the theories arrived at do not contradict the facts, and thus that they provide a possible interpretation of the phenomena in question.

The actual purpose of the book, as indicated by the subtitle and the chapter headings, is to build up a coherent theory explaining the cyclical and long-run changes in the capitalist economy.

M. KALECKI

March 1957

Part I

Degree of Monopoly and Distribution of Income

1. Costs and Prices[3]

'Cost-determined' and 'demand-determined' prices

Short-term price changes may be classified into two broad groups: those determined mainly by changes in cost of production and those determined mainly by changes in demand. Generally speaking, changes in the prices of finished goods are 'cost-determined', while changes in the prices of raw materials inclusive of primary foodstuffs are 'demand-determined'. The prices of finished goods are affected, of course, by any 'demand-determined' changes in the prices of raw materials, but it is through the channel of *costs* that this influence is transmitted.

It is clear that these two types of price formation arise out of different conditions of supply. The production of finished goods is elastic as a result of existing reserves of productive capacity. When demand increases, it is met mainly by an increase in the volume of production, while prices tend to remain stable. The price changes which do occur result mainly from changes in costs of production.

The situation with respect to raw materials is different. The increase in the supply of agricultural products requires a relatively considerable time. This is true, although not to the same extent, with respect to mining. With supply inelastic in short periods, an increase in demand causes a diminution of stocks and a consequent increase in price. This initial price movement may be enhanced by the addition of a speculative element. The commodities in question are normally standardized, and are subject to quotation at commodity exchanges. A primary rise in demand which causes an increase in prices is frequently accompanied by secondary speculative demand. This makes it even more difficult in the short run for production to catch up with demand.

The present chapter will be devoted mainly to the study of the formation of 'cost-determined' prices.

Price fixing by a firm

Let us consider a firm with a given capital equipment. It is assumed that supply is elastic, i.e. that the firm operates below the point of practical capacity and that the prime costs (cost of materials and wages[1] per unit of output) are stable over the relevant range of output.[2] In view of the uncertainties faced in the process of price-fixing, it will not be assumed that the firm attempts to maximize its profits in any precise sort of manner. Nevertheless, it will be assumed that the actual level of overheads does not directly influence the determination of price, since the total of overhead costs remains roughly stable as output varies. Thus, the level of output and prices at which the sum of overheads and profits may be supposed to be highest is at the same time the level which may be considered to be most favourable to profits. (It will be seen at a later stage, however, that the level for overheads may have an indirect influence upon price formation.)

In fixing the price the firm takes into consideration its average prime costs and the prices of other firms producing similar products. The firm must make sure that the price does not become too high in relation to prices of other firms, for this would drastically reduce sales, and that the price does not become too low in relation to its average prime cost, for this would drastically reduce the profit margin. Thus, when the price p is determined by the firm in relation to unit prime cost u, care is taken that the ratio of p to the weighted average price of all firms, $\bar{p}$,[3] does not become too high. If u increases, p can be increased proportionally only if $\bar{p}$ rises proportionally as well. But if $\bar{p}$ increases less than u, the firm's price p will also be raised less than

[1] Salaries are included in overheads.

[2] In fact, unit prime costs fall somewhat in many instances as output increases. We ignore this complication, which is of no major importance. The assumption of an almost horizontal short-run prime cost curve was made in my *Essays on the Theory of Economic Fluctuations*, back in 1939. Since that time it has been proved by many empirical enquiries, and has played, explicitly or implicitly, an important role in economic research. (See e.g. W. W. Leontief, *The Structure of American Economy*, Cambridge, Mass., Harvard Univ. Press, 1941.)

[3] Weighted by the respective outputs and inclusive of the firm in question.

u. These conditions are clearly satisfied by the formula

$$\bar{p} = mu + n\bar{p} \tag{1}$$

where both m and n are positive coefficients.

We postulate that $n < 1$, for the following reason. In the case where the price p of the firm considered is equal to the average price $\bar{p}$, we have:

$$p = mu + np$$

from which it follows that n must be less than 1.[4]

The coefficients m and n characterizing the price-fixing policy of the firm reflect what may be called the degree of monopoly of the firm's position. Indeed, it is clear that equation (1) describes semi-monopolistic price formation. Elasticity of supply and stability of unit prime costs over the relevant range of output is incompatible with so-called perfect competition. For if perfect competition were to prevail the excess of the price p over the unit prime costs u would drive the firm to expand its output up to the point where full capacity is reached. Thus any firm remaining in the business would work up to capacity, and the price would be pushed up to the level which balances demand and supply.

For the analysis of changes in the degree of monopoly, it is convenient to use diagrammatic presentation. Let us divide equation (1) by the unit prime cost u:

$$\frac{p}{u} = m + n\frac{\bar{p}}{u}$$

This equation is represented in Fig. 20, where $\bar{p}/u$ is taken as abscissa and p/u as ordinate, by a straight line AB. The inclination of AB is less than 45° because $n < 1$. The position of this straight line which is fully determined by m and n reflects the degree of monopoly. When, as a result of change in m and n, the straight line moves up from the position of AB to that of $A'B'$, then to a given average price $\bar{p}$ and unit prime cost u there corresponds a higher price p of the firm over the relevant range of $\bar{p}/u$. We shall say in this case that the degree of monopoly increases. When, on the other hand, the straight line moves down to the position $A''B''$ we shall say that the degree of monopoly diminishes. (We assume that m and n always change in such a way that none of the lines corresponding to various positions of AB intersects any other over the relevant range of $\bar{p}/u$.)

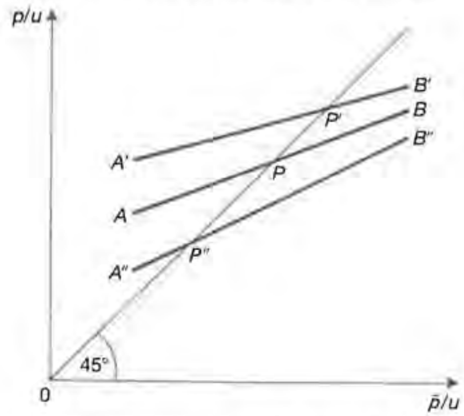

FIG. 20. *Changes in the Degree of Monopoly*

We may now demonstrate a proposition which is of some importance to our future argument. Let us take into consideration the points of intersection P, P', P'' of the straight lines AB, $A'B'$, $A''B''$ with the line $0K$ drawn through zero point at 45°. It is clear that the higher the degree of monopoly the larger the abscissa of the respective point of intersection. Now this point is determined by the equations

$$\frac{p}{u} = m + n\frac{\bar{p}}{u} \quad \text{and} \quad \frac{p}{u} = \frac{\bar{p}}{u}$$

It follows that the abscissa of the point of intersection is equal to $m/(1 - n)$. Consequently a higher degree of monopoly will be reflected in the increase of $m/(1 - n)$ and conversely.

In this section and the subsequent one, the discussion of the influence of the degree of monopoly upon price formation is rather formal in character. The actual reasons for the changes in the degree of monopoly are examined at a later stage.

Price formation in an industry: a special case

We may commence the discussion of the determination of average price in an industry by considering a case where the coefficients m and n are the same for all firms, but where their unit prime costs u differ.

We have then, on the basis of equation (1):

$$\begin{aligned} p_1 &= mu_1 + n\bar{p} \\ p_2 &= mu_2 + n\bar{p} \ldots \\ p_k &= mu_k + n\bar{p} \end{aligned} \tag{1a}$$

If these equations are weighted by their respective outputs (that is, each multiplied by its respective output, all added, and the sum divided by the aggregate output) we obtain:

$$\bar{p} = m\bar{u} + n\bar{p}$$

so that

$$\bar{p} = \frac{m}{1-n}\bar{u} \tag{2}$$

Let us recall that, according to the preceding section, the higher the degree of monopoly the higher $m/(1 - n)$. We can thus conclude: the average price $\bar{p}$ is proportional to the average unit prime cost $\bar{u}$ if the degree of monopoly is given. If the degree of monopoly increases, $\bar{p}$ rises in relation to $\bar{u}$.

It is still important to see in what way a new 'price equilibrium' is reached when the unit prime costs change as a result of changes in prices of raw materials or unit wage costs. Let us denote the 'new' unit prime costs by u_1, u_2, etc., and the 'old' prices by p_1', p_2', etc. The weighted average of these prices is $\bar{p}'$. To this correspond new prices p_1'', p_2'', etc., equal to $mu_1 + n\bar{p}'$, $mu_2 + n\bar{p}'$, etc. This leads in turn to a new average price, $\bar{p}''$, and so on, the process finally converging to a new value of $\bar{p}$ given by formula (2). This convergence of the process depends on the condition $n < 1$. Indeed, from equation (1a) we have:

$$\bar{p}'' = m\bar{u} + n\bar{p}'$$

and for the new final $\bar{p}$:

$$\bar{p} = m\bar{u} + n\bar{p}$$

Subtracting the latter equation from the former, we obtain:

$$\bar{p}'' - \bar{p} = n(\bar{p}' - \bar{p})$$

which shows that the deviation from the final value $\bar{p}$ diminishes in geometric progression, given that $n < 1$.

Price formation in an industry: general case

We shall now consider the general case where coefficients m and n differ from firm to firm. It appears that, by a procedure similar to that applied in the special case, the formula

$$\bar{p} = \frac{\bar{m}}{1 - \bar{n}} \bar{u} \tag{2a}$$

is reached. $\bar{m}$ and $\bar{n}$ are weighted averages of the coefficients m and n.[4]

Let us now imagine a firm for which coefficients m and n are equal to $\bar{m}$ and $\bar{n}$ for the industry. We may call it a representative firm. We may further say that the degree of monopoly of the industry is that of the representative firm. Thus the degree of monopoly will be determined by the position of the straight line corresponding to

$$\frac{p}{u} = \bar{m} + \bar{n}\frac{\bar{p}}{u}$$

A rise in the degree of monopoly will be reflected in the upward shift of this straight line (see Fig. 20). It follows from the argument on p. 212 that the higher the degree of monopoly, according to this definition, the higher is $\bar{m}/(1 - \bar{n})$.

From this and from equation (2a) there follows the generalization of the results obtained in the preceding section for a special case. The average price $\bar{p}$ is proportional to the average unit prime cost $\bar{u}$ if the degree of monopoly is given. If the degree of monopoly increases, $\bar{p}$ rises in relation to $\bar{u}$.

The ratio of average price to average prime cost is equal to the ratio of the aggregate proceeds of industry to aggregate prime costs of industry. It follows that the ratio of proceeds to prime costs is stable, increases, or falls depending on what happens to the degree of monopoly.

It should be recalled that all the results obtained here are subject to the assumption of elastic supply. When firms reach their practical capacity, a further rise in demand will cause a price increase beyond the level indicated by the above considerations. However, this level might be maintained for some time while the firm allows orders to pile up.

[4] $\bar{m}$ is the average of m weighted by total prime costs of each firm; $\bar{n}$ is the average of n weighted by respective outputs.

Causes of change in the degree of monopoly

We shall confine ourselves here to a discussion of the major factors underlying changes in the degree of monopoly in modern capitalist economies. First and foremost the process of concentration in industry leading to the formation of giant corporations should be considered. The influence of the emergence of firms representing a substantial share of the output of an industry can be readily understood in the light of the above considerations. Such a firm knows that its price p influences appreciably the average price $\bar{p}$, and moreover that the other firms will be pushed in the same direction because their price formation depends on the average price $\bar{p}$. Thus the firm can fix its price at a level higher than would otherwise be the case. The same game is played by other big firms, and thus the degree of monopoly increases substantially. This state of affairs can be reinforced by tacit agreement. (Such an agreement may take *inter alia* the form of price-fixing by one large firm, the 'leader', while other firms follow suit.) Tacit agreement, in turn, may develop into a more or less formal cartel agreement which is equivalent to full-scale monopoly restrained merely by fear of new entrants.

The second major influence is the development of sales promotion through advertising, selling agents, etc. Thus, price competition is replaced by competition in advertising campaigns, etc. These practices also will obviously cause a rise in the degree of monopoly.

In addition to the above, two other factors must be considered: (i) the influence of changes in the level of overheads in relation to prime costs upon the degree of monopoly, and (ii) the significance of the power of trade unions.

If the level of overheads should rise considerably in relation to prime costs, there will necessarily follow a squeeze of profits unless the ratio of proceeds to prime costs is permitted to rise. As a result, there may arise a tacit agreement among the firms of an industry to protect profits, and consequently to increase prices in relation to unit prime costs. For instance, the increase in capital costs per unit of output as a result of the introduction of techniques which increase capital intensity may tend to raise the degree of monopoly in this way.

The factor of 'protection' of profits is especially apt to appear during periods of depression. The situation in such periods is as follows. Aggregate proceeds would fall in the same proportion as prime costs if the degree of monopoly remained unchanged. At the same time, aggregate overheads by their very nature fall in a depression less than prime costs. This provides a background for tacit agreements not to reduce prices in the same proportion as prime costs. As a result, there is a tendency for the degree of monopoly to rise in the slump, a tendency which is reversed in the boom.[5]

Although the above considerations show a channel through which overheads may affect price formation, it is clear that their influence upon prices in our theory is much less clear-cut than that of prime costs. The degree of a monopoly *may*, but need not necessarily, increase as a result of a rise in overheads in relation to prime costs. This and the emphasis on the influence of prices of other firms constitute the difference between the theory presented here and the so-called full-cost theory.

Let us turn now to the problem of the influence of trade union strength upon the degree of monopoly. The existence of powerful trade unions may tend to reduce profit margins for the following reasons. A high ratio of profits to wages strengthens the bargaining position of trade unions in their demands for wage increases, since higher wages are then compatible with 'reasonable profits' at existing price levels. If after such increases are granted prices should be raised, this would call forth new demands for wage increases. It follows that a high ratio of profits to wages cannot be maintained without creating a tendency towards rising costs. This adverse effect upon the competitive position of a firm or an industry encourages the adoption of a policy of lower profit margins. Thus, the degree of monopoly will be kept down to some extent by the activity of trade unions, the more so the stronger the trade unions are.

The changes in the degree of monopoly are of decisive importance not only for the distribution of income between workers and capitalists, but in some instances for the distribution of income within the capitalist class as well. Thus the rise in the degree of monopoly caused by the growth of big corporations results in a relative shift of income from other industries to industries dominated by such corporations. In this way income is redistributed from small to big business.

Long-run and short-run cost–price relations

The cost–price relations arrived at above were based on short-run considerations. However, the only parameters which enter the equations in question are coefficients m and n, reflecting the degree of monopoly. These may, but need not necessarily, change in the long run. If m and n *are* constant, the long-run changes in prices will reflect only the long-run changes in unit prime costs. Technological progress will tend to reduce the unit prime cost u. But the *relations* between prices and unit prime costs can be affected by changes in equipment and technique only to the extent to which they influence the degree of monopoly.[6] The latter possibility was indicated above when it was mentioned that the degree of monopoly may be influenced by the level of overheads in relation to prime costs.

[5] This is the basic tendency; however, in some instances the opposite process of cut-throat competition may develop in a depression.

It should be noticed that the whole approach is in contradiction to generally accepted views. It is usually assumed that as a result of increasing intensity of capital, i.e. an increasing amount of fixed capital per unit of output, there is of necessity a continuous increase in the ratio of price to unit prime cost. The view is apparently based on the assumption that the sum of overheads and profits varies in the long run roughly proportionally with the value of capital. Thus the rise in capital in relation to output is translated into a higher ratio of overheads plus profits to proceeds, and the latter is equivalent to an increase in the ratio of prices to unit prime costs.

Now, it appears that profits plus overheads may show a long-run fall in relation to the value of capital, and as a result that the ratio of price to unit prime cost may remain constant even though capital increases in relation to output. This is illustrated by developments in American manufacturing in the period 1899–1914 (see Table 29).

As will be seen from the table, fixed capital rose continuously in relation to production over the period considered, while the ratio of proceeds to prime costs remained roughly stable. This is explained by a fall in profits plus overheads in relation to the value of fixed capital (both in relation to its book value and in relation to its value at current prices).

There remains, of course, the possibility stated above that the rise in overheads in relation to prime costs as a result of the increase in capital intensity may cause a rise in the degree of monopoly because of a tendency to 'protect' profits; this tendency, however, is by no means automatic and may not materialize, as is shown by the above example.

We have dealt above with certain questions which arise in connection with the application of our theory to the long-run phenomena.

[6] This, however, is qualified by the assumption underlying our cost–price equations, namely that the unit prime cost does not depend on the degree of utilization of equipment and that the limit of practical capacity is not reached. See p. 211.

Table 29. *Capital Intensity and the Ratio of Proceeds to Prime Costs in Manufacturing in the USA, 1899–1914*

Year	Ratio of real fixed capital to production	Ratio of overheads and profits		Ratio of proceeds to prime costs (%)
		To book value of fixed capital	To value of fixed capital at current prices	
	1899 = 100			
1899	100	100	100	133
1904	111	95	96	133
1909	125	89	84	133
1914	131	80	73	132

Sources: NBER; Paul H. Douglas, *The Theory of Wages*; US census of manufactures. For details see statistical appendix, n. 1.

When this theory is applied to the analysis of price formation in the course of a business cycle, the problem arises whether our formulae hold good in the boom. Indeed, in such periods the utilization of equipment may reach the point of practical capacity and thus, under the pressure of demand, prices may exceed the level indicated by these formulae. It seems, however, that as a result of the availability of reserve capacities and the possibility of increasing the volume of equipment whenever bottle-necks occur, this phenomenon is not frequently encountered even in booms. In general, it seems to be restricted to war or post-war developments, where shortages of raw materials or equipment severely limit supply in relation to demand. It is this type of increase in prices which is the basic reason for the inflationary developments prevailing in such periods.

Application to the long-run changes in US manufacturing

As the ratio of price to unit prime cost is equal to the ratio of aggregate proceeds to aggregate prime costs, the changes in this ratio can be analysed empirically for various industries on the basis of the US census of manufactures, which gives the value of products, the cost of materials, and the wage bill for each industry. However, the changes in the ratio of proceeds to prime costs for a single industry which, according to the above, are determined by changes in the degree of monopoly, reflect changes in conditions particular to that industry. For instance, a change in the price policy of one big firm may cause

a fundamental change in the degree of monopoly in that industry. For this reason we limit our considerations here to the manufacturing industry as a whole, and thus are able to interpret the changes in the ratio of proceeds to prime cost in terms of major changes in industrial conditions.

We thus take into consideration the ratio of the aggregate proceeds of US manufacturing to its aggregate prime costs. The following difficulty arises, however. This ratio reflects not merely the changes in the ratios of proceeds to prime costs of single industries, but also shifts in their importance in manufacturing as a whole. For this reason, Table 30 gives not only the ratio of proceeds to prime costs of US manufacturing, but also such a ratio calculated on the assumption that from one period to another the relative share of major industrial groups in the aggregate value of proceeds is stable.[7] The actual difference between these two series appears to be in general not significant.

It will be seen that there is a substantial increase in the ratio of proceeds to prime costs from 1879 to 1889. It is generally known that this period marked a change in American capitalism characterized by the formation of giant industrial corporations. It is thus not surprising that the degree of monopoly increased in that period.

Table 30. *Ratio of Proceeds to Prime Costs in Manufacturing in the USA, 1879–1937*

Year	Original data (%)	Assuming stable industrial composition, base year 1899 (%)
1879	122.5	124.0
1889	131.7	131.0
1899	133.3	133.3
1914	131.6	131.4
1923	133.0	132.7
1929	139.4	139.6
1937	136.3	136.8

Source: US census of manufactures.

[7] The details of the calculation, as well as the adjustments which have been made in order to assure approximate comparability for various census years which was upset by the changes in the scope and methods of the census, are described in the statistical appendix, nn. 2 and 3.

From 1889 to 1923 there is little change in the ratio of proceeds to prime costs. A marked increase, however, appears again in the period 1923–9. The rise in the degree of monopoly in this period is partly accounted for by what may be called a 'commercial revolution'—a rapid introduction of sales promotion through advertising, selling agents, etc. Another factor was a general increase in overheads in relation to prime costs which occurred in this period.

It may be questioned whether the high level of the ratio of proceeds to prime costs in 1929 was not due, at least partly, to firms reaching their full capacity in the boom. It should be noticed, however, that the degree of utilization of equipment was not higher in 1929 than in 1923. It also appears from the consideration of the census figures in 1925 and 1927 that the rise in ratio of proceeds to prime costs in 1923–9 was gradual in character.

From 1929 to 1937 the ratio of proceeds to prime costs shows a moderate reduction. This can probably be attributed largely to the rise in the power of trade unions.

The explanations given here are tentative and sketchy in character. Indeed, the interpretation of the movement of the ratio of proceeds to prime costs in terms of changes in the degree of monopoly is really the task of the economic historian, who can contribute to such a study a more thorough knowledge of changing industrial conditions.

Application to US manufacturing and retail trade during the great depression

Table 31 gives the ratio of proceeds to prime costs for US manufacturing for 1929, 1931, 1933, 1935, and 1937. Again, in addition to the original ratio of proceeds to prime cost the ratio adjusted for changes in composition in the value of products is given.[8] As in the previous table, the two series do not differ significantly. For this period the ratio of aggregate retail sales of consumer goods in the USA to their cost to retailers is also available. This corresponds roughly to the ratio of proceeds to prime costs for the retail trade, and is included in Table 31 (a series adjusted for composition of sales was not calculated).

It will be seen that the ratio of proceeds to prime costs tended to increase in the depression; but taking into consideration the extent of

[8] As in the preceding table, the figures were adjusted for changes in the scope and methods of the census (see statistical appendix, nn. 2 and 3).

Table 31. *Ratio of Proceeds to Prime Costs in Manufacturing and Retail Trade in the USA, 1929–1937*

Year	Ratio of proceeds to prime costs in manufacturing industries		Ratio of sales to costs in retail trade
	Original data	Assuming stable industrial composition, base year 1929 (%)	
1929	139.4	139.4	142.0
1931	143.3	142.2	144.7
1933	142.8	142.3	148.8
1935	136.6	136.7	140.8
1937	136.3	136.6	140.7

Sources: US census of manufactures; B. M. Fowler and W. H. Shaw, 'Distributive Costs of Consumption Goods', *Survey of Current Business*, July 1942.

the depression in the 1930s, the change is very moderate. The increase in the ratio can be attributed to a rise in overheads in relation to prime costs, which fostered tacit agreements to protect profits and thus to raise the degree of monopoly. It will be seen that during the recovery from 1933 to 1937 there was a reverse movement. For manufacturing, however, the ratio of proceeds to prime cost fell to a level which was significantly lower than in 1929. As suggested in the preceding section, this is probably the result of a considerable strengthening of trade unions in the period 1933–7.

Fluctuations in prices of raw materials

As stated at the beginning of this chapter, short-run changes in the prices of primary products largely reflect changes in demand. Thus they fall considerably during downswings and rise substantially during upswings.

It is known that prices of raw materials undergo larger cyclical fluctuations than wage rates. The causes of this phenomenon can be explained as follows. Even with constant wage rates, the prices of raw materials would fall in a depression as a result of a slump in 'real' demand. Now, the cuts in money wages during a depression can never catch up with the price of raw materials, because wage cuts in turn cause a fall in demand and hence a new fall in the prices of primary products. Imagine that the prices of raw materials fall by 20% as

Table 32. *Indices of Prices of Raw Materials and of Hourly Earnings in Manufacturing, Mining, Construction, and Railroads in the USA, 1929–1941*

Year	Prices of raw materials	Hourly earnings	Ratio of prices of raw materials to hourly earnings
1929	100.0	100.0	100.0
1930	86.5	99.1	87.3
1931	67.3	94.5	71.2
1932	56.5	82.1	68.8
1933	57.9	80.9	71.6
1934	70.4	93.8	75.1
1935	79.1	98.0	80.7
1936	81.9	99.5	82.3
1937	87.0	109.6	79.4
1938	73.8	111.1	66.4
1939	72.0	112.3	64.1
1940	73.7	115.7	63.7
1941	85.6	126.6	67.6

Sources: Dept. of Commerce, statistical abstract of the USA; *Survey of Current Business, Supplement*.

a result of the slump in real demand. Imagine further that the wage rate is cut subsequently by 20% also. The theory of price formation developed above shows that the general price level will in consequence also fall by around 20%. (The degree of monopoly is likely to increase somewhat, but not much.) But this will cause a corresponding fall in incomes, in demand, and thus in prices of raw materials.

Table 32 compares indices of prices of raw materials and hourly earnings in the USA in the period 1929–41.

The ratio of prices of raw materials to hourly wages shows a long-run downward trend which in part reflects the rise in productivity of labour. This does not, however, obscure the cyclical pattern, which is manifested in particular in the decided fall in both the slump of 1929–33 and that of 1937–8.

Price formation of finished goods

The formation of prices of finished goods according to the above theory is the result of price formation at each stage of production on

the basis of the formula:

$$\bar{p} = \frac{\bar{m}}{1-\bar{n}}\bar{u} \tag{2}$$

With a given degree of monopoly, prices at each stage are proportional to unit prime costs. In the first stage of production, prime costs consist of wages and the cost of primary products. In the next stage the prices are formed on the basis of the prices of the previous stage and the wages of the present stage, and so on. It is easy to see, therefore, that with a given degree of monopoly, prices of finished goods are homogeneous linear functions of prices of primary materials on the one hand, and of wage costs at all stages of production on the other.

Since fluctuations of wages in the course of the business cycle are much smaller than those of prices of raw materials (see the preceding section), it follows directly that prices of finished goods also tend to fluctuate considerably less than prices of raw materials.

As to different categories of prices of finished goods, it has been frequently assumed that the prices of investment goods during a depression fall more than prices of consumer goods. There is no basis for such a contention in the present theory. There may even be a certain presumption in favour of some fall in the prices of consumer goods in relation to the prices of investment goods. The weight of primary products inclusive of food is probably higher in the aggregate in the case of consumer goods than in the case of investment goods, and the prices of primary products fall more than wages during a depression.

Table 33 gives the indices of prices of raw materials, of consumer prices (at retail level), and of prices of finished investment goods for the USA during 1929–41. It will be seen that the prices of raw materials showed much larger fluctuations than the prices of finished consumer or investment goods.

The ratio of the prices of investment goods to the prices of consumer goods shows a distinct rising trend. However, from the time-curve of this ratio in Fig. 21 it is apparent that there was a more pronounced rise during the downswings of 1929–33 and 1937–8[9] than in the period considered as a whole. It appears, on the other hand, that these cyclical fluctuations of the ratio of the prices of investment goods to

[9] In the latter case, however, the phenomenon seems to have been exaggerated by special factors.

Table 33. *Indices of Prices of Raw Materials, Consumer Goods, and Investment Goods in the USA, 1929–1941*

Year	Prices of raw materials	Prices of consumer goods[a]	Prices of investment goods[a]	Ratio of prices of investment goods to prices of consumer goods
1929	100.0	100.0	100.0	100.0
1930	86.5	95.3	97.2	102.0
1931	67.3	85.3	89.2	104.3
1932	56.5	75.0	80.3	107.1
1933	57.9	71.5	78.3	109.5
1934	70.4	75.8	85.8	113.2
1935	79.1	77.8	84.7	108.9
1936	81.9	78.5	87.3	111.2
1937	87.0	81.5	92.4	113.4
1938	73.8	79.6	95.8	120.4
1939	72.0	78.9	94.4	119.6
1940	73.7	79.8	96.9	121.4
1941	85.6	84.8	102.9	121.3

[a] Price indices implicit in the deflation of consumption and fixed-capital investment calculated from *National Income Supplement to Survey of Current Business*, 1951. It is clear that these indices are of the Paasche type.

Source: Dept. of Commerce, *Survey of Current Business.*

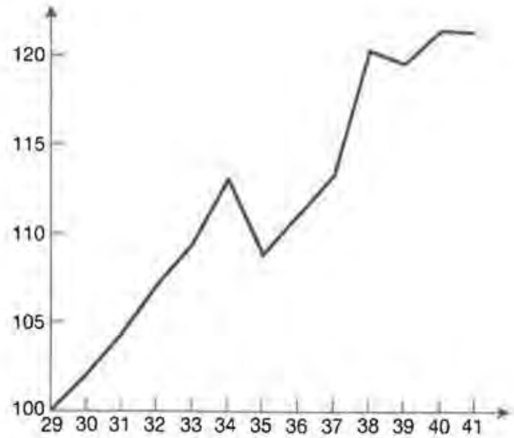

FIG. 21. *Ratio of Prices of Investment Goods to Prices of Consumer Goods, USA, 1929–1941*

the prices of consumer goods, although clearly marked, are rather small in amplitude.

2. Distribution of National Income

Determinants of the relative share of wages in income

We shall now link the ratio of proceeds to prime costs in an industry, which we discussed in the previous chapter, with the relative share of wages in the value added of that industry. The value added, i.e. the value of products less the cost of materials, is equal to the sum of wages, overheads, and profits. If we denote aggregate wages by W, the aggregate cost of materials by M, and the ratio of aggregate proceeds to aggregate prime cost by k, we have:

$$\text{overheads} + \text{profits} = (k-1)(W+M)$$

where the ratio of proceeds to prime costs k is determined, according to the above, by the degree of monopoly. The relative share of wages in the value added of an industry may be represented as

$$w = \frac{W}{W + (k-1)(W+M)}$$

If we denote the ratio of the aggregate cost of materials to the wage bill by j, we have:

$$w = \frac{1}{1 + (k-1)(j+1)} \tag{3}$$

It follows that the relative share of wages in the value added is determined by the degree of monopoly and by the ratio of the materials bill to the wage bill.

A similar formula to that established for a single industry can now be written for the manufacturing industry as a whole. However, here the ratio of proceeds to prime costs and the ratio of the cost of materials to wages depend also on the importance of particular industries in manufacturing taken as a whole. In order to separate this element, we can proceed as follows. In formula (3), for k, the ratio of proceeds to prime costs, and for j, the ratio of the materials bill to the wage bill, we substitute the ratios k' and j', adjusted in such a way as to eliminate the effect of changes in the importance of particular industries. Thus we obtain:

$$w' = \frac{1}{1 + (k' - 1)(j' + 1)} \tag{3a}$$

The relative share of wages in the value added, w', obtained in this way will deviate from the actual relative share of wages, w, by an amount which will be due to changes in the industrial composition of value added.

Of the parameters in formula (3a), k' is determined by the degree of monopoly in manufacturing industries. The problem of determinants of j' is somewhat more complicated. Prices of materials are determined by the prices of primary products, by wage costs at the lower stages of production, and by the degree of monopoly at those stages. Thus, roughly speaking, j', which equals the ratio of unit costs of materials to unit wage costs, is determined by the ratio of prices of primary products to unit wage costs and by the degree of monopoly in manufacturing.[10] To summarize: the relative share of wages in the value added of manufacturing is determined, apart from the industrial composition of the value added, by the degree of monopoly and by the ratio of raw-material prices to unit wage costs. A rise in the degree of monopoly or in raw-material prices in relation to unit wage costs causes a fall of the relative share of wages in the value added.

It should be recalled in this connection that, as distinguished from prices of finished goods, the prices of raw materials are 'demand-determined'. The ratio of raw-material prices to unit wage costs depends on the demand for raw materials, as determined by the level of economic activity, in relation to their supply, which is inelastic in the short run (see pp. 209 and 221–2).

We can now consider, in much the same way as above, a group of industries broader than manufacturing where the pattern of price formation may be assumed to be similar, namely manufacturing, construction, transportation, and services. For this group as a whole, the relative share of wages in the aggregate value added will decrease with an increase in the degree of monopoly or an increase in the ratio of prices of primary products to unit wage costs. The result will also be

[10] This rough generalization is based on 2 simplifying assumptions: (i) that unit costs of materials change proportionally with prices of materials, i.e. changing efficiency in the utilization of materials is not taken into account; and (ii) that unit wage costs at the lower stages of production vary proportionally with unit wage costs at higher stages.

affected, of course, by changes in the industrial composition of the value added of the group.

It may now be shown that this theorem can be generalized to cover the relative share of wages in the gross national income of the private sector (i.e. national income gross of depreciation exclusive of income of government employees). In addition to the sectors of the economy accounted for above, we have still to consider agriculture and mining, communications and public utilities, trade, real estate, and finance. In agriculture and mining, the products are raw materials and the relative share of wages in the value added depends mainly on the ratio of prices of the raw materials *produced* to their unit wage costs. In the remaining sectors, the relative share of wages in the value added is negligible. It will thus be seen that, broadly speaking, the degree of monopoly, the ratio of prices of raw materials to unit wage costs, and industrial composition[11] are the determinants of the relative share of wages in the gross income of the private sector.

Long-run and short-run changes in the distribution of income

The long-run changes in the relative share of wages, whether in the value added of an industrial group such as manufacturing or in the gross income of the whole private sector, are, according to the above, determined by long-run trends in the degree of monopoly, in the prices of raw materials in relation to unit wage costs, and in industrial composition. The degree of monopoly has a general tendency to increase in the long run and thus to depress the relative share of wages in income, although, as we have seen above, this tendency is much stronger in some periods than in others. It is difficult, however, to generalize about the relation of raw-material prices to unit wage costs (which depends on long-run changes in the demand–supply position of raw materials) or about industrial composition. No a priori statement is therefore possible as to the long-run trend of the relative share of wages in income. As we shall see in the next section, the relative share of wages in the value added of US manufacturing declined considerably after 1880, whereas in the UK wages maintained their share in the national income from the 1880s to 1924, showing long-run ups and downs in the intervening period.

[11] It should be noticed that by industrial composition we mean the composition of the *value* of the gross income of the private sector. Thus, changes in the composition depend not only on changes in the *volume* of the industrial components but also on the relative movement of the respective prices.

It is possible to say something more specific about changes in the relative share of wages in income in the course of the business cycle. We have found that the degree of monopoly is likely to increase somewhat during depressions (see p. 216). Prices of raw materials fall in the slump in relation to wages (see p. 222). The former influence tends to reduce the relative share of wages in income and the latter to increase it. Finally, changes in industrial composition during a depression adversely affect the relative share of wages. Indeed, these changes are dominated by a reduction of investment in relation to other activities, and the relative share of wages in the income of investment goods industries is generally higher than in other industries. (In communications, public utilities, trade, real estate, and finance, particularly, wage payments are relatively unimportant.)

The net effect of changes in these 3 factors upon the relative share of wages in income—of which the first and the third are negative and the second positive—appears to be small. Thus the relative share of wages, whether in the value added of an industrial group or in the gross income of the private sector as a whole, does not seem to show marked cyclical fluctuations.

The above may be illustrated (i) by an analysis of the long-run changes in the relative share of wages in the value added of US manufacturing and in the national income of the UK; (ii) by an analysis of changes in the relative share of wages in the value added of US manufacturing during the great depression; and (iii) by an analysis of changes during the same period in the relative share of wages in the national income of the USA and the UK.

Long-run changes in the relative share of wages in the value added of US manufacturing and in the national income of the UK

The long-run changes in the relative share of wages in the value added of US manufacturing are analysed in Table 34. In the first 2 columns, k' and j' are given, i.e. the 'adjusted' ratio of proceeds to prime costs and the 'adjusted' ratio of the materials bill to the wage bill.[12] From these two series w', the adjusted relative share of wages in the value added, is derived by employing formula (3a). Finally, the actual

[12] The 'adjusted' ratio of proceeds to prime costs, k', is the same series as in Table 31 above. For the original values of the ratio of the materials bill to the wage bill, and for the description of the calculation of the 'adjusted' series j' given in Table 34, see statistical appendix, nn. 2 and 3. The adjustments introduced for changes in the scope and methods of the census are also described there.

Table 34. *Relative Share of Wages in Value Added in the US Manufacturing Industry, 1879–1937*

Year	Ratio of proceeds to prime costs (%) — Assuming stable industrial composition (base year 1899) k'	Ratio of materials bill to wage bill (%) j'	Share of wages in value added (%) w'	Share of wages in value added (%) Original data w
1879	124.0	355	47.8	47.8
1889	131.0	297	44.8	44.6
1899	133.3	337	40.7	40.7
1914	131.4	341	41.9	40.2
1923	132.7	292	43.8	41.3
1929	139.6	311	38.1	36.2
1937	136.3	298	40.9	38.6

Source: US census of manufactures.

relative share of wages in the value added is given. The changes in the difference $w - w'$ indicate the influence of changes in the industrial composition of value added.

It appears that w, the actual relative share of wages in the value added, suffered a considerable though not quite continuous fall over the period considered. This fall resulted mainly from the increase in the 'adjusted' ratio of proceeds to prime costs, k', which in our interpretation reflects a rise in the degree of monopoly. The 'adjusted' ratio of the materials bill to the wage bill, j', tended to fall rather than to rise and thus in general its changes mitigated the decline in w. Finally, the effect of changes in industrial composition was to reduce the actual relative share of wages in the value added w: indeed, the latter fell more than its adjusted value w'.

No data exist with respect to the relative share of wages in the national income of the USA over a long period. Such data, however, are available for the UK.

Table 35 gives the relative share of wages in the national home-produced income[13] of the UK. The table includes in addition the ratio

[13] Home-produced national income is national income exclusive of income from foreign investments, which is irrelevant to the problem of distribution considered here. It should be noticed that even after this adjustment the data do not correspond fully to our concepts, because they relate to net rather than to gross national income, and because national income includes the income of government employees while we dealt above with the relative share of wages in the income of the private sector. However, it seems probable that these factors could not seriously affect the trend of the relative share of wages in the national income.

Table 35. *Relative Share of Wages in Home-Produced National Income of the UK, 1881–1924*

Period	Relative share of wages (%)	Ratio of Sauerbeck index of wholesale prices to index of wage rates (1881 = 100)
1881–5	40.0	93.6
1886–90	40.5	80.8
1891–5	41.7	73.5
1896–1900	40.7	70.6
1901–5	39.8	72.4
1906–10	37.9	78.3
1911–13	37.1	82.1
1924	40.6	69.6

Source: A. R. Prest, 'National Income of the United Kingdom', *Economic Journal*, Mar. 1948; unpublished estimates of UK income from overseas by F. Hilgerdt; *Statist*; A. L. Bowley, *Wages and Income in the United Kingdom Since 1860*, Cambridge, Cambridge Univ. Press, 1937, Table 1, p. 6, Woods' index of wage rates.

of the Sauerbeck index of wholesale prices to the index of wage rates, which can be taken as an approximate indicator of changes in the ratio of prices of raw materials to unit wage costs. Although the Sauerbeck index is a general index of wholesale prices, it is based mainly on prices of raw materials and semi-manufactures. It is true that the index of wage rates rises more quickly (or falls more slowly) than the index of wage costs, due to the secular increase in productivity, and thus a decreasing trend is involved in our indicator of the ratio of raw-material prices to unit wage costs. However, this trend is likely to be slow, especially since the wage-rate index is partly based on piece-rates. It is therefore very likely that the ratio of prices of raw materials to wage costs fell between 1881–5 and 1891–5 as did the indicator. It certainly rose between 1896–1900 and 1911–13; and it fell again between 1911–13 and 1924.

The movement of the relative share of labour in the national income may be plausibly interpreted in the following way. While there was a long-run rise in the degree of monopoly, its influence was largely offset by the fall in the ratio of raw-material prices to unit wage costs between 1881–5 and 1891–5. The influence of the degree of monopoly was reinforced by the rise of the ratio of raw-material prices to unit

wage costs in the period 1896–1900 and 1911–13, and finally more than offset by a fall in this ratio between 1911–13 and 1924. Thus, the fact that the relative share of wages in the national income was about the same in 1924 as in 1881–5 would be, according to this interpretation, the result of the accidental balancing of the influence of changes in the degree of monopoly and changes in the ratio of raw-material prices to unit wage costs. Unfortunately, this interpretation cannot be considered conclusive because of the possible influence of changes in the industrial composition of national income.

Changes in the relative share of wages in the value added of US manufacturing during the great depression

In Table 36, changes in the relative share of wages in the value added of US manufacturing during the great depression are analysed by employing the same method as that used for the analysis of long-run changes (cf. Table 34). The table contains the 'adjusted' ratio of proceeds to prime costs k', and the 'adjusted' ratio of the material bill to the wage bill j'.

From k' and j' is calculated w'—the 'adjusted' relative share of wages in the value added—by means of formula (3a). Finally, the actual relative share of wages in the value added, w, is given. The changes in the difference $w - w'$ reflect the effect of changes in industrial composition.

Table 36. *Relative Share of Wages in Value Added in the US Manufacturing Industry, 1929–1937*

Year	Ratio of proceeds to prime costs (%)	Ratio of materials bill to wage bill (%)	Share of wages in value added (%)	Share of wages in value added (%)
	Assuming stable industrial composition (base year 1929)			Original data
	k'	j'	w'	w
1929	139.4	346	36.2	36.2
1931	142.2	307	36.8	35.7
1933	142.3	312	36.4	35.0
1935	136.7	314	39.7	37.9
1937	136.6	331	38.8	38.6

Source: US census of manufactures. For details see statistical appendix, nn. 2 and 3.

If we tentatively leave aside the influence of changes in industrial composition, and thus consider only k', j', and w', the following picture emerges. From 1929 to 1933, the ratio of proceeds to prime costs, k', increases, reflecting the rise in the degree of monopoly during a depression (see pp. 220–1). However, at the same time the ratio of the materials bill to the wage bill declines as a result of the fall, typical for a slump, in the prices of raw materials in relation to wages. The influence of these 2 factors upon the relative share of wages in the value added, w', is in opposite directions. As w' was stable from 1929 to 1933, it appears that these 2 factors were balanced. From 1933 to 1937 the 'adjusted' relative share of the wages in the value added, w', increased as a result of the fall in the 'adjusted' ratio of proceeds to prime costs, k', which was not offset by the rise in the 'adjusted' ratio of the materials bill to the wage bill, j'. This situation reflects the relatively great reduction in the degree of monopoly in the recovery resulting from the increased power of trade unions. The long-run tendency for prices of raw materials to fall relative to wage costs, which is reflected in the fact that j' did not recover in 1937 to its 1929 level, was a contributory factor.

As to the difference between the actual and 'adjusted' relative share of wages in the value added, $w - w'$, it appears that it fell in the depression (w fell somewhat from 1929 to 1933, while w' remained roughly stable; from 1933 to 1937 w increased a little more than w'). This is mainly due to the greater decline in production of investment goods than in total manufacturing production during the slump. Indeed, the relative share of wages in the value added is higher for these goods than for manufactured goods as a whole, and thus the reduction in the importance of the output of investment goods during a depression tends to reduce the relative share of wages in the value added of manufacturing as a whole.

It is of some interest to establish the weight of the 3 factors considered above in determining the movement of the relative share of wages in the value added during the course of the cycle. For this purpose we may calculate from formula (3a) what the value of w' would be in 1933 if only the ratio of proceeds to prime costs changed while the ratio of the materials bill to the wage bill remained at its 1929 level. The result is 34.6%. This figure, together with the value of w in 1929 and 1933 and the value of w' in 1933 (cf. Table 36), enables us to construct Table 37.

Table 37. *Analysis of Changes in the Relative Share of Wages in Value Added in US manufacturing, 1929–1933*

Item	Relevant years			
Proceeds ÷ prime costs	1929	1933	1933	1933
Materials bill ÷ wage bill	1929	1929	1933	1933
Industrial composition	1929	1929	1929	1933
Relative share of wages in value added (%)	36.2	34.6	36.4	35.0
Difference (%)	− 1.6	+ 1.8	− 1.4	

The difference between the second and the first columns gives the effect of the change in the ratio of proceeds to prime costs; that between the third and second columns the effect of the change in the ratio of the materials bill to the wage bill; and that between the fourth and the third columns the effect of the change in the industrial composition.

It will be seen that the effects of the 3 factors considered are relatively small. Thus their balance is also small, and this accounts for the approximate stability of the relative share of wages in the value added during the depression.

Changes in the relative share of wages in the national income in the USA and the UK during the great depression

Unfortunately, no exact data exist on this subject for the USA because national income statistics do not give wages separately from salaries. It is possible, however, to form an approximate idea about changes in the relative share of wages in the gross income of the private sector for 1929–37. The data on wages in manufacturing industries are available.[14] As mentioned above, wage payments are negligible in some industrial groups, namely in trade (shop assistants being classified as salary-earners), finance and real estate, communications, and public utilities. For the remaining industries, namely agriculture, mining, construction, transport, and services, only salaries and wages combined are available. If we now calculate a weighted index of wages in

[14] The series of payrolls is available for all years; it agrees with the census of manufactures for the census years.

manufacturing on the one hand and of salaries and wages in agriculture, mining, construction, transport, and services on the other, we obtain an approximation to the index of the total wage bill. (Indeed, wages in manufacturing constitute about half total wages, while salaries in the remaining industries under consideration move to some extent in parallel with wages.) We further divide this index by that of the gross income of the private sector, and in this way obtain an approximate index of the relative share of wages in this income (Table 38).

This series shows a slow upward long-run trend which can be attributed mainly to a fall in the degree of monopoly as a result of the strengthening of trade unions after 1933, and to some extent to a decline in prices of raw materials in relation to wage costs. The cyclical fluctuations are obviously small. (If salaries in agriculture, mining, construction, transportation, and services were eliminated, the index would be somewhat lower during the depression because salaries in general fall somewhat less than wages; but there is no doubt that the cyclical fluctuations would remain small.) This result is most likely due to the interaction of the same factors which emerged from the analysis of the relative share of wages in the value added of manufacturing industries.

Table 38. *Approximation to the Index of Relative Share of Wages in Gross Income of the Private Sector in the USA, 1929–1937*

Year	Index of wages in manufacturing	Index of wages and salaries in agriculture, mining, construction, transport, and services	Combined index
	In relation to gross income of the private sector		
1929	100.0	100.0	100.0
1930	94.1	105.3	99.7
1931	90.8	109.5	100.1
1932	87.6	113.9	100.8
1933	100.2	109.3	104.8
1934	107.8	102.7	105.3
1935	106.7	96.2	101.5
1936	110.8	99.3	105.1
1937	116.4	96.7	106.6

Source: US census of manufactures, Dept. of Commerce, *National Income Supplement to Survey of Current Business, 1951.* For details see statistical appendix, n. 4.

During the depression there was probably a rise in the degree of monopoly in the 'wage-paying' industries, but a fall in the prices of raw materials in relation to wages. The changes in the industrial composition of the private sector during the slump tended to reduce the relative share of wages. Indeed, there was a relative shift in the distribution of national income from 'wage-paying' industries to other industries; and also within the 'wage-paying' group from industries with a higher relative share to those with a lower relative share of wages in gross income. These shifts were due mainly to the relatively greater reduction during the depression of investment activity. Thus, as in the manufacturing industries, the adverse effect of the rise in the degree of monopoly, and of the change in industrial composition upon the relative share of wages in the gross income during the depression, appears to have been roughly offset by the influence of the fall of prices of raw materials in relation to wages.

We may now consider the relation between wages and home-produced national income in the UK in 1929–38.[15] Two national

Table 39. *Indices of Relative Share of Wages in National Income in the UK, 1929–1938*

Year	Wage bill (Bowley) in relation to national income (Bowley)	Wage bill (Bowley) in relation to national income (Stone)
1929	100.0	100.0
1930	97.6	100.0
1931	98.4	98.8
1932	99.8	99.1
1933	95.3	96.8
1934	96.9	98.5
1935	96.8	98.0
1936	96.7	97.5
1937	102.4	97.9
1938	98.1	97.4

Sources: A. L. Bowley, *Studies in the National Income, 1929–1934*, Cambridge, Cambridge Univ. Press, 1942; A. R. Prest, 'National Income of the United Kingdom'; *Board of Trade Journal.*

[15] As mentioned above (see n. 13 above), the UK series of home-produced national income does not correspond exactly to the concept of gross income of the private sector used by us, since the national income is net of depreciation and includes salaries of government officials. It appears, however, that in the period considered the changes in the relative share of wages in the national income thus defined are indicative of the changes corresponding to our concept.

income series are available for the period in question; one estimated by Professor A. L. Bowley and the other by Mr J. R. S. Stone. However, there exists only the Bowley estimate for the wage bill. Fortunately, however, the indices of both variants of national income are in general very similar in the period in question, although their absolute values differ.

Table 39 gives the indices of the ratios of the wage bill (as estimated by Bowley) to the 2 variants of national income. It will be seen that both series display no marked cyclical fluctuations.

Cyclical changes in the relative share of wages and salaries in the gross income of the private sector

We have dealt above only with changes in the relative share of wages in aggregate income. We shall now consider briefly the problem of the relative share of labour as a whole in the gross income of the private sector by taking into account not only wages but salaries as well. The application of the theory of income distribution to the analysis of long-run changes in the relative share of wages and salaries in income would be difficult because of the growing importance of salaries in the sum of overheads and profits as a result of increasing concentration of business. However, cyclical fluctuations in the relative share of wages and salaries in the gross income of the private sector *can* be examined, and are of considerable interest.

We have seen above that the relative share of wages in the gross income of the private sector tends to be fairly stable in the course of the cycle. This cannot be expected, however, for the relative share of wages and salaries combined. Salaries, because of their 'overhead' character, are likely to fall less during the depression and to rise less during the boom than wages. Thus the 'real' wage and salary bill, V, can be expected to fluctuate less during the course of the cycle than the 'real' gross income of the private sector, Y.[16] Consequently, we can write:

$$V = \alpha Y + B$$

where B is a positive constant in the short period, although subject to long-run changes. The coefficient α is less than 1 because $V < Y$ and $B > 0$. If we now divide both sides of this equation by the 'real' income

[16] We imagine both the wage and salary bill and the gross income of the private sector to be deflated by the same price index.

Y, we obtain

$$\frac{V}{Y} = \alpha + \frac{B}{Y} \tag{4}$$

where V/Y is the relative share of wages and salaries in the gross income of the private sector. V/Y increases, of course, when the 'real' income Y declines. It may be noticed here that equation (4) constitutes one link in the theory of the business cycle developed below.

We now shall apply equation (4) to the US data for 1929–41. The relative share of wages and salaries[17] in the gross income of the private sector and the value of this income at 1939 prices are given in Table 40.[18] In accordance with equation (4), we correlate the relative share of wages and salaries in income V/Y with the reciprocal of 'real' income $1/Y$ and also with time t to allow for possible secular trend.

Table 40. *Relative Share of Wages and Salaries in Gross Income of the Private Sector in the USA, 1929–1941*

Year	Relative share of wages and salaries in gross income of the private sector $(V/Y)\cdot 100$ (%)	Gross income of the private sector at 1939 prices Y ($ billion)	Calculated relative share of wages and salaries in gross income of the private sector (%)
1929	50.0	74.1	51.0
1930	52.4	65.9	52.6
1931	55.0	59.3	54.1
1932	57.9	48.0	57.0
1933	57.8	46.9	57.1
1934	56.0	51.9	55.8
1935	52.7	57.7	54.5
1936	53.4	65.5	53.2
1937	53.3	69.0	52.6
1938	53.2	64.3	54.2
1939	53.5	68.8	53.6
1940	52.1	75.9	52.3
1941	51.4	89.6	51.0

Source: US Dept. of Commerce, *National Income Supplement to Survey of Current Business, 1951.*

[17] It should be noticed that salaries include those of higher business executives which are rather akin to profits.

[18] As a deflator, the index implicit in the deflation of the real gross product of the private sector by the US Dept. of Commerce was used. For details, see statistical appendix, nn. 5 and 6.

(t is counted in years from 1935, which is the middle point of the period.) We obtain the following regression equation:

$$\frac{V}{Y}100 = 42.5 + \frac{707}{Y} + 0.11t$$

The double correlation coefficient is 0.926. The value of V/Y calculated from the regression equation is given in Table 40 as well. The positive trend probably reflects the influence of the fall in the degree of monopoly and in the prices of raw materials in relation to unit wage costs.

Part II

Determination of Profits and National Income

3. Determinants of Profits[5]

Theory of profits in a simplified model

We may consider first the determinants of profits in a closed economy in which both government expenditure and taxation are negligible. Gross national product will thus be equal to the sum of gross investment (in fixed capital and inventories) and consumption. The value of gross national product will be divided between workers and capitalists, virtually nothing being paid in taxes. The income of workers consists of wages and salaries. The income of capitalists or gross profits includes depreciation and undistributed profits, dividends and withdrawals from unincorporated business, rent, and interest. We thus have the following balance sheet of the gross national product, in which we distinguish between capitalist consumption and worker consumption:

Gross profits	Gross investment
Wages and salaries	Capitalist consumption
	Worker consumption
Gross national product	Gross national product

If we make the additional assumption that workers do not save, then the worker consumption is equal to their income. It follows directly then:

Gross profits = Gross investment + capitalist consumption

What is the significance of this equation? Does it mean that profits in a given period determine capitalist consumption and investment, or the reverse of this? The answer to this question depends on which of these items is directly subject to the decisions of capitalists. Now, it is clear that capitalists may decide to consume and to invest more in a given period than in the preceding one, but they cannot decide to earn more. It is, therefore, their investment and consumption decisions which determine profits, and not vice versa.

If the period which we consider is short, we may say that capitalist investment and consumption are determined by decisions shaped in the *past*. For the execution of investment orders takes a certain time, and capitalist consumption responds to changes in the factors which influence it only with a certain delay.

If capitalists always decided to consume and to invest in a given period what they had earned in the preceding period, the profits in the given period would be equal to those in the preceding one. In such a case, profits would remain stationary, and the problem of interpreting the above equation would lose its importance. But such is *not* the case. Although profits in the preceding period are one of the important determinants of capitalist consumption and investment, capitalists in general do *not* decide to consume and invest in a given period precisely what they have earned in the preceding one. This explains why profits are *not* stationary, but fluctuate in time.

The above argument requires certain qualifications. Past investment decisions may not fully determine the volume of investment in a given period, owing to unexpected accumulation or running down of stocks. The importance of this factor, however, seems to have been frequently exaggerated.

A second qualification arises out of the fact that consumption and investment decisions will usually be made in real terms, and in the mean time prices may change. For instance, a piece of ordered capital equipment may now cost more than at the time when the order was given. To get over this difficulty, both sides of the equation will be assumed to have been calculated at constant prices.

We may now conclude that the real gross profits in a given short period are determined by decisions of capitalists with respect to their consumption and investment shaped in the past, subject to correction for unexpected changes in the volume of stocks.

For the understanding of the problems considered, it is useful to present the above from a somewhat different angle. Imagine that following the Marxian 'schemes of reproduction' we subdivide the economy into three departments: department I producing investment goods, department II producing consumer goods for capitalists, and

department III producing consumer goods for workers. The capitalists in department III, after having sold to the workers the amount of consumer goods corresponding to their wages, will still have a surplus of consumer goods left, which will be the equivalent of their profits. These goods will be sold to the workers of departments I and II, and, as the workers do not save, the value of these sales will be equal to their incomes. Thus, total profits will be equal to the sum of profits in department I, profits in department II, and wages in these 2 departments: or, total profits will be equal to the value of production of these 2 departments—in other words, to the value of production of investment goods and consumer goods for capitalists.

The production of departments I and II will also determine the production of department III if the distribution between profits and wages in all departments is given. The production of department III will be pushed up to the point where profits earned out of that production will be equal to the wages of departments I and II. Or, to put it differently, employment and production of department III will be pushed up to the point where the surplus of this production over what the workers of this department buy with their wages is equal to the wages of departments I and II.

The above clarifies the role of the 'distribution factors', i.e. factors determining the distribution of income (such as degree of monopoly) in the theory of profits. Given that profits are determined by capitalist consumption and investment, it is the workers' income (equal here to worker consumption) which is determined by the 'distribution factors'. In this way capitalist consumption and investment, conjointly with the distribution factors, determine worker consumption and consequently the national output and employment. The national output will be pushed up to the point where profits carved out of it in accordance with the distribution factors are equal to the sum of capitalist consumption and investment.[19]

[19] The above argument is based on the assumption of elastic supply which was made in pt. I. However, if the output of consumer goods for workers is at capacity level, any increase in capitalist consumption or investment will merely cause a rise in prices of these goods. In such a case it is the rise in prices of consumer goods for workers which will increase profits in department III up to a point where they are equal to the higher amount of wages in departments I and II. Real wage rates will fall, reflecting the fact that an increased wage bill meets an unchanged supply of consumer goods.

The general case

We may now pass from our simplified model to the real situation where the economy is not a closed system, and where government expenditure and taxation are not negligible. The gross national product is then equal to the sum of gross investment, consumption, government expenditure on goods and services, and the surplus of exports over imports. ('Investment' here stands for private investment, public investment being included in government expenditure on goods and services.) Since the total value of production is divided between capitalists and workers or paid in taxes, the value of gross national product on the income side will be equal to gross profits net of taxes, wages and salaries net of taxes, plus all taxes direct and indirect. We thus have the following balance sheet of the gross national product:

Gross profits net of (direct) taxes	Gross investment
	Export surplus
Wages and salaries net of (direct) taxes	Government expenditure on goods and services
Taxes (direct and indirect)	Capitalist consumption
	Worker consumption
Gross national product	Gross national product

Part of the taxes are spent on transfers such as social benefits, while the remainder serves to finance government expenditure on goods and services. Let us subtract from both sides of the balance sheet, taxes minus transfers. On the income side the item 'Taxes' will disappear and we shall add transfers to wages and salaries. On the other side, the difference between government expenditure on goods and services and taxes minus transfers will be equal to the budget deficit. Thus the balance sheet will be as follows:

Gross profits net of taxes	Gross investment
	Export surplus
Wages, salaries, and transfers net of taxes	Budget deficit
	Capitalist consumption
	Worker consumption
Gross national product minus taxes plus transfers	Gross national product minus taxes plus transfers

By subtracting now from both sides wages, salaries, and transfers net of taxes, we obtain the following equation:

$$\text{Gross profits net of taxes} = \begin{cases} \text{Gross investment} \\ + \text{Export surplus} \\ + \text{Budget deficit} \\ - \text{Worker saving} \\ + \text{Capitalist consumption} \end{cases}$$

Thus this equation differs from the equation of the simplified model in that, instead of investment, we have now investment plus export surplus plus budget deficit minus worker saving. It is clear, however, that our previous relationship still obtains if we assume that both the budget and foreign trade are balanced and that the workers do not save, that is:

$$\text{Gross profits after tax} = \text{Gross investment} + \text{capitalist consumption}$$

Even if these assumptions are made, the system is much more realistic than in the first simplified model, and all the arguments of the previous section still apply. It has to be remembered, however, that we are dealing now with profits after tax, while in the first simplified model the problem did not arise because taxes were assumed to be negligible.

Savings and investment

Let us subtract on both sides of the general equation for profits (see opposite page), capitalist consumption, and add worker savings. We obtain:

Capitalist gross savings	Gross investment
Worker savings	Export surplus
	Budget deficit
Total gross savings	Total gross savings

Thus, total savings are equal to the sum of private investment, export surplus and budget deficit, while capitalist savings are, of course, equal to this sum minus worker savings.

If we now assume that both foreign trade and the government budget are balanced, we obtain:

$$\text{Gross savings} = \text{Gross investment}$$

If we assume, moreover, that workers do not save, we have:

Capitalist gross savings = Gross investment

This equation is equivalent to:

Gross profits = Gross investment + capitalist consumption

because it may be obtained from the latter equation by the deduction of capitalist consumption from both sides.

It should be emphasized that the equality between savings and investment plus export surplus plus budget deficit in the general case—or investment alone in the special case—will be valid under all circumstances. In particular, it will be independent of the level of the rate of interest which has customarily been considered in economic theory to be the factor balancing the demand for and supply of new capital. In the present conception, investment, once carried out, automatically provides the savings necessary to finance it. Indeed, in our simplified model, profits in a given period are the direct outcome of capitalist consumption and investment in that period. If investment increases by a certain amount, savings out of profits are *pro tanto* higher.

To put it in a more concrete fashion: if some capitalists increase their investment by using for this purpose their liquid reserves, the profits of other capitalists will rise *pro tanto*, and thus the liquid reserves invested will pass into the possession of the latter. If additional investment is financed by bank credit, the spending of the amounts in question will cause equal amounts of saved profits to accumulate as bank deposits. The investing capitalists will thus find it possible to float bonds to the same extent, and thus to repay the bank credits.

One important consequence of the above is that the rate of interest cannot be determined by the demand for and supply of new capital because investment 'finances itself'. The factors determining the level of the rate of interest are discussed in Part III below.

The effect of the export surplus and budget deficit

In what follows we shall frequently assume a balanced government budget and balanced foreign trade, as well as zero worker savings, which will enable us to base our argument on the equality between profits after taxes and the sum of gross investment and capitalist consumption. It is useful, however, to say a few words now about the significance of the influence of the export surplus and the budget deficit on profits.

According to the formula established above, profits are equal to investment plus export surplus plus budget deficit minus worker savings plus capitalist consumption. It follows directly that an increase in the export surplus will raise profits *pro tanto* if other components are unchanged. The mechanism involved is the same as that described on pp. 240–1. The value of an increment in the production of the export sector will be accounted for by the increase in profits and wages of that sector. The wages, however, will be spent on consumer goods. Thus production of consumer goods for workers will be expanded up to the point where profits out of this production will increase by the amount of additional wages in the export sector.[20]

It follows directly that the export surplus enables profits to increase above that level which would be determined by capitalist investment and consumption. It is from this point of view that the fight for foreign markets may be viewed. The capitalists of a country which manages to capture foreign markets from other countries are able to increase their profits at the expense of the capitalists of the other countries. Similarly, a colonial metropolis may achieve an export surplus through investment in its dependencies.[21]

A budget deficit has an effect similar to that of an export surplus. It also permits profits to increase above the level determined by private investment and capitalist consumption. In a sense the budget deficit can be considered as an artificial export surplus. In the case of the export surplus, a country receives more for its exports than it pays for its imports. In the case of the budget deficit, the private sector of the economy receives more from government expenditure than it pays in taxes. The counterpart of the export surplus is an increase in the indebtedness of the foreign countries towards the country considered.

[20] If the production of consumer goods for workers is at capacity level, prices of these goods will rise to a point where profits out of this production will increase by the amount of additional wages in the export sector (see n. 19 above).

[21] Foreign lending by a given country need not be associated with exports of goods from that country. If country *A* lends to country *B*, the latter can spend the proceeds of the loan in country *C*, which may increase *pro tanto* its stock of gold and liquid foreign assets. In this case, foreign lending by *A* will cause an export surplus in *C*, accompanied by an accumulation of gold or liquid foreign assets in that country. In the case of colonial dependencies this situation is not likely to arise, i.e. the amount invested will be normally spent in the metropolis.

The counterpart of the budget deficit is an increase in the indebtedness of the government towards the private sector. Both of these surpluses of receipts over payments generate profits in the same way.

The above shows clearly the significance of 'external' markets (including those created by budget deficits) for a capitalist economy. Without such markets, profits are conditioned by the ability of capitalists to consume or to undertake capital investment. It is the export surplus and the budget deficit which enable the capitalists to make profits over and above their own purchases of goods and services.

The connection between 'external' profits and imperialism is obvious. The fight for the division of existing foreign markets and the expansion of colonial empires, which provide new opportunities for export of capital associated with export of goods, can be viewed as a drive for export surplus, the classic source of 'external' profits. Armaments and wars, usually financed by budget deficits, are also a source of this kind of profit.

4. Profits and Investment

Profits and investment under simplifying assumptions

It was noted above (p. 240) that capitalist investment and consumption are determined by decisions shaped in the *past*. The determinants of investment decisions, which are rather complex in character, are considered in ch. 9 below. We shall deal here with the determination of capitalist consumption.

We may make the following assumption, which is plausible as a first approximation, about the 'real' capitalist consumption in a given year, C_t: that it consists of a stable part A and a part proportional to $P_{t-\lambda}$, the real profits after tax of some time ago; that is:

$$C_t = qP_{t-\lambda} + A \tag{5}$$

where λ indicates the delay of the reaction of capitalist consumption to the change in their current income. q is positive and < 1 because capitalists tend to consume only a part of the increment in income. In fact, this part is likely to be rather small, so that q is probably considerably less than 1. Finally, A is a constant in the short run, although subject to long-run changes. We shall assume for the time

being that foreign trade and the government budget are balanced, and that workers do not save. In this case, profits after tax P are equal to the sum of investment I and capitalist consumption C:

$$P = I + C \tag{6}$$

Substituting the value of C from equation (5) we obtain:

$$P_t = I_t + qP_{t-\lambda} + A \tag{7}$$

It follows that 'real' profits at time t are determined by current investment and profits at the time $t - \lambda$. Profits at time $t - \lambda$ will in turn be determined by investment at that time and by profits at the time $t - 2\lambda$, and so on. It is thus clear that profits at time t are a linear function of investment at time t, $t - \lambda$, $t - 2\lambda$, etc., and that the coefficients of investment I_t, $I_{t-\lambda}$, $I_{t-2\lambda}$, etc., in this relation will be 1, q, q^2, etc., respectively. Now q, as stated above, is less than 1 and probably considerably less than 1. Thus the series of coefficients 1, q, q^2, . . . will be quickly decreasing, and consequently among I_t, $I_{t-\lambda}$, $I_{t-2\lambda}$, . . . only those relatively near in time will count in the determination of profits, P_t. Profits will thus be a function both of current investment and of investment in the near past; or, roughly speaking, profits follow investment with a time-lag. We can thus write as an approximate equation:

$$P_t = f(I_{t-\omega}) \tag{8}$$

where ω is the time-lag involved.

The shape of function f can be determined as follows. Let us go back for a moment to equation (7) and substitute for P its value from equation (8):

$$f(I_{t-\omega}) = I_t + qf(I_{t-\omega-\lambda}) + A$$

This equation should be fulfilled whatever the course in time of investment I_t. Thus it should cover *inter alia* the case where investment is maintained for some time at a stable level, so that we have $I_t = I_{t-\omega} = I_{t-\omega-\lambda}$. It follows:

$$f(I_t) = I_t + qf(I_t) + A$$

or

$$f(I_t) = \frac{I_t + A}{1 - q}$$

As this equality is fulfilled for any level of I_t, it gives us the shape of function f. We thus can write equation (8) as:

$$P_t = \frac{I_{t-\omega} + A}{1-q} \tag{8a}$$

The significance of equation (8a) is that it reduces the number of determinants of profits from 2 to 1 as a result of taking into consideration the dependence of capitalist consumption on past profits as given by equation (5). Profits according to equation (8a) are fully determined by investment, with a certain time-lag involved. Moreover, investment depends on investment decisions still farther back in time. It follows that profits are determined by past investment decisions.

The interpretation of equation (8a) may give rise to certain difficulties. Under the given assumptions that foreign trade and the government budget are balanced and that workers do not save, investment is equal to capitalist savings (see p. 243). It thus follows directly from equation (8a) that capitalist savings 'lead' profits. This result may appear paradoxical. Common sense would suggest the opposite sequence—that savings are determined by profits. This, however, is not the case. Capitalist consumption in a certain period is the result of decisions based on past profits. Since profits usually change in the meantime, actual savings do *not* correspond to the intended disposition of income. Indeed, actual savings which are equal to investment *will* 'lead' profits, as shown by equation (8a). How this happens may be illustrated by the following example. Imagine that for some time both investment and thus savings and also profits are constant. Imagine that there is a sudden increase in investment. Savings will increase immediately, together with investment, and profits will rise by the same amount. However, capitalist consumption will rise only after some time as a result of this primary increase in profits. Thus profits will still be increasing after the rise in investment and savings has already come to a stop.

The general case

How will equation (8a) change if we do *not* postulate that foreign trade and the government budget are balanced, and that worker savings are zero? If we denote the sum of private investment, export surplus, and budget deficit by I', worker savings by s, and capitalist consumption, as above, by C, we have for profits the equation (see p. 243):

$$P = I' - s + C$$

It will be seen that for this general case equation (8a) will be modified to:

$$P_t = \frac{I'_{t-\omega} - s_{t-\omega} + A}{1-q} \tag{8b}$$

Indeed, formula (8a) was obtained from the relation between capitalist consumption and profits (equation (5)) and from the assumption that investment I is equal to the difference between profits and capitalist consumption. Thus, when this difference is equal to $I' - s$, it is this item that should replace I in formula (8a).

Equation (8b) may be replaced by a simpler, although approximate, formula. It should be remembered that total savings are equal to the sum of investment, export surplus, and budget deficit, I' (see p. 243). Further, although in general worker savings, s, are not equal to zero, their level and absolute changes are small as compared with total savings. Moreover, s must show in the course of the business cycle a pronounced correlation with total savings. (This follows from our considerations in the next chapter which establish a relation between profits and national income.) Thus, $I' - s$ must be closely correlated with I'. We have consequently as a good approximation:

$$P_t = \frac{I'_{t-\omega} + A'}{1-q'} \tag{8c}$$

where the change of parameters from q to q' and from A to A' reflects the replacement of $I'_{t-\omega} - s_{t-\omega}$ by a linear function of $I'_{t-\omega}$. It should be remembered that q is a coefficient indicating what part of an increment in profit will be devoted to consumption, while the constant A is that part of capitalist consumption which is stable in the short run, although subject to long-run changes. q' and A' reflect in addition the relation of worker savings to total savings, which are equal to I'.

Formula (8c) is superior to formula (8b) in that it may be illustrated statistically. This is virtually impossible for (8b) because no statistical data about worker savings, s, are available.

Statistical illustration

We shall apply equation (8c) to the US data for 1929–40. The 'real' values of gross profits after tax, P[22] and of I' are given in Table 41. The meaning of I' is slightly modified as compared with its basic

[22] P is obtained from gross profits by deducting all direct taxes. *Direct* taxes on wages and salaries were very small in the period considered.

Table 41. *Determination of Profits in the USA, 1929–1940*

Year	Gross profits after taxes P_t	Gross private investment plus export surplus plus budget deficit plus brokerage fees I'_t	$I'_{t-\frac{1}{4}}$	Calculated gross profits after taxes
		($ billions at 1939 prices)		
1929	33.7	14.2	13.7	33.2
1930	28.5	10.2	11.2	29.6
1931	24.5	5.5	6.7	23.3
1932	18.3	3.2	3.8	19.2
1933	17.6	3.4	3.3	18.2
1934	20.4	6.0	5.3	20.6
1935	24.4	8.4	7.8	23.7
1936	26.8	11.6	10.8	27.5
1937	27.9	10.8	10.6	26.9
1938	26.2	9.0	9.5	25.2
1939	28.1	12.9	11.9	28.2
1940	31.0	15.9	15.1	32.2

Source: Dept. of Commerce, *National Income Supplement to Survey of Current Business, 1951*.

concept. In addition to gross investment, export surplus, and budget deficit, it here includes brokerage fees. In the US statistics these are included in consumption. However, as this is a typical form of capital expenditure which is not closely related to income, it is proper here to consider it on a par with investment. As a deflator for both series, the price index implicit in the deflation of gross national product of the private sector is used.[23]

Before establishing the correlation between P and I', it was necessary to determine the time-lag, ω. This was complicated by the fact that some trend also appeared to be involved in the relation between P and I'. In order to circumvent this difficulty, the trend was approximately eliminated by taking into consideration the first differences ΔP and $\Delta I'$. From correlating these differences, it appeared that the best fit is obtained for a time-lag of about 3 months.

In view of this, P was correlated with $I'_{t-\frac{1}{4}}$, i.e. with I' shifted 3 months back by means of interpolation. Thus, $I'_{t-\frac{1}{4}}$ was obtained by taking three-quarters of I' in a given year and one-quarter of I' in the

[23] For details of the calculation of P and I', see statistical appendix, nn. 7 and 8.

preceding year. To allow for trend, a double correlation was established of P with $I'_{t-\frac{1}{4}}$ and the time t (counted in years from the middle of 1929–40, i.e. from the beginning of 1935). The regression equation is:

$$P_t = 1.34\,I'_{t-\frac{1}{4}} + 13.4 - 0.13t$$

The values of profits calculated from this equation are given for comparison with actual profits in Table 41. The correlation is very close. The double correlation coefficient is 0.986.

If there were no saving out of wages and salaries, the coefficient of $I'_{t-\frac{1}{4}}$ would be equal to $1/(1-q)$ in equation (8b). In this case we should have for q, which is the coefficient indicating what part of an increment of profits will be directed to consumption:

$$\frac{1}{1-q} = 1.34; \quad q = 0.25$$

This would mean that only 25% of additional profits would be devoted to consumption and 75% to savings. Actually, the coefficient q will be larger, because part of savings comes from labour income. However, q is unlikely to exceed 30% by very much.

The trend coefficient is negative, which is probably mainly accounted for by the fact that, as a result of the great depression, profits in the 1930s were much lower than profits in the preceding decade, and that this long-run fall in profits could have caused a decline in the constant, A, during the period considered. In other words, capitalists' standard of living was declining as a result of the long-run slump in profits.

5. Determination of National Income and Consumption

Introduction

In chapter 2 the relative share of wages and salaries in national income was investigated, and in the two previous chapters the relationship between profits and I', the sum of investment, export surplus, and budget deficit was established. The combination of the results of these two enquiries will enable us to establish a relation between the national income and I'. Thus, in the special case where foreign trade and the government budget are balanced, the national income will be related to investment I.

The formula for the relative share of wages and salaries in the gross income of the private sector established in ch. 2 (p. 237) is as follows:

$$\frac{V}{Y} = \alpha + \frac{B}{Y} \tag{4}$$

where V is the 'real' wage and salary bill, and Y is the 'real' gross income of the private sector. The coefficient α is positive and < 1, and the constant B, which is subject to long-run changes, is also positive. The difference between Y and V is gross profits before taxes π. (In the preceding chapter P represented gross profits *after* taxes.) We thus have:

$$\frac{Y - \pi}{Y} = \alpha + \frac{B}{Y}$$

or

$$Y = \frac{\pi + B}{1 - \alpha} \tag{9}$$

For an understanding of the subsequent discussion, a few words should be added about the difference between the gross *national product* and the gross *income* of the *private sector*, Y. The difference between the gross *national* product and the gross *private* product is accounted for by the government product as measured by payments to government employees. The difference between the value of gross private *product* and the gross *income* of the private sector, Y, is accounted for by indirect taxes which are included in the value of the private product.[24] Thus the difference between gross national product and the gross income of the private sector consists of payments to government employees and indirect taxes.

National product, profits, and investment in a simplified model

We shall discuss the problem of determination of national product or income first with respect to the simplified model considered at the beginning of ch. 3. We assumed there a closed system and a negligible government revenue and expenditure. As a result, gross national product is equal to the sum of private investment and consumption. We also ignored worker savings. For such a model, as we have seen, formula (8a), relating profits after taxes P to investment I (see p. 248),

[24] Since the gross income of the private sector, Y, is taken here before direct taxation, Y includes *direct* taxes.

is valid:

$$P_t = \frac{I_{t-\omega} + A}{1 - q} \tag{8a}$$

where $1 > q > 0$ and $A > 0$. Since tax revenue is negligible, profits before and after tax may be taken as identical. Gross national product and gross private income of the private sector, Y, may also be taken as identical, since payments to government employees and indirect taxation are both negligible. We thus have the following equations for the determination of gross national product:

$$Y_t = \frac{P_t + B}{1 - \alpha} \tag{9a}$$

$$P_t = \frac{I_{t-\omega} + A}{1 - q} \tag{8a}$$

It is clear that the gross income or product, Y_t, is fully determined by investment, $I_{t-\omega}$.

Since equation (8a) reflects the factors determining the distribution of national income, we can also say that the gross income, Y_t, is pushed up to a point at which profits out of it, as determined by the 'distribution factors', correspond to the level of investment $I_{t-\omega}$. The role of the 'distribution factors' is thus to determine income or product on the basis of profits which are in turn determined by investment. The mechanism of such determination of income has already been described in ch. 3 (see pp. 240–1).

It follows directly that changes in the distribution of income occur, not by way of a change in profits, P, but through a change in gross income or product, Y. Imagine, for instance, that as a result of the increase in the degree of monopoly the relative share of profits in the gross income rises. Profits will remain unchanged, because they continue to be determined by investment which depends on past investment decisions, but the real wages and salaries and the gross income or product will fall. The level of income or product will decline to the point at which the higher relative share of profits yields the same absolute level of profits. In our equations it will be reflected as follows: the increase in the degree of monopoly will cause a fall of the coefficient α.[25] As a result, a lower level of income or product, Y_t, will correspond to a given level of investment, $I_{t-\omega}$.

[25] According to equation (4), α is that part of the relative share of wages and salaries in income Y which is independent of the level of Y; the other part, B/Y, stands for the influence of the overhead element in salaries.

Changes in investment and consumption in a simplified model

Given the relations between profits and investment and gross income and profits, as expressed by equations (8a) and (9a), any change in investment causes a definite change in income. A rise in investment by $\Delta I_{t-\omega}$ causes with a time-lag a rise in profits by

$$\Delta P_t = \frac{\Delta I_{t-\omega}}{1-q}$$

Moreover, a rise in profits by ΔP causes a rise in the gross income or product by

$$\Delta Y_t = \frac{\Delta P_t}{1-\alpha}$$

or

$$\Delta Y_t = \frac{\Delta I_{t-\omega}}{(1-\alpha)(1-q)}$$

It should be remembered that q is the coefficient indicating that part of ΔP, an increment of profits, which will be devoted to consumption; and that α is the coefficient indicating that part of ΔY, an increment in the gross income, which goes to wages and salaries. Both $1-q$ and $1-\alpha$ are < 1, so that $\Delta Y_t > \Delta I_{t-\omega}$. In other words, gross income or product increases more than investment owing to the effect of the rise in investment upon capitalist consumption $\{$factor $1/(1-q)\}$ and upon worker income $\{$factor $1/(1-\alpha)\}$. Since worker consumption is here assumed to be equal to worker income, this means that income increases more than investment because of the influence of the increase in investment upon capitalist and worker consumption.[26] During a slump, the fall in investment also causes a reduction in consumption, so that the fall in employment is larger than that arising directly from the curtailment of investment activity.

In order to bring into focus the nature of this process in the capitalist economy, it is useful to consider what the effect of a reduction in investment in a socialist system would be. The workers released from the production of investment goods would be employed

[26] It should be noted that equation (9a), which reflects the price–cost relationship, is based on the condition of elastic supply postulated in pt. I. If the supply of consumer goods is inelastic, an increase in investment will not result in a rise in the volume of consumption but merely in an increase in the prices of consumer goods (see fn. 19). In the subsequent argument we continue to assume, in line with pt. I, the condition of elastic supply.

in consumer goods industries. The increased supply of these goods would be absorbed by means of a reduction in their prices. Since profits of the socialist industries would be equal to investment, prices would have to be reduced to the point where the decline in profits would be equal to the fall in the value of investment. In other words, full employment would be maintained through the reduction of prices in relation to costs. In the capitalist system, however, the price–cost relationship, as reflected in equation (9a), is maintained, and profits fall by the same amount as investment plus capitalist consumption through the reduction in output and employment. It is indeed paradoxical that, while the apologists of capitalism usually consider the 'price mechanism' to be the great advantage of the capitalist system, price flexibility proves to be a characteristic feature of the socialist economy.[27]

Up to this point we have been considering the relation between the *absolute* changes of investment I, profits P, and gross income or product Y. It is of interest also to compare their *proportional* changes. Let us go back for this purpose to equations (8a) and (9a). It should be remembered that the constant A, the stable part of capitalist consumption, and the constant B, the stable part of salaries, are positive. It follows that profits P change proportionally less in the course of the business cycle than investment I, and that the same is true of gross income Y in relation to profits P. Consequently the relative changes of gross income Y are smaller than those of investment I.

Since in our model gross income or product Y is equal to the sum of investment and consumption, the relative changes of consumption are smaller than those of gross income. For if one component (investment) varies proportionally more than the sum (gross income or product), the other component (consumption) must vary proportionally less than the sum. It follows directly that investment varies proportionally more than consumption, or, in other words, that it falls in relation to consumption during the slump and rises during the boom.

The general case

Let us now drop the assumption that government expenditure and revenue are negligible. For the time being we may continue to assume

[27] It should be noted that in an expanding socialist economy a reduction in the price–cost ratio will reflect a relative rather than an absolute shift from investment to consumption.

that foreign trade and the government budget are balanced and that workers do not save. Thus equation (8a):

$$P_t = \frac{I_{t-\omega} + A}{1 - q} \tag{8a}$$

still holds good but profits before taxes, π, are no longer identical with profits after taxes, P. We shall assume that the tax system is given and that the relation between 'real' profits before taxes, π, and 'real' profits after taxes, P, can be expressed approximately by a linear function. We are then able to substitute for formula (9a) the equation:

$$Y_t = \frac{P_t + B'}{1 - \alpha'} \tag{9b}$$

where the constant α' and B' do not depend merely on the factors underlying the distribution of national income, but are influenced also by the effect of the tax system on profits. From these 2 equations it is apparent that gross income of the private sector Y is again determined—with a time-lag—by investment I. To an increment in investment $\Delta I_{t-\omega}$ there corresponds an increment in gross income:

$$\Delta Y_t = \frac{\Delta I_{t-\omega}}{(1-\alpha)(1-q)}$$

ΔY is here again larger than ΔI. This, however, is accounted for not only by the increase in capitalist and worker consumption following the rise in investment, but also by the larger volume of direct taxes which they pay out of increased income.

Passing now to the general case where foreign trade and the government budget are not necessarily balanced and worker savings are not necessarily zero, we have (see p. 249):

$$P_t = \frac{I'_{t-\omega} + A'}{1 - q'} \tag{8c}$$

where I' is the sum of investment, export surplus, and budget deficit, and where q' and A' differ from q and A in equation (8a) in that they reflect worker savings. The shape of equation (9b) is unchanged:

$$Y_t = \frac{P_t + B'}{1 - \alpha'} \tag{9b}$$

These two equations determine Y_t in terms of $I'_{t-\omega}$. The increment in Y_t corresponding to the increment of $I'_{t-\omega}$ is:

$$\Delta Y_t = \frac{\Delta I'_{t-\omega}}{(1-\alpha')(1-q')}$$

The determination of consumption is much more complicated than in our simplified model, where consumption was the difference between Y and I. In the general case, consumption is the difference between aggregate income after tax and savings. Now savings are equal to I', the sum of investment, export surplus, and budget deficit. Aggregate income after tax is not equal here to Y. Indeed, the latter is the gross income of the private sector which does not include the income of government employees or government transfer payments and is *before* direct taxes. Aggregate income after tax is equal to Y, plus the income of government employees and government transfer payments and minus all direct taxes. It follows that consumption is equal to $Y - I'$ minus direct taxes, plus income of government employees plus transfers. It is obvious that consumption cannot be fully determined in terms of I' by the above equations which permit the determination of $Y - I'$ only.

Statistical illustration

We shall now estimate the coefficients of the relation between Y and I' for the USA in 1929–41. On p. 238 we established for that period the following equation for the relative share of the wage and salary bill, V, in the gross income of the private sector, Y:

$$\frac{V}{Y}100 = 42.5 + \frac{707}{Y} + 0.11t$$

where the time t is counted from 1935.

Taking into consideration that profits before tax $\pi = Y - V$, we obtain

$$\frac{Y - \pi}{Y} = 0.425 + \frac{7.07}{Y} + 0.0011t$$

From this equation Y can be calculated on the basis of π. Table 42 gives the actual 'real' values of Y and π[28] and the calculated value of Y.

[28] As deflator, the index implicit in the deflation of the gross product of the private sector by the US Dept. of Commerce was used again.

Table 42. *Gross Income of the Private Sector and Profits in the USA, 1929–1941*

Year	Gross income of the private sector Y	Profits before taxes π	Calculated gross income of the private sector
		($ billions at 1939 prices)	
1929	74.1	37.0	75.5
1930	65.9	31.4	66.2
1931	59.3	26.7	58.2
1932	48.0	20.2	47.0
1933	46.9	19.8	46.2
1934	51.9	22.8	51.6
1935	57.7	27.3	60.0
1936	65.5	30.5	65.2
1937	69.0	32.2	67.9
1938	64.3	30.1	65.7
1939	68.8	32.0	69.0
1940	75.9	36.3	76.1
1941	89.6	43.6	89.0

Source: Dept. of Commerce, *National Income Supplement to Survey of Current Business, 1951*. For details, see statistical appendix, nn. 6 and 7.

The correlation between actual and calculated Y is extremely close. The coefficient of correlation is 0.995.

If we drop the trend component in the above equation we obtain:

$$Y = 1.74\pi + 12.2$$

which is the counterpart of equation (9). We still have to take taxation of profits into consideration if we are to obtain the relation of Y to profits after tax, P. For this purpose we correlate 'real' profits before and after taxes (P was given above in Table 41), and obtain a regression equation which, we may assume, characterizes the tax system prevailing in that period.[29] This relationship between π and P permits us to express Y in terms of profits after tax, P. We thus have as a counterpart of equation (9b):

$$Y_t = 2.03P_t + 10.4$$

The relation between P and I' for the same period was established

[29] We take into consideration here the period 1929–40 rather than 1929–41. The regression equation is: $P = 0.86\pi + 0.9$. The correlation is quite close, which results from the fact that the system of direct taxes was fairly stable over the period considered. Taxes were increased considerably, however, in 1941. (For details, see statistical appendix, n. 9.)

above (p. 251). Disregarding the trend component, we have as a counterpart of equation (8c):

$$P_t = 1.34I'_{t-\frac{1}{2}} + 13.4$$

From these 2 equations we obtain:

$$Y_t = 2.72I'_{t-\frac{1}{2}} + 37.7$$

The increment of Y_t, which corresponds, with a time-lag, to an increment of $I'_{t-\frac{1}{2}}$, is:

$$\Delta Y_t = 2.72\Delta I'_{t-\frac{1}{2}}$$

Thus *absolute* changes in Y are considerably larger than those in I'. At the same time, according to the preceding equation, *proportional* changes in Y are smaller than those in I'.

Gross product of the private sector

As stated above (p. 252) the gross income of the private sector, Y, is not equal to the gross product of that sector. In order to pass from the former to the latter, it is necessary to add indirect taxes of all kinds, such as excise and custom duties or employers' contributions to social insurance. If we denote the 'real' gross product or output of the private sector by O and the 'real' value of the aggregate indirect taxes by E, we have:[30]

$$O = Y + E$$

As was shown above, Y is determined—with a time-lag—by the sum of investment, export surplus, and budget deficit, I', or by investment I if foreign trade and the budget are balanced. In order to determine the gross product of the private sector, it is necessary to make some assumptions about E. The relative fluctuations of E in the course of the business cycle are usually much smaller than those of gross income, Y, for the following reasons: (i) indirect taxes are frequently levied on necessities or semi-necessities, the consumption of which fluctuates much less than Y; (ii) the rates are frequently fixed in money and not *ad valorem*, so that the real value of such rates increases when prices fall. For the sake of simplicity, we shall assume in the theory of business cycle developed below that E is a constant.

[30] We imagine Y and E to be deflated by the same price index as O, i.e. by the index of *market* prices.

For the determination of the output of the private sector, O, in terms of the sum of investment, export surplus, and budget deficit, I', we now have:

$$O_t = Y_t + E \tag{10}$$

$$Y_t = \frac{P_t + B'}{1 - \alpha'} \tag{9b}$$

$$P_t = \frac{I'_{t-\omega} + A'}{1 - q'} \tag{8c}$$

It follows directly that an increment of $I'_{t-\omega}$ determines an increment of O_t:

$$\Delta O_t = \frac{\Delta I'_{t-\omega}}{(1-\alpha')(1-q')}$$

On the assumption that E is a constant, O will show smaller proportional changes than Y. As the relative changes of Y in the course of the cycle are smaller than those of I', it follows that this is even more true of O. Thus, if foreign trade and the budget are balanced so that $I' = I$, it can be said that the gross product of the private sector O fluctuates less than investment I.

Long-run changes in investment and income

It has been shown above that the relative changes of investment, I (or rather of the sum of investment, export surplus, and budget deficit, I', which is equal to savings) in the course of the business cycle are greater than those of gross income or output of the private sector. However, this is not necessarily the case in the long run.

The discrepancy in fluctuations of I' and Y or O in the course of the business cycle depends mainly on 2 factors: (i) that capitalist consumption fluctuates less than profits; and (ii) that wages plus salaries fluctuate less than gross income, Y. However, capitalist consumption need not increase more slowly than profits in the course of the long-run growth of an economy. Indeed, the stable part of capitalist consumption, A (see p. 246), may rise in the long run proportionally with profits, P. In the same way, the stable part of wages and salaries, B, which reflects the overhead element in salaries (see p. 236), may also rise in the long run proportionally with income, Y. Thus, in the long run investment and income may not show disproportionate changes as they do in the course of the business cycle.

Table 43. *Ratio of 'Gross Capital Formation' to 'Gross National Income' in the USA, 1869–1913*

Years	(%)
1869–78	18.9
1874–83	19.0
1879–88	19.2
1884–93	20.8
1889–98	16.3
1894–1903	21.1
1899–1908	20.1
1904–13	19.8

Source: S. Kuznets, *National Product since 1869*, New York, NBER, 1946.

It appears that in the USA, in 1870–1914, the long-run changes in investment and income were in fact roughly proportional. Table 43 gives the ratio of gross capital formation to gross national income for that period by decades, according to Kuznets. This ratio remained fairly stable.

Although both the numerator and denominator differ in concept from I' and Y,[31] it is virtually certain that in the period considered I' and Y moved roughly proportionally to the 'gross capital formation' and to the 'gross national income' respectively. The stability of the ratio of I' to Y does not necessarily mean that both the distribution of income and the proportion of consumption out of profits remained constant, because there might have been compensating changes in these factors. In any case, the above is not meant to suggest that the long-run stability of the ratio of savings to income is an economic law, but merely to show that there is a possibility of such a relationship.

[31] I' = 'gross capital formation' − public investment + budget deficit. Y = 'gross national income' − public investment + budget deficit − income of government employees. The differences in question are small in the period considered, and therefore proportionality in the change between I' and 'gross capital formation' and between Y and 'gross national income' may be assumed.

Part III

The Rate of Interest[7]

6. The Short-Term Rate of Interest

Introduction

It has been stated above that the rate of interest cannot be determined by the demand for and the supply of capital because investment automatically brings into existence an equal amount of savings. Thus, investment 'finances itself' whatever the level of the rate of interest (see p. 244). The rate of interest is, therefore, the result of the interplay of other factors. We shall argue that the short-term rate is determined by the value of transactions and the supply of money by banks; and that the long-term rate is determined by anticipations of the short-term rate based on past experience, and by estimates of the risk involved in the possible depreciation of long-term assets (see ch. 7).

Velocity of circulation and the short-term rate

Let M denote the stock of money, i.e. current bank accounts and notes, and T the total turnover, i.e. the aggregate value of transactions in a certain period. T/M is, then, the velocity of circulation of money, V. It has been frequently assumed that V is constant; and this indeed is the corner-stone of the quantity theory of money. But it seems fairly obvious that the velocity of circulation in fact depends on the short-term rate of interest.

Indeed, the higher the short-term rate the greater the inducement to invest money for short periods rather than to keep it as cash reserve. Or, to put it more precisely: transactions can be managed with a larger or a smaller stock of money; a larger stock of money, in relation to turnover, however, means on average a smoother and more convenient handling of transactions. The higher the short-term rate of interest

the more expensive this convenience as compared with the alternative of investing in short-term assets.[32]

It may legitimately be asked why the short-term rate has been taken into consideration here and not the rate of interest in general. The reason for the singling out of the short-term rate in this context is as follows. The short-term rate of interest is the remuneration for forgoing the convenience of holding cash in its pure form.[33] When holding money is compared with holding short bills, the only difference is that the bill is not directly usable for settling transactions and that it yields interest.[34] When holding money and holding a bond is compared, however, the risk of a fall in the price of the bond has also to be taken into consideration.[35]

We reached the conclusion above that the velocity of circulation V is an increasing function of the short-term rate of interest ρ or:

$$\frac{T}{M} = V(\rho) \tag{11}$$

It follows directly from this equation that given the function V the short-term rate of interest ρ is determined by the value of transactions T and the supply of money M which, in turn, is determined by banking policy.

The relationship between the short-term rate of interest ρ and the velocity of circulation V may be represented by a curve with the shape

[32] The question arises here whether, in this context, the short-term rate of interest must be understood gross or net of income taxes. If the inconvenience of curtailment of cash holdings is supposed by a manager to be finally reflected in a corresponding reduction of profits, then it is the interest gross of taxes which should be taken into account. This seems likely to be the case. However, the results of the subsequent empirical enquiry which relates to the UK in 1930–8 are not affected by this difficulty, since the rate of income tax was fairly stable over that period.

[33] With the qualification that the short-term rate covers in addition some costs and inconveniences involved in investing operations as such or 'investment costs'.

[34] 'Bills' typify here short-term assets in general in which time deposits are also included.

[35] It does not follow from this that any addition to cash at the disposal of a firm will tend to be invested in bills. Imagine that a firm holds cash, bills, and bonds. Imagine further that, while its turnover remains unaltered and the short-term and long-term rates of interest are unchanged, the firm receives more cash. Now, if the firm invested all the additional cash in bills, this would be consistent with the relation between convenience of holding cash and the given short-term rate of interest, but it would unnecessarily reduce the proportion of the relatively 'risky' but more remunerative assets (bonds) in its holdings. Thus the firm will tend to invest part of the additional cash in bonds.

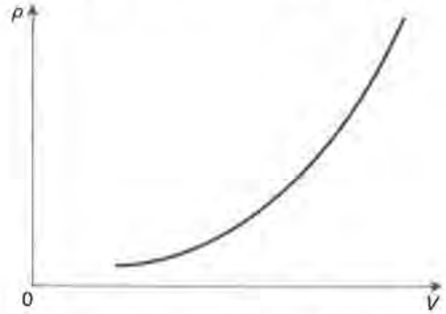

FIG. 22. *Relationship between the Velocity of Circulation, V, and the short-term rate of interest, ρ*

shown in Fig. 22. When V is high, i.e. cash holdings are rather small in relation to turnover, it requires a rather large increase in the short-term rate of interest to effect any further curtailment of cash holdings. Thus, at such a point a rather large increase in the short-term rate of interest is required to effect a given increment in the velocity of circulation, ΔV. On the other hand, when cash is very plentiful in relation to turnover, economies in cash are easily achievable and the rise in the rate of interest required to make possible an increase in the velocity of circulation, ΔV, is small.

Statistical illustration

We shall apply the above to an analysis of changes in the short-term rate of interest in the UK in 1930–8. For this period, figures of turnover (debit entries to current accounts) of the London clearing banks are available. Although the ratio of these to the level of current accounts appears at first sight to give us the velocity of circulation, unfortunately the case is not so simple.

The turnover consists of 2 very different parts: financial and non-financial transactions. For 1930 financial transactions were estimated to constitute about 85%[36] of the total turnover. On the other hand, financial current accounts are unlikely to be more than one-third of the total.[37] This disproportion obviously reflects the much greater velocity of circulation of financial, compared with non-financial,

[36] E. H. Phelps Brown and G. L. S. Shackle, *Statistics of Monetary Circulation in England and Wales, 1919–1937*, Royal Economic Society, Memorandum No. 74, London, 1938, p. 28.

[37] Ibid., p. 3.

accounts. As a result, a change in the proportion of financial to non-financial accounts will cause a considerable change in the ratio of turnover to current accounts even though both velocities of circulation remain unaltered. This defect can be remedied in the following way. We reduce the weight of financial transactions by multiplying them by that factor which brings the ratio of financial to non-financial transactions in the base year 1930 to the level of the ratio of financial to non-financial current accounts in that year. Next we add the 'reduced financial transactions' to the non-financial transactions, and divide the sum by total current accounts. This ratio may be considered an approximate index of changes in the velocity of circulation. This calculation is described in detail in my paper on 'The Short-Term Rate of Interest and the Velocity of Circulation'.[38] The results obtained there are given in Table 44 and plotted in Fig. 23.[39]

As may be seen, except for 1931, the points of relationship of ρ and V lie around a curve of the shape which we deduced on a priori grounds in the preceding section. 1931 is considerably above the curve. This is explained by the financial crisis in the second half of that year, which caused an upward shift of the curve, i.e. increased the

Table 44. *Index of Velocity of Circulation and the Short-Term Rate of Interest in the UK, 1930–1938*

Year	Velocity of circulation (1930 = 100)	Rate on treasury bills (%)
1930	100	2.48
1931	95	3.59
1932	93	1.49
1933	83	0.59
1934	88	0.73
1935	85	0.55
1936	82	0.58
1937	84	0.56
1938	80	0.61

Source: Bank of England, statistical summary.

[38] *Review of Economic Statistics*, May 1941.

[39] The results are slightly revised, allowance having been made for (i) a change in the working practice of town clearings in Nov. 1932, which increased the volume of total clearings by about 2%; (ii) a change in the scope of current accounts in Jan. 1938, which caused an increase of about 2%.

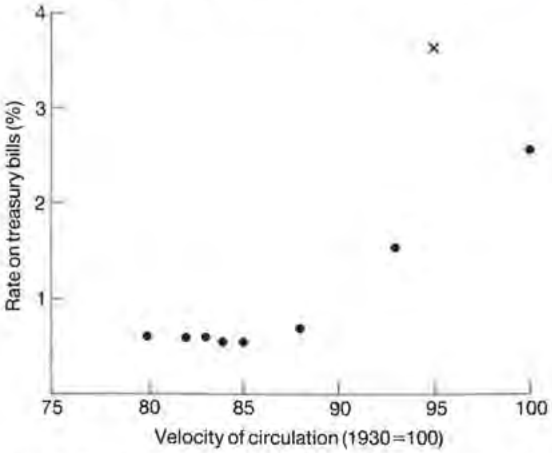

FIG. 23. *Velocity of Circulation and rate on Treasury Bills, UK, 1930–1938*

amount of cash required for a given turnover at a given short-term rate of interest.[40]

An analysis of the relationship between the short-term rate of interest and the velocity of circulation of cash balances of large manufacturing companies in the USA for the period 1919–40 was carried out on the same lines by Mr I. N. Behrman.[41] He arrives at similar results.

Changes in the supply of cash by banks

It follows from equation (11) that

$$MV(\rho) = T$$

In this form the equation is actually the quantity of money equation.[42] Its significance here, however, is quite different from that in the quantity theory of money. It shows that with a given value of transactions, T, an increase in the supply of money, M, by the banking system causes a fall in the short-term rate of interest.

The process by which banks increase the supply of money deserves to be considered in some detail. For the sake of simplicity, let us

[40] The point for the year 1938 is also slightly raised by the increase of the short-term rate in the autumn, due to political events.

[41] 'The Short-Term Interest Rate and the Velocity of Circulation', *Econometrica*, Apr. 1948.

[42] T is the aggregate *value* of transactions and thus stands for PT in the Fisher equation.

assume that bank deposits consist only of current accounts. Imagine that banks decide to reduce their cash ratio (i.e. the ratio of the amount of notes and accounts in the central bank to deposits) and buy bills. The price of bills will rise, and thus the short-term rate of interest will fall to that level at which the public will be prepared to add to their current accounts the amount which the banks expend on bills.

It is of interest to note that the buying of bonds by banks will have similar repercussions. It is true that initially the price of bonds will rise and the yield of bonds will fall to a level which will induce the public to shift from long-term assets to short-term assets and cash. But there will also be a tendency on the part of the public to invest the additional cash received from the sale of bonds to the banks in bills; thus the price of bills will rise and the short-term rate will fall to the level at which the public will be prepared to hold the additional cash rather than invest it in bills.

Cyclical changes in the short-term rate of interest

According to the above, cyclical fluctuations in the short-term rate of interest can be explained in terms of the supply of cash by banks in

Table 45. *Short-Term Rate of Interest in the UK and the USA, 1929–1940*

Year	Rate on treasury bills in the UK (%)	Rate on prime commercial papers of 4–6 months in the USA (%)
1929	5.26	5.86
1930	2.48	3.59
1931	3.59	2.63
1932	1.49	2.73
1933	0.59	1.72
1934	0.73	1.02
1935	0.55	0.76
1936	0.58	0.75
1937	0.56	0.95
1938	0.61	0.81
1939	[a]	0.59
1940	[a]	0.56

[a] War years.

Sources: Bank of England, statistical summary; Board of Governors of the Federal Reserve System, banking and monetary statistics.

response to fluctuations in the value of transactions, T. It appears that in general this supply of cash fluctuates less than the value of transactions, so that the velocity of circulation and the short-term rate of interest increase in a boom and fall in a slump.

It should be added that the movements of the short-term rate of interest in the 1930s, both in the UK and in the USA, are not quite typical.

Both in the UK and in the USA there is a sharp fall in the depression years (with a temporary reversal in 1931 in the UK and in 1932 in the USA reflecting the financial panic; see Table 45). However, in the years of recovery the short-term rate continues to fall, thus reflecting a basic shift towards 'easy money' in banking policy.

7. The Long-Term Rate of Interest

The short-term rate and the long-term rate

It has been shown in the preceding chapter that the short-term rate of interest is determined by the volume of transactions and the supply of cash by the banking system. We shall now examine the problem of the determination of the long-term rate of interest.

In order to establish a connection between the short-term and the long-term rate of interest, we shall examine the problem of substitution between a representative short-term asset, say a bill of exchange, and a representative long-term asset, say a consol. Imagine a person or enterprise considering how to invest its reserves. The security-holder is likely to compare the results of holding various types of security for a few years. In comparing the yields, he takes into account the expected average discount rate over this period, which we denote by ρ_e, and the present long-term rate of interest (yield of consols), r. We may now examine the advantages and disadvantages of both types of security, the net result of which accounts for the difference $r - \rho_e$.

We may first consider the possibility of a capital loss. The holding of bills guarantees the integrity of the principal. On the other hand, bonds may depreciate in value during the period considered. Short-period fluctuations in the value of securities owned may be disregarded by the holder, but if the capital loss proves to have a more

permanent character, it must be accounted as such.[43] Therefore, a provision for the risk of depreciation in value, γ, must be taken into account when the yields r and ρ_e are compared.

On the other hand, there are certain advantages involved in holding bonds as compared with bills. The expected rate of discount, ρ_e, is subject to uncertainty, while the rate of interest on bonds, r, is not. Moreover, the holding of bills which must be rebought every 3 months involves various inconveniences and costs. These considerations, however, are not very important, and the advantages, ε, of bond-holding from this point of view are not apt to be valued at more than, say, 1%.

If we consider the net effect of the disadvantages, γ, and the advantages, ε, of holding a bond we have:

$$r - \rho_e = \gamma - \varepsilon \tag{12}$$

We may give further consideration to the value of γ. If the present price of consols is p and the holder has a certain, more or less definite, idea based on past experience about the minimum to which this price may fall, $p_{\min}$, it is plausible to assume that γ is roughly proportional to $(p - p_{\min})/p$, i.e. to the maximum percentage by which the price of consols is considered apt to fall. We thus have

$$\gamma = g\frac{p - p_{\min}}{p} = g\left(1 - \frac{p_{\min}}{p}\right) \tag{13}$$

If the period for which the calculation is made were 1 year and the depreciation in capital value were considered certain, g would be equal to 100. But since the period is normally longer and the maximum depreciation not very probable, g may be expected to be much less than 100.

As the price of consols is in inverse proportion to their yield, expression (13) may be written:

$$\gamma = g\left(1 - \frac{r}{r_{\max}}\right) \tag{13a}$$

where $r_{\max}$ is the yield corresponding to the 'minimum price', $p_{\min}$. By substituting this expression for γ in equation (12), we obtain, after

[43] It should be noted that the loss is due to depreciation of the bond *per se* and not to the need to convert it into cash at a time when the market position is unfavourable. The cash required in an emergency can always be obtained by means of bank credit granted on the security of the bonds up to a high percentage of their value.

simple transformations:

$$r = \frac{\rho_e}{1 + \frac{g}{r_{\max}}} + \frac{g - \varepsilon}{1 + \frac{g}{r_{\max}}} \tag{14}$$

If the coefficients g, ε, and $r_{\max}$ are stable, this equation expresses the long-term rate, r, as a linear function of the expected short-term rate, ρ_e. It may be seen that (g, ε, and $r_{\max}$ being stable) r always changes by a smaller amount than ρ_e, since $1 + g/r_{\max} > 1$. This follows from our assumption that when r increases the risk of the depreciation of consols declines (equation (13a)).

We thus have 2 factors explaining the stability of the long-term rate as compared with the short-term rate of interest. (i) The short-run changes in the short-term rate, ρ, are only partly reflected in the estimates of ρ_e. (ii) The long-term rate, r, changes by a smaller amount than ρ_e, the average short-term rate expected over the next few years.

It is important to note that the 'risk coefficient' may increase not only when the depreciation of bonds is considered more likely, but also when the proportion of holdings of long-term assets to holdings of short-term assets plus cash rises. For then, with the same probability of depreciation in bond values, an actual fall means a greater loss relative to the value of all liquid assets. This 'increasing risk' is accounted for by a higher g. Thus, *ceteris paribus*, if the amount of long-term assets relative to all liquid assets held by the public rises, g tends to increase.

Moreover, the coefficient g also depends on the rate of income tax (which we have so far ignored). Indeed, the difference between the long-term yield and the short-term yield is subject to tax, but depreciation in the value of bonds is not usually accounted in making the tax assessment, or at least not fully accounted. This introduces an additional disadvantage in the holding of bonds as compared with bills, and thus the coefficient g is correspondingly higher.

Application to the yields of British consols, 1849–1938

We shall now apply the results arrived at in the last section to the analysis of yields of consols in 1849–1938. A time-curve of the yield of consols is presented in Fig. 24. It will be seen that it is possible to subdivide this period into 10 very unequal intervals, within each of which the long-term rate undergoes relatively small fluctuations

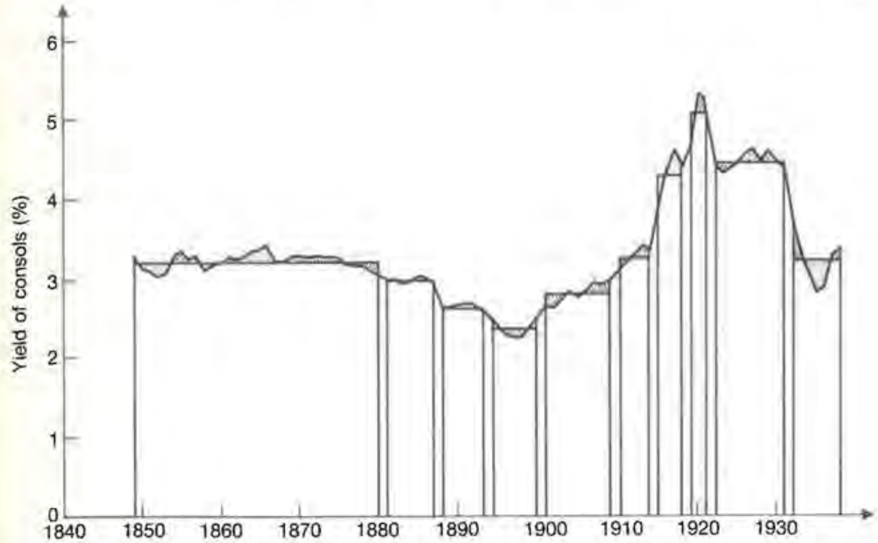

FIG. 24. *Yield of Consols, UK, 1849–1938*

round the average as compared with the changes between the intervals: 1849–80, 1881–7, 1888–93, 1894–1900, 1901–9, 1910–14, 1915–18, 1919–21, 1922–31, 1932–8. This may be accounted for by a hypothesis that within each of these intervals the expected short-term rate ρ_e and the coefficients g, $r_{\max}$, and ε fluctuated only slightly around certain values while they underwent more basic changes from interval to interval.

Let us turn our attention to these changes in the expected average discount rate ρ_e. Within each of our intervals, the discount rate ρ in fact underwent distinct fluctuations which did not, however, cause important fluctuations in ρ_e. This may be accounted for by the following hypothesis: the investors, in their estimates of ρ_e, disregarded to a great extent the high and low levels of the discount rate within the intervals, classifying them as temporary, and based their expectations chiefly on the most recent medium position; and the spread of these medium values was rather small within each period. If this hypothesis is correct, it follows that the average ρ_e in each period does not differ much from the average of the actual rate of discount ρ in that period. On this assumption we may take the average discount rate in each period to be our first approximation of the average ρ_e, and thus may correlate the average yields of consols and average discount rates within the selected periods and analyse the regression equations by means of formula (14).

The average yield of consols and the average discount rate for the selected periods from 1849 to 1938 are given in Table 46. Fig. 25 presents the same data on a scatter diagram. It will be seen that most of the points lie very close to two straight lines, AB and A_1B_1. The points corresponding to the intervals before the First World War lie close to the line AB except those representing 1881–7 and 1910–14. The points corresponding to the post-war periods lie close to the line A_1B_1, which is considerably above AB. Finally, the war period 1915–18 is represented by a point lying between AB and A_1B_1. The position of the point 1881–7 above AB is accounted for by the fact that the yield of consols in this period did not reflect the level of the 'pure long-term rate' but was 'too high' owing to expected conversion.[44]

The results obtained may be plausibly interpreted in terms of formula (14). In 1849–1909 the coefficients g, r_{max}, and ε were more or less stable, and therefore we have a linear functional relationship between r and ρ_e represented by AB. After this period these coefficients underwent a definite change, chiefly during the First World War, and then became stable again in the post-war period, so that points ρ_e and

Table 46. *Average Yield of Consols and Average Discount Rate, Selected Periods, 1849–1938*

Interval	Average yield of consols (%)	Average discount rate (%)
1849–80	3.21	3.66
1881–7	2.98	2.82
1888–93	2.63	2.68
1894–1900	2.38	2.18
1901–9	2.82	3.09
1910–14	3.27	3.4
1915–18	4.30	4.3
1919–21	5.07	5.09
1922–31	4.48	3.76
1932–8	3.25	0.82

Sources: T. T. Williams, 'The Rate of Discount and the Price of Consols', *Journal of the Royal Statistical Society*, Feb. 1912; UK annual abstract of statistics; Bank of England, statistical summary.

[44] See R. G. Hawtrey, *A Century of Bank Rate*, London, Longmans, 1938.

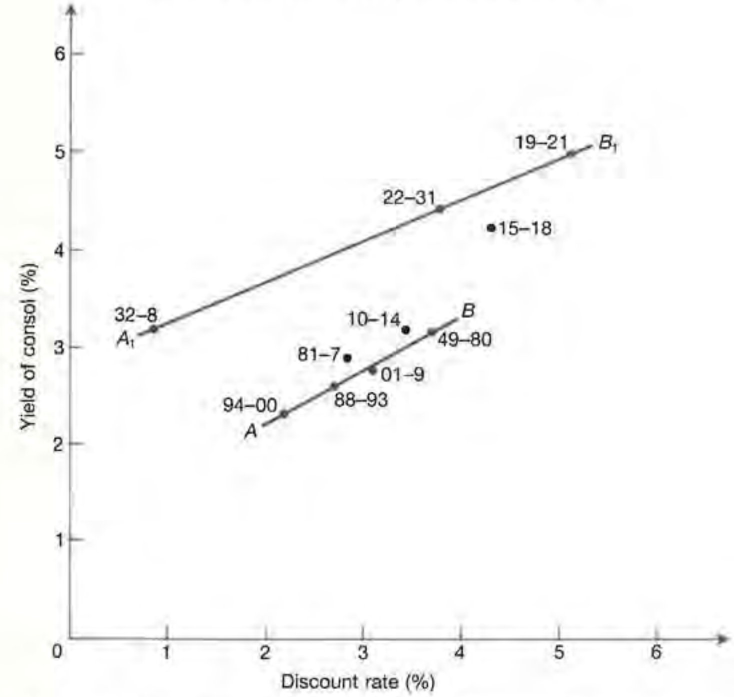

FIG. 25. *Discount Rate and Yield of Consols, UK, 1849–1938*

r are in this period situated on the straight line A_1B_1. The points 1910–14 and 1915–18, lying between AB and A_1B_1, represent the period during which the shift from AB to A_1B_1 occurred.

From the equations of lines AB and A_1B_1 the coefficients g and ε may now be obtained for 1849–1909 and 1919–38 respectively.

The equation of AB (1849–1909) is

$$r = 0.550\,\rho_e + 1.17$$

If we compare it with formula (14),

$$r = \frac{\rho_e}{1 + \dfrac{g}{r_{max}}} + \frac{g - \varepsilon}{1 + \dfrac{g}{r_{max}}} \tag{14}$$

we obtain 2 equations:

$$\frac{1}{1 + \dfrac{g}{r_{max}}} = 0.550 \quad \text{and} \quad \frac{g - \varepsilon}{1 + \dfrac{g}{r_{max}}} = 1.17$$

With regard to the expected maximum long-term rate we may assume that it is approximately 3.4, for this was the maximum rate in the period in question, and the level of r at the beginning of the period was not much lower. It is then possible to determine from the last equations the coefficients g and ε. We obtain: $g = 2.78$, $\varepsilon = 0.65$.

The equation for 1919–38 is

$$r = 0.425\,\rho_e + 2.90$$

and consequently

$$\frac{1}{1+\frac{g}{r_{max}}} = 0.425 \quad \text{and} \quad \frac{g-\varepsilon}{1+\frac{g}{r_{max}}} = 2.90$$

Here r_{max} may be assumed equal to 5.1, this being the level reached at the beginning of the period and never exceeded thereafter. Thus we obtain: $g = 6.9$, $\varepsilon = 0.07$.

We may now put together the results of our calculation:

Period	g	r_{max}	ε
1849–1909	2.78	3.40	0.65
1919–38	6.90	5.10	0.07

From the point of view of confirming our theory, the most important result is that ε (the advantage, abstracting from the risk of depreciation, of bonds as compared with bills) is small, as we expected it to be for a priori reasons. If the coefficient of ρ_e in the post-war period had been not 0.425 but, say, 0.25, we should, *ceteris paribus*, have obtained for ε the value 3.7, which would be obviously absurd and so would disprove our theory.[45] [8]

The coefficient g is small as compared with 100, both in the pre-war and the post-war periods—which is again in accordance with a priori argument. The considerable rise in g (about 2.5 times) between these two periods is explained by the much greater fluctuations in r after 1914 and by the rise in income taxes and surtaxes. The definite rise in g in combination with the increase in r_{max} accounts for the shift of the line AB to the position A_1B_1.

[45] The theory would not be disproved, however, if ε were small and negative, although according to our theory it should be positive. The empirical enquiry outlined here is of necessity approximate in character, and thus may easily render a small negative ε instead of a small positive one.

Stability of the long-term rate of interest during the business cycle

A glance at Fig. 24 will show that major changes in the long-term rate do not follow a 6- to 10-year cyclical pattern. Apart from minor fluctuations, there is something like one wave from 1849 to 1914. This period is followed by that of the war and post-war inflation. After the descent from the peak reached at the beginning of the 1920s, the long-term rate is stabilized until the great depression, when a downward trend continuing into the second half of the 1930s appears. The reversal of this trend in the last two years before the Second World War is due to the political situation.

Table 47 gives the yield on consols for 1929–38, and the yield of US treasury bonds for 1929–40. In both countries the main feature is the downward trend which results from the long-run fall in the short-term rate. However, the American series differs at two points: there is a significant increase in the US long-term rate in 1932, reflecting the intensity of the financial panic; and there is no rise in 1937 and 1938 in contrast to the UK, where the long-term rate was affected by the world political situation. In neither series can any definite cyclical pattern be

Table 47. *The Long-Term Rate of Interest in the UK and the USA during the Great Depression*

Year	Yield on UK $2\frac{1}{2}$% consols (%)	Yield on US treasury bonds (%)
1929	4.60	3.60
1930	4.48	3.29
1931	4.39	3.34
1932	3.74	3.68
1933	3.39	3.31
1934	3.10	3.12
1935	2.89	2.79
1936	2.94	2.69
1937	3.27	2.74
1938	3.37	2.61
1939	[a]	2.41
1940	[a]	2.26

[a] War years.

Sources: Bank of England, statistical summary; Board of Governors of the Federal Reserve System, banking and monetary statistics.

seen. In particular, there is no significant fall like that in the short-term rate until 1934.

The fact that the long-term rate does not show marked cyclical fluctuations is fully in line with the above theory. The short-term rate normally falls in a slump and rises in a boom because the supply of money undergoes smaller fluctuations than the value of transactions. But the long-term rate reflects these fluctuations only to a small extent. Indeed, the long-term rate is based on the average short-term rate expected in the next few years rather than on the current short-term rate; moreover, the long-term rate changes considerably less than the expected short-term rate because the increase in it, that is, the fall in the price of bonds, makes the risk of their further depreciation less likely (see p. 270).

Some authors have attributed to the rate of interest an important role among the forces underlying economic fluctuations. As it is the long-term rate that is relevant to the determination of investment and thus to the mechanism of the cyclical process, the results arrived at above are of considerable significance. Indeed, in view of the fact that the long-term rate of interest, for reasons discussed above, does not show marked cyclical fluctuations, it can hardly be considered an important element in the mechanism of the business cycle.[46]

[46] See pp. 283–4 below.

Part IV

Determination of Investment

8. Entrepreneurial Capital and Investment

The size of the firm and entrepreneurial capital

Two factors are usually mentioned as limiting the size of a firm: diseconomies of a large scale, and limitations of market, the expansion of which would require unprofitable price reductions or increases in selling costs. The first of these factors seems to be rather unrealistic. It has no technological basis because, although every plant has an optimum size, it is still possible to have 2, 3, or more plants. The argument with respect to difficulties of management arising out of large-scale enterprise also seems doubtful, since adequate measures of decentralization can always be introduced to meet this problem. The limitation of the size of the firm by the market for its products is real enough, but it leaves unexplained the existence of large and small firms in the same industry.

There is, however, another factor which is of decisive importance in limiting the size of a firm: the amount of entrepreneurial capital, i.e. the amount of capital owned by the firm. The access of a firm to the capital market, or in other words the amount of rentier capital it may hope to obtain, is determined to a large extent by the amount of its entrepreneurial capital. It would be impossible for a firm to borrow capital above a certain level determined by the amount of its entrepreneurial capital. If, for instance, a firm should attempt to float a bond issue which was too large in terms of its entrepreneurial capital, this issue would not be subscribed in full. Even if the firm should undertake to issue the bonds at a higher rate of interest than that prevailing, the sale of bonds might not be improved, since the higher rate in itself might raise misgivings with regard to the future solvency of the firm.

In addition, many firms will not use to the full the potentialities of the capital market because of the 'increasing risk' involved in expansion. Indeed, some firms may even keep their investment at a level below that of the entrepreneurial capital, a part of which may be held in securities. A firm considering expansion must face the fact that, given the amount of the entrepreneurial capital, the risk increases with the amount invested. The greater the investment in relation to the entrepreneurial capital, the greater the reduction of the entrepreneur's income in the event of an unsuccessful business venture. Suppose, for instance, that an entrepreneur fails to make any return on his business. Now, if only a part of his capital is invested in business and a part is held in first-rate bonds, he will still derive some net income from his capital. If all of his capital is invested his income will be zero, while, if he has borrowed, he will suffer a net loss which, if it continues long enough, must drive his business out of existence. It is clear that the heavier the borrowing the greater will be the danger of such a contingency.

The size of a firm thus appears to be circumscribed by the amount of its entrepreneurial capital, both through its influence on the capacity to borrow capital and through its effect on the degree of risk. The variety in the size of enterprises in the same industry at a given time can be easily explained in terms of differences in entrepreneurial capital. A firm with a large entrepreneurial capital could obtain funds for a large investment, whereas a firm with a small entrepreneurial capital could not. Differences in the position of firms arising out of differences in their entrepreneurial capital are further accentuated by the fact that firms below a certain size have no access whatever to the capital market.

It follows from the above that the expansion of the firm depends on its accumulation of capital out of current profits. This will enable the firm to undertake new investment without encountering the obstacles of the limited capital market or 'increasing risk'. Not only can savings out of current profits be directly invested in the business, but this increase in the firm's capital will make it possible to contract new loans.

The problem of joint-stock companies

Legitimate doubt may arise as to whether the above limitations to investment are applicable in the case of joint-stock companies. If a

company issues bonds or debentures, the situation is not materially altered. The greater the issue the more dividends are impaired in the event of an unsuccessful business venture. The position is similar in the case of an issue of preference shares (the fixed return on which is paid from profit before any return accrues to ordinary shares). But what about an issue of ordinary shares? Prima facie it would seem that no limits are set to such an issue, but in fact there are quite a few restraining factors.

(i) It should first be stated that a joint-stock company is not a 'brotherhood of shareholders' but is managed by a controlling group of big shareholders, while the rest of the shareholders do not differ from holders of bonds with a flexible rate of interest.[9] Now this group, if it is to continue to exercise control, cannot sell an unlimited number of shares to the public. It is true that this difficulty may be partly overcome, for instance, by building up holding companies.[47] Nevertheless, the problem of the maintenance of control by top shareholders exerts *some* restraining influence upon issues to the 'public'.

(ii) There is a risk that the investment financed by an issue of shares may not increase company profits proportionally as much as the issue increased the share and reserve capital. If the rate of rèturn on the new investment does not at least equal the old rate of profits, then the dividends of the old shareholders in general, and of the controlling group in particular, will be squeezed. Risk of this type is, of course, greater the larger the new issue. This is, therefore, another case of increasing risk.

(iii) Share issues are restrained by the limited market for shares of a given company. The public tend to distribute their risks by holding a variety of shares. It will be impossible, therefore, to place more than a limited amount of new shares at a price which would be reasonable from the point of view of the old shareholders. For the latter, the price at which new shares are sold is of crucial importance. Indeed, if this price is too low in relation to expected profits, a situation similar to that considered under (ii) will arise. The new issue will not increase the

[47] A group possessing 51% of shares of a company starts a new company to hold their shares. The group retains 51% of the shares of the new company and sells 49% to the public. It now controls the holding company and through it the old company with only about 26% of the capital of the latter, while it has about 25% of this capital in cash which it is free to invest in a new share issue of the old company.

earning capacity of the company proportionally as much as its share and reserve capital, and this will result in a squeezing of the dividends of the old shareholders.

All this points to the fact that a joint-stock company also has definite limitations to its expansion. This expansion depends, as in the case of a family concern, on the accumulation of capital out of current profits. This increase in entrepreneurial capital, however, is not confined to the undistributed profits of the company. Subscriptions of share issues by the controlling group which are closely connected with the group's 'personal' savings should be considered as another form of accumulation of entrepreneurial capital.

The 'internal' accumulation of capital provides resources which can be ploughed back into the business. Moreover, such an accumulation facilitates new issues of shares to the public because it helps to overcome the obstacles enumerated above. (i) When the accumulation takes the form of subscriptions to share issues by the controlling group, it permits the issue of a certain amount of shares to the public without infringing upon the command of the group over the majority of shares. (ii) A growth in the size of the firm through 'internal' accumulation of capital decreases the risk involved in issuing a given amount of shares to the public to finance new investment. (iii) An increase in the capital of the company without recourse to the public will tend to widen the capital market for the shares of that company, since, in general, the larger a company is the more important will its role in the share market be.

Concluding remarks

The limitation of the size of the firm by the availability of entrepreneurial capital goes to the very heart of the capitalist system. Many economists assume, at least in their abstract theories, a state of business democracy where anybody endowed with entrepreneurial ability can obtain capital for starting a business venture. This picture of the activities of the 'pure' entrepreneur is, to put it mildly, unrealistic. The most important prerequisite for becoming an entrepreneur is the *ownership* of capital.

The above considerations are of great importance for the theory of determination of investment. One of the important factors of investment decisions is the accumulation of firms' capital out of current profits. We shall deal with this subject in detail in the next chapter.[48]

9. Determinants of Investment

Determinants of fixed capital investment decisions

Our problem here is to find the determinants of the *rate* of investment decisions, i.e. the amount of investment decisions per unit of time. Investment decisions in a given period, determined by certain factors operating in that period, are followed by actual investment with a time-lag. The time-lag is largely due to the period of construction, but also reflects such factors as delayed entrepreneurial reactions. If the amount of fixed capital investment decisions per unit of time is denoted by D, and investment in fixed capital by F, we shall have the relation:

$$F_{t+\tau} = D_t \tag{15}$$

where the lag, τ, is the horizontal distance between the time-curve of investment decisions per unit of time, D, and the time-curve of investment in fixed capital, F.[49]

We shall approach the problem of the determinants of fixed-capital investment decisions as follows. If we consider the rate of investment decisions in a short period, we can assume that at the beginning of this period the firms have pushed their investment plans up to a point where they cease to be profitable, either because of the limited market for the firm's products or because of increasing risk and limitation of the capital market. New investment decisions will thus be made only if, in the period considered, changes in the economic situation take place which extend the boundaries set to investment plans by those factors. We shall take into consideration 3 broad categories of such changes in the given period: (i) gross accumulation of capital by firms

[48] The problems discussed here are also of considerable importance for the theory of concentration of capital: see J. Steindl, 'Capitalist Enterprise and Risk', *Oxford Economic Papers*, Mar. 1945.

[49] It should be noticed that investment decisions are not strictly irrevocable. The cancellation of investment orders, although involving considerable loss, can and does take place. This is a factor, therefore, which disturbs the relationship between investment decisions and investment as described by equation (15).

out of current profits, i.e. their current gross savings; (ii) changes in profits; and (iii) changes in the stock of fixed capital.[10] Let us examine these factors in more detail.

The first factor has been dealt with in a general way in the preceding chapter. Investment decisions are closely related to 'internal' accumulation of capital, i.e. to the gross savings of firms. There will be a tendency to use these savings for investment, and, in addition, investment may be financed by new outside funds on the strength of the accumulation of entrepreneurial capital. The gross savings of firms thus extend the boundaries set to investment plans by the limited capital market and the factor of increasing risk.

The gross savings of firms consist, strictly speaking, of depreciation and undistributed profits. We shall include with these, however, the 'personal savings' of the controlling groups invested in their own companies through subscriptions to new share issues. This concept of gross savings of firms is thus somewhat vague. We shall get around this difficulty by assuming that the gross savings of firms as conceived above are related to total gross private savings (*inter alia* as a result of the correlation between profits and national income—see pp. 251–2 above). On this assumption, the rate of capital investment decisions D is an increasing function of total gross savings S. (We imagine that investment decisions and investment are in real terms—i.e. their values are deflated by the index of prices of investment goods. It follows directly that gross savings also have to be deflated by the index of prices of investment goods.)

Another factor which influences the rate of investment decisions is the increase in profits per unit of time. A rise in profits from the beginning to the end of the period considered renders attractive certain projects which were previously considered unprofitable, and thus permits an extension of the boundaries of investment plans in the course of the period. The value of the resulting new investment decisions divided by the length of the period gives us the contribution of the change of profits per unit of time to the rate of investment decisions in the period considered.

When the profitability of new investment projects is being weighed, expected profits are considered in relation to the value of the new capital equipment. Thus profits are taken in relation to the current prices of investment goods. We can allow for this factor by deflating profits by the price index of investment goods. In other words, if we denote aggregate gross profits after taxes deflated by the price of

investment goods by P,[50] we can say that *ceteris paribus* the rate of investment decisions D is an increasing function of $\Delta P/\Delta t$.

Finally, the net increment of capital equipment per unit of time adversely affects the rate of investment decisions, i.e. without this effect the rate of investment decisions would be higher. Indeed, an increase in the volume of capital equipment if profits P are constant means a reduction in the rate of profit. Just as an increase in profits within the period considered renders additional investment projects attractive, so an accumulation of capital equipment tends to restrict the boundaries of investment plans. This effect is most easily seen in the case where new enterprises enter the field and thereby render investment plans of the established firms less attractive. If we denote the value of the stock of capital equipment deflated by appropriate prices by K, we can say that the rate of investment decisions D is *ceteris paribus* a decreasing function of $\Delta K/\Delta t$.

To sum up: the rate of investment decisions D is, as a first approximation, an increasing function of gross savings S and of the rate of change in aggregate profits, $\Delta P/\Delta t$, and a decreasing function of the rate of change in the stock of capital equipment, $\Delta K/\Delta t$. Assuming, moreover, a linear relation we have:

$$D = aS + b\frac{\Delta P}{\Delta t} - c\frac{\Delta K}{\Delta t} + d \tag{16}$$

where d is a constant subject to long-run changes,[11] particular technical progress.[11] As, according to equation (15),

$$F_{t+\tau} = D_t$$

we also have for investment in fixed capital at time $t + \tau$:

$$F_{t+\tau} = aS_t + b\frac{\Delta P_t}{\Delta t} - c\frac{\Delta K_t}{\Delta t} + d \tag{16a}$$

Factors not taken into consideration

It may be questioned why changes in the rate of interest, which have an opposite effect to changes in profits, were not considered as a co-determinant of investment decisions. This simplification is based on

[50] The concept of 'real' gross profits, P, in chs. 3, 4, and 5 differs from the present one in that there the price index implicit in the deflation of the gross product of the private sector was used as deflator.

the fact that, according to the above (see p. 276), the long-term rate of interest does not show marked cyclical fluctuations.

It is true that the yields of business debentures sometimes increase appreciably during depressions because of crises of confidence. The omission of this factor does not invalidate the above theory, since the rise in the yields of the securities in question works in the same direction as the fall in profits (although it is of much less significance). Thus this effect may be roughly accounted for in the discussion of the business cycle by a somewhat higher coefficient b in equation (16).

It is still necessary, however, to consider the problem raised by the fluctuations of share yields, that is, of the ratios of current dividends to share prices. The movement of yields of preference shares shows very much the same pattern as that of the yields of debentures, and may be taken into consideration in the same way. This is not, however—at least not fully—the case for ordinary shares. Although this factor seems to be in general of limited importance, this is not to deny that it may vitiate to some extent the application of the above theory.

We shall now consider briefly an entirely different factor which was not taken into account in building up equation (16), namely, innovations. We assume that innovations, in the sense of gradual adjustments of the equipment of a firm to the current state of technology, are part and parcel of 'ordinary' investment as determined by this formula. The immediate effect of a new invention is discussed in ch. 15 below in connection with the theory of economic development. It will be seen there that these effects are reflected in the level of d. The same is true of the long-run changes in the rate of interest or in the share yields.

Two special cases of the theory

It can be shown that equation (16) covers, as special cases, some of the existing theories of investment decisions.

Let us first assume that the coefficients a and c are equal to zero so that the equation is reduced to

$$D = b\frac{\Delta P}{\Delta t} + D$$

Let us assume in addition that d is equal to depreciation. It follows that net investment is determined by the rate of change in 'real' profits. This case corresponds roughly to the so-called acceleration principle. It is true that this principle establishes a relationship between net

investment and the rate of change in output rather than in profits, and that the theoretical foundations are different from those given above, but the final results are much the same because of the interrelationship between 'real' profits and aggregate output (see ch. 5).

With respect to the theoretical problem, it would appear to be more realistic to base the acceleration principle on the grounds suggested above (see p. 282) than to deduce it from the necessity of expanding capacity in order to increase output. It is well known that large reserve capacities exist, at least throughout a considerable part of the cycle, and that output may therefore increase without an actual increase in existing capacities. But whatever the basis of the acceleration principle may be, it is inadequate not only because it does not take into consideration the other determinants of investment decisions examined above, but also because it does not agree with the facts. In the course of the business cycle, the highest rate of increase in output will be somewhere close to the medium position (see Fig. 26). It would follow from the acceleration principle that the highest level of investment decisions would come into existence at that time. This, however, is unrealistic. Indeed, it would mean that the time-lag between investment decisions and aggregate output would be about one-fourth of the business cycle, or 1.5–2.5 years. As it is difficult to assume that the time-lag between investment decisions and actual investment would be more than 1 year,[51] it would mean that the actual investment in fixed capital would 'lead' output by 0.5–1.5 years. The available data do not substantiate such a lag. This will be seen, for instance, from Fig. 27, where the time-curves of investment in fixed capital and

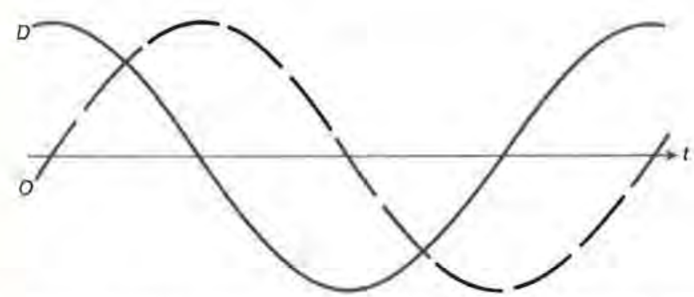

FIG. 26. *Fixed Capital Investment Decisions, D, and Aggregate Output, O (reduced to the same amplitude), according to the Acceleration Principle*

[51] See pp. 292–3 below.

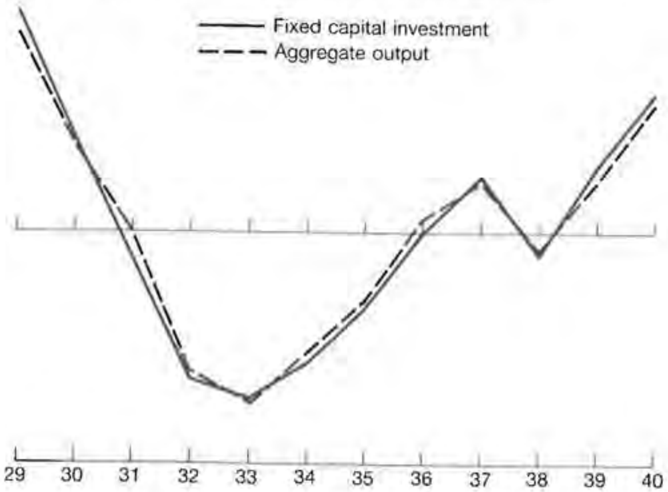

FIG. 27. *Fluctuations in Fixed Capital Investment and Gross Product of the Private Sector, USA, 1929–1940. The time-curves are reduced to the same amplitude and the intervening trend is eliminated. (For details see statistical appendix, n. 10.)*

output (gross product of the private sector) are given for the USA for 1929–40. It appears that no appreciable time-lag is discernible. The regression equation, patterned on our equation (16a), which we obtain below for the US investment in fixed capital for this period (see p. 295), also does not conform at all to the acceleration principle.

We obtain the second special case of our theory by assuming that a given amount of new savings affects investment decisions to an equal extent, that is, by assuming that a is equal to 1. We also assume that the constant d is equal to 0. Thus we have:

$$D = S + b\frac{\Delta P}{\Delta t} - c\frac{\Delta K}{\Delta t}$$

If in addition the assumption is made that inventories are stable throughout the cycle, and that the export surplus and the budget deficit are both equal to zero, it follows that savings S are equal to actual investment in fixed capital F (because savings are equal to investment in fixed capital and inventories plus export surplus plus budget deficit). We thus obtain:

$$D = F + b\frac{\Delta P}{\Delta t} - c\frac{\Delta K}{\Delta t}$$

and taking into consideration that $F_t = D_{t-\tau}$

$$D_t = D_{t-\tau} + b\frac{\Delta P_t}{\Delta_t} - c\frac{\Delta K_t}{\Delta_t}$$

or

$$D_t - D_{t-\tau} = b\frac{\Delta P_t}{\Delta t} - c\frac{\Delta K_t}{\Delta t}$$

Now it is clear from the last equation that if profits P and the stock of capital equipment K are constant, so is the rate of investment decisions D (because $D_t = D_{t-\tau}$). When profits increase to a new level, so does D (because during the period when P is increasing $D_t > D_{t-\tau}$). When the stock of capital equipment K rises to a new level, D declines (because during the period when K is increasing $D_t < D_{t-\tau}$). It follows that the rate of investment decisions is an increasing function of the level of profits and a decreasing function of the stock of capital equipment. This is the relationship which was the basis of the theory of the business cycle given in my *Essays on the Theory of Economic Fluctuations*. Thus this theory also appears to be a special case of the present one.

It is sometimes assumed that the relationship obtained here as a special case is operative under all conditions, on the following grounds. The expected rate of profit may be assumed to be an increasing function of 'real' current profits and a decreasing function of the stock of capital equipment. It is further considered obvious that the higher the expected rate of profits the higher the level of investment in fixed capital will be.[52] The latter, however, is plausible only at first glance. The relation ceases to be obvious when it is remembered that we consider here the amount of investment decisions *per unit of time*. If a certain level of the rate of profits is maintained for some time, then the firm would make all the investment decisions which correspond to that rate of profits so that after that, unless some new facts came into the picture, no decisions would be forthcoming. It is the full reinvestment of savings coupled with the equality of savings and investment in fixed capital that assures, in the special case considered, the maintenance of the level of investment decisions per unit of time when the rate of profits is constant. But once these fairly rigid assumptions are dropped, the theorem ceases to be true, and a more

[52] Such was also my conception in my early papers in *Revue d'Économie Politique* and *Econometrica*.

general approach based on the equation

$$D = aS + b\frac{\Delta P}{\Delta t} - c\frac{\Delta K}{\Delta t} + d$$

is necessary.

Examination of the fundamental equation

Before proceeding with an examination of the coefficients of equation (16a) it will be useful to alter it somewhat.[12] Let us first take into consideration the fact that the rate of change in fixed capital equipment is equal to investment in fixed capital net of depreciation in the same period:

$$\frac{\Delta K}{\Delta t} = F - \delta$$

where δ is depreciation of equipment due to wear and tear and obsolescence. Thus equation (16a) can be written as follows:

$$F_{t+\tau} = aS_t + b\frac{\Delta P_t}{\Delta t} - c(F_t - \delta) + d$$

Let us now transfer $-cF_t$ from the right-hand to the left-hand side of the equation and divide both sides of the equation by $1 + c$:

$$\frac{F_{t+\tau} + cF_t}{1 + c} = \frac{a}{1+c}S_t + \frac{b}{1+c}\frac{\Delta P_t}{\Delta t} + \frac{c\delta + d}{1+c}$$

The left-hand side of the equation is then a weighted average of $F_{t+\tau}$ and F_t. We can assume as a good approximation that it is equal to an intermediate value $F_{t+\theta}$ where θ is a time-lag less than τ. As c is likely to be a rather small fraction,[53] θ is of the same order as τ. We can now write:

$$F_{t+\theta} = \frac{a}{1+c}S_t + \frac{b}{1+c}\frac{\Delta P_t}{\Delta t} + \frac{c\delta + d}{1+c}$$

[53] Cyclical fluctuations in the stock of capital K in % terms are rather small. Thus changes in the rate of profit resulting from this factor are small as well. Consequently, fluctuations in investment in fixed capital are accounted for to a much greater extent by changes in S and $\Delta P/\Delta t$ than by those in $\Delta K/\Delta t$ (although the latter may be of considerable significance in certain phases of the cycle, as will be seen in ch. 11). In other words, the amplitude of fluctuations in $c(\Delta K/\Delta t)$ is much smaller than that in F. But as $\Delta K/\Delta t$ is the net investment in fixed capital (and the depreciation δ undergoes only slight cyclical fluctuations), this means that c is small as compared with 1.

The determinants of investment in fixed capital are thus reduced to past savings and to the past rate of change in profits. The negative effect of an increase in the stock of capital equipment is reflected in the denominator $1 + c$. To simplify the form of the equation we shall denote

$$\frac{b}{1+c} = b' \quad \text{and} \quad \frac{c\delta + d}{1+c} = d'$$

No such abbreviation will, however, be introduced for $a/(1 + c)$, because its dependence on a and c (the coefficients of savings, S, and of the rate of change in the stock of capital equipment, $\Delta K/\Delta t$, respectively, in the initial equation) is of significance for the subsequent discussion. We thus can write our equation finally in the form

$$F_{t+\theta} = \frac{a}{1+c}S_t + b'\frac{\Delta P_t}{\Delta t} + d' \qquad (17)$$

We shall now examine the coefficients of this equation. The constant d' is subject to long-run changes.[54] An analysis of the factors on which these changes depend is given in ch. 15. However, as will be seen below, its value is not relevant in a discussion of the business cycle. Nothing can be said on an a priori basis about the coefficient b', although, as will be seen, its value is of decisive importance in determining the character of cyclical fluctuations. It will thus be necessary to consider a few alternative cases with different values of this coefficient. The only coefficient about which we shall make definite assumptions at this stage is $a/(1 + c)$.

The coefficient a, which indicates by how much investment decisions D increase as a result of increments in total current savings S, will be influenced by various factors. First, the increment in the 'internal' savings of the firms which is relevant for investment decisions is smaller than the increment in total saving. This factor in itself would tend to make a less than 1. Another factor works in the same direction. The reinvestment of savings on a *ceteris paribus* basis, that is, with constant aggregate profits, may encounter difficulties because the market for the firm's products is limited, and expansion into new spheres of activity involves considerable risk. On the other hand, an

[54] d' denotes $(c\delta + d)/(1 + c)$. On p. 283 d was assumed to be a constant subject to long-run changes. Depreciation, δ, fluctuates only very little in the course of the business cycle, but in the long run it varies in line with the volume of capital equipment.

increment in 'internal' savings enables the firm to absorb outside funds at a higher rate if investment *is* considered desirable. This factor tends to increase investment decisions by more than the increment in 'internal' savings. These conflicting factors leave us still uncertain about whether a will be greater or less than 1.

The coefficient $a/(1 + c)$ is smaller than a because c is positive. According to the above, this reflects the negative influence upon investment decisions of an increasing stock of capital equipment. We shall assume that this coefficient is less than 1 for the following reasons. It will be seen below that with $a/(1 + c) > 1$ there would be in fact no business cycle at all (see ch. 11), and the long-run development of the capitalist economy would also be different from the process we know (see ch. 14). Moreover, the analysis of the US data for 1929–40 yields for $a/(1 + c)$ a value significantly less than 1. Since the coefficient c is a rather small fraction (see p. 288 above), $a/(1 + c) < 1$ means that a cannot be much higher than 1 (and, of course, it can be $\leqslant 1$).

Investment in inventories

In our analysis of investment in fixed capital we arrived at equation (17), which indicates that fixed capital investment decisions are a function both of the level of economic activity and of the rate of change in this level. Indeed, the amount of savings S in the equation is associated with the *level* of economic activity, while the rate of increase in profits $\Delta P/\Delta t$ is related to the *rate of change* in this level. It is for this reason that the acceleration principle, which bases itself on the rate of change only, is inadequate for the explanation of investment in fixed capital. However, for investment in inventories, the acceleration principle seems to be a reasonable assumption.

It is indeed plausible to assume that the rate of change in the volume of inventories is roughly proportional to the rate of change in output or the volume of sales. However, empirical investigations of changes in inventories show that here also a significant time-lag between cause and effect is clearly discernible. This is accounted for by the fact that a rise in output and sales does not create any immediate need for an increase in inventories, because a part of inventories serves as a reserve and, therefore, it is temporarily possible to increase the speed of turnover of total inventories. It is only after some time that inventories are adjusted to the new higher level of output. Similarly, when output

falls the volume of inventories is accordingly curtailed, but only after a certain delay and in the meantime there is a decline in their speed of turnover.

There arises the question whether the availability of capital does not play a significant role in investment in inventories, as it does in investment in fixed capital. In other words, should we not assume that investment in inventories depends not only on the rate of change in output, but on the inflow of new savings as well? This, however, does not seem in general to be the case, since inventories are semi-liquid assets, and short-term credit can be depended upon to finance any expansion in step with output and sales.

In the light of the above, we can relate investment in inventories, J, to the rate of change in output of the private sector, $\Delta O/\Delta t$, with a certain time-lag. According to the information available, this time-lag seems to be of a similar order to that involved in fixed capital investment, τ. For the sake of simplicity we shall assume that the inventory time-lag is equal to θ which is of the same order as τ (see p. 288). We thus can write for investment in inventories:

$$J_{t+\theta} = e\frac{\Delta O_t}{\Delta t} \tag{18}$$

It should be noticed that the coefficient e and the time-lag θ are really averages. The relationship between changes in inventories and changes in output is very different for various commodities, and changes in inventories have no direct relation to changes in output of services (also included in O_t). If any stability in e can be expected at all, it is only on the basis of a correlation between fluctuations of various components of the total output of the private sector, O.

It should be noticed that the phenomenon of accumulation of unsold goods is accounted for at least partly by the time-lag θ in equation (18). Indeed, when the volume of sales stops rising and begins to fall, inventories according to our formula will continue to rise for a time. This is not to deny, however, that in such circumstances the accumulation of unsold goods may continue on a larger scale than suggested by this formula. This deviation from the formula probably does not have a very serious bearing upon the overall theory of the trade cycle, because this 'abnormal' accumulation of inventories is frequently liquidated in a relatively short time.

Formula for total investment

We obtained above the following formulae for investment in fixed capital F and for investment in inventories J:

$$F_{t+\theta} = \frac{a}{1+c} S_t + b' \frac{\Delta P_t}{\Delta t} + d' \tag{17}$$

$$J_{t+\theta} = e \frac{\Delta O_t}{\Delta t} \tag{18}$$

Adding these 2 equations we obtain a formula for total investment I:

$$I_{t+\theta} = \frac{a}{1+c} S_t + b' \frac{\Delta P_t}{\Delta t} + e \frac{\Delta O_t}{\Delta t} + d' \tag{19}$$

S_t on the right-hand side depends on the *level* of economic activity at time t, while $\Delta P_t/\Delta t$ and $\Delta O_t/\Delta t$ depend on the *rate of change* in this level. The total investment thus depends, according to our theory, on both the level of economic activity and the rate of change in this level at some earlier time.

10. Statistical Illustration

The problem of time-lag

We shall now apply the investment equation to the US data for 1929–40. A major problem at this point is the selection of the time-lag θ.

It seems unreasonable to assume, either for investment in fixed capital or for investment in inventories, that this time-lag should be longer than 1 year or shorter than half a year. A longer time-lag for investment in fixed capital might perhaps be assumed by some. It should be noticed, however, that US statistics of investment in fixed capital depend on shipments of equipment and on 'value put in place' for construction. In the latter case, where the work on various structures is differently advanced, the time-lag is about half that between starts and completions. This, of course, reduces considerably the chance that the time-lag applicable to the analysis of the US data will be more than one year. (Construction accounts for around 50% of investment in fixed capital.) On the other hand, it is difficult to imagine

this lag to be less than half a year, especially if we consider that θ also includes the delayed reaction of entrepreneurs to factors determining investment decisions. The same seems to be true of inventories. In the light of what is known about their movement, it is difficult to assume a time-lag shorter than half a year. On the other hand, a time-lag longer than 1 year seems definitely unreasonable in this case.

Having fixed the limits for the time-lag θ, we are still left with the problem of choosing the 'right' θ within these limits. This, however, appears to be an impossible task. In the case of investment in fixed capital, we obtain with a one-year time-lag a reasonable double correlation of investment with savings and the rate of change in profits. With a half-year time-lag we obtain a close correlation of investment with savings, but the rate of change in profits has no apparent influence. (The single correlation coefficient is much higher here than the double correlation coefficient in the case of the 1-year time-lag.) This relation, however, in spite of the perfect fit, does not seem to be very reasonable. Apart from the fact that, according to the above theory, the rate of change in profits should exert at least some influence, it does not seem plausible that such a complex phenomenon as investment in fixed capital should be determined so perfectly by one variable only.[55]

The correlation between investment in inventories and the rate of change in the aggregate output appears to be much higher for a 1-year than for a half-year time-lag. It will be seen, however, that the low correlation coefficient in the case of a half-year time-lag is largely due to the fact that investment in inventories in 1930 is considerably above the regression line. As this was the first depression year, this may be interpreted as an unusually long delay in adjustment of inventories immediately after the turning-point in output (see p. 291). It is thus again hard to say whether a half-year time-lag is less appropriate than a 1-year time-lag, even though the correlation coefficient in the former case is much lower.

[55] The danger of applying the criterion of 'goodness of fit' to the determination of the time-lag between investment decisions and actual investment may be illustrated by an extreme case. Imagine that foreign trade and the budget are balanced, and that the volume of inventories is stable for a number of years. Then savings are equal to investment in fixed capital for the whole of this period. Thus the 'best fit' for equation (17) would be obtained for $\theta = 0$. The 'regression equation' would then be $F_t = S_t$ with $a/(1+c) = 1$, $b' = 0$, and $d' = 0$. The 'correlation coefficient' would, of course, be equal to 1.

The above discussion indicates that the 'goodness of fit' is here not an adequate criterion for the selection of the time-lag. In the circumstances, the only solution seems to be to produce 2 variants of the investment equation, basing one on a 1-year and the other on a half-year time-lag.

Investment in fixed capital

We shall first examine the 2 variants for investment in fixed capital. We thus apply the equation

$$F_t = \frac{a}{1+c} S_{t-\theta} + b' \frac{\Delta P_{t-\theta}}{\Delta t} + d' \tag{17}$$

firstly on the assumption that $\theta = 1$, and secondly on the assumption that $\theta = \frac{1}{2}$.

Table 48 shows the relevant data for the variant $\theta = 1$. (The period covered is 1930–40 because savings S and profits P are for the preceding year and thus the year 1929 is 'lost'.)

Both the value of investment in fixed capital, F_t, and the value of total gross savings for the previous year, S_{t-1}, are deflated by the price

Table 48. *Determination of Investment in Fixed Capital in the USA, 1930–1940 (assuming $\theta = 1$)*

Year	Investment in fixed capital F_t	Gross savings S_{t-1}	Rate of change of gross profits after taxes $P_{t-\frac{1}{2}} - P_{t-\frac{3}{2}}$	Calculated investment in fixed capital
	($ billions at 1939 prices)[a]			
1930	10.2	14.6	−2.1	10.4
1931	7.1	10.9	−6.6	6.7
1932	4.0	8.9	−6.3	5.6
1933	3.5	3.3	−5.4	2.3
1934	4.4	3.3	2.6	4.6
1935	5.8	6.2	2.9	6.5
1936	7.9	8.8	3.5	8.4
1937	9.3	12.0	2.0	10.0
1938	7.2	11.0	−1.7	8.2
1939	9.5	8.8	−0.7	7.1
1940	11.4	12.7	2.3	10.5

[a] Deflated by price index of investment goods.

Source: Dept. of Commerce, national income supplement to the *Survey of Current Business*, 1951. For details see statistical appendix, nn. 10–13.

index of investment goods.[56] The greatest difficulty was confronted in determining the series $\Delta P/\Delta t$. We estimated the value of gross profits after tax deflated by the price index of investment goods for the years 1928–9, 1929–30, 1930–1, etc., running from mid-year to mid-year.[57] The rate of increase in profits in 1929 was calculated as the difference between profits in 1929–30 and 1928–9, etc. Or, in other words, the rate of change in profits in the preceding year, $\Delta P_{t-1}/\Delta t$, was calculated as $P_{t-\frac{1}{2}} - P_{t-\frac{3}{2}}$.

The correlation of investment in fixed capital F_t with savings of the preceding year S_{t-1}, and the rate of increase in profits also of the preceding year, $P_{t-\frac{1}{2}} - P_{t-\frac{3}{2}}$, can now be readily established. The regression equation is as follows:

$$F_t = 0.634 S_{t-1} + 0.293(P_{t-\frac{1}{2}} - P_{t-\frac{3}{2}}) + 1.76$$

The double correlation coefficient is equal to 0.904. The partial correlation coefficient between F_t and S_{t-1} is 0.888 and that between F_t and $P_{t-\frac{1}{2}} - P_{t-\frac{3}{2}}$ is 0.684. Investment F_t calculated from this equation, is given in the last column of Table 48 for comparison with actual F_t.[58] The coefficient of S is 0.634 and thus conforms to our assumption that $a/(1+c)$ in equation (17) is less than 1 (see p. 290).

We shall now consider the variant $\theta = \frac{1}{2}$. As mentioned, it appears that in this case the partial correlation with change in profits may be ignored. Thus Table 49 gives only F_t and $S_{t-\frac{1}{2}}$, which is calculated approximately as $(S_{t-1} + S_t)/2$.

The regression equation is:

$$F_t = 0.762 S_{t-\frac{1}{2}} + 0.29$$

The correlation coefficient is 0.972, which is much higher than the double correlation coefficient in the variant $\theta = 1$. The value of F_t calculated from the regression equation is given in Table 49. The

[56] We do not include brokerage fees in gross savings here as we did on p. 250. For although, as indicated there, it is a type of capital expenditure, it does not increase the total assets of the capitalists, and thus does not create entrepreneurial capital available for reinvestment. For this reason, S in Table 48 is not equal to I' in Table 41. Another reason for this discrepancy is that S is deflated here by prices of investment goods, while I' in Table 41 is deflated by the index implicit in the deflation of the gross income of the private sector.

[57] See statistical appendix, nn. 12 and 13.

[58] No distinct trend appears to be involved. This is the reason why no allowance was made for trend in the correlation analysis.

coefficient $a/(1 + c)$ is equal here to 0.762, which again agrees with the assumption concerning $a/(1 + c)$ made above.

The actual F_t and the values calculated from the regression equations for both variants are plotted on scatter diagrams in Fig. 28, the calculated values being taken as abscissae and the actual values as

Table 49. *Determination of Investment in Fixed Capital in the USA, 1930–40 (assuming $\theta = \frac{1}{2}$)*

Year	Investment in fixed capital F_t	Gross savings $S_{t-\frac{1}{2}}$	Calculated investment in fixed capital
	($ billions at 1939 prices)		
1930	10.2	12.8	10.0
1931	7.1	9.9	7.8
1932	4.0	6.1	5.0
1933	3.5	3.3	2.8
1934	4.4	4.8	3.9
1935	5.8	7.5	6.0
1936	7.9	10.4	8.2
1937	9.3	11.5	9.1
1938	7.2	9.9	7.8
1939	9.5	10.8	8.5
1940	11.4	14.2	11.1

Source: As Table 48. For details see statistical appendix, nn. 10 and 11.

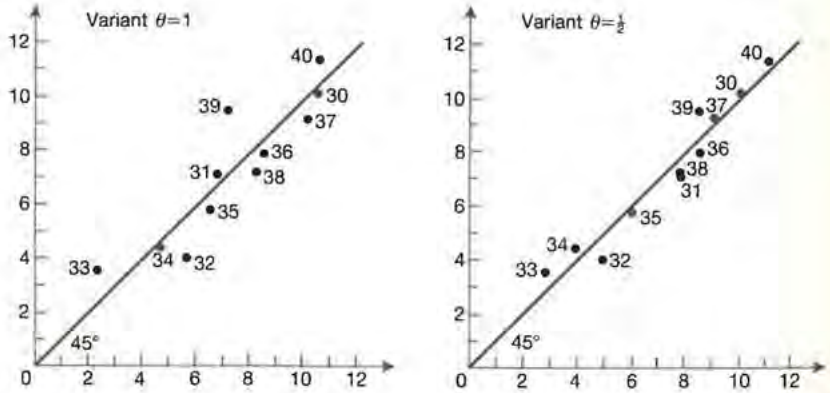

FIG. 28. *Scatter Diagram of Calculated and Actual Investment in Fixed Capital, USA, 1930–1940 ($ billions at 1939 prices). Calculated values: abscissae; actual values: ordinates.*

ordinates. The regression line is a straight line drawn at 45° through the zero point.

Some authors (for instance, Kaldor and myself) have assumed that after investment in fixed capital has reached a certain level in the boom it grows more slowly in response to determinants than in the early stage of the boom[59] and that an analogous phenomenon occurs in the slump.[13] Our scatter diagrams do not seem to bear out this hypothesis.

Investment in inventories

We may consider first the variant $\theta = 1$. Table 50 shows the quantitative changes in inventories, J, and the rates of change in gross product or output of the private sector in the preceding year, $\Delta O_{t-1}/\Delta t$.[60] The latter is calculated (as in the case of the rate of increase in profits in Table 48) as $O_{t-\frac{1}{2}} - O_{t-\frac{3}{2}}$.

The regression equation of investment in inventories J in relation to the rate of change in output in the preceding year is as follows:

$$J_t = 0.215(O_{t-\frac{1}{2}} - O_{t-\frac{3}{2}}) - 0.08$$

The correlation coefficient is 0.913. (The presence of the constant -0.08 means that inventories are changing even when output is not. In a unit of time inventories will change by -0.08 in addition to the change caused by the movement of output. In other words, -0.08 is a trend coefficient for inventories. It will be seen that in the period considered the trend was insignificant as compared with the changes

[59] This tendency was assumed to appear even before the stage of bottle-necks in investment goods industries was reached.

[60] Both the change in inventories J and the change in gross product of the private sector O are taken here exclusive of changes in farm inventories for the following reason. Farm inventories are affected by changes in crops which are influenced by climatic conditions not related to changes in total output of the private sector. As the weight of agriculture in total output of the private sector is much smaller than the weight of farm inventories in total inventories at the end of the year, when a large part of the new harvest is still unsold, this introduces a disturbing factor. By excluding changes in farm inventories both from total output and from total changes in inventories, we roughly eliminate this factor. The influence of changes in agricultural output on changes in total output is considerably reduced in this way, and, in view of the small weight of agricultural output in the total output, changes in total output after the above adjustment give a good approximation of changes in non-agricultural output. This treatment corresponds to a model of an economy where cyclical fluctuations in agricultural output are of no great importance, which is reasonable from a methodological point of view.

Table 50. *Determination of Investment in Inventories in the USA, 1930–40 (assuming $\theta = 1$)*

Year	Investment in inventories[a] J_t	Rate of change in gross product of the private sector $O_{t-\frac{1}{2}} - O_{t-\frac{3}{2}}$	Calculated investment in inventories
	($ billions at 1939 prices)		
1930	0	− 0.9	− 0.3
1931	− 1.4	− 8.8	− 2.0
1932	− 3.0	− 8.5	− 1.9
1933	− 1.5	− 8.9	− 2.0
1934	0.6	8.7	1.8
1935	0.5	2.6	0.5
1936	2.3	7.0	1.4
1937	1.7	8.6	1.8
1938	− 1.1	− 2.2	− 0.6
1939	0.3	1.3	0.2
1940	2.1	7.7	1.6

[a] Exclusive of farm inventories.

Source: As Table 48. For details see statistical appendix, nn. 14 and 15.

induced by fluctuations in output.) J_t calculated from the regression equation is given in Table 50 for comparison with the actual series.

For the variant $\theta = \frac{1}{2}$ we shall correlate investment in inventories J_t with $O_t - O_{t-1}$. Indeed, $O_t - O_{t-1}$ gives the rate of increase in aggregate output over a period the centre of which is the end of the preceding year. Thus the time-lag between J_t and $O_t - O_{t-1}$ is half a year. The relevant data are given in Table 51.

The regression equation is

$$J_t = 0.194(O_t - O_{t-1}) - 0.13$$

The correlation coefficient is here only 0.828 and thus much lower than in the variant $\theta = 1$. (The significance of the constant member, which is here − 0.13, has already been discussed above.) The comparison of J_t with the value calculated from the equation (see Table 51) shows a considerable discrepancy for 1930. It is this discrepancy that is largely responsible for the relatively low correlation coefficient. As suggested above, the abnormally high level of investment in inventories in 1930 is not unnatural, since it was the first year after the turning-point in output.

Table 51. *Determination of Changes in Inventories[a] in the USA, 1930–40 (assuming $\theta = \frac{1}{2}$)*

Year	Investment in inventories[a] J_t	Rate of change in gross product of the private sector $O_t - O_{t-1}$	Calculated investment in inventories
	($ billions at 1939 prices)		
1930	0	− 8.0	− 1.7
1931	− 1.4	− 6.3	− 1.4
1932	− 3.0	− 10.0	− 2.1
1933	− 1.5	− 0.5	− 0.2
1934	0.6	6.5	1.1
1935	0.5	3.8	0.6
1936	2.3	10.1	1.8
1937	1.7	3.2	0.5
1938	− 1.1	− 4.2	− 0.9
1939	0.3	7.3	1.3
1940	2.1	8.3	1.5

[a] Exclusive of farm inventories.

Source: As Table 48. For details see statistical appendix, n. 14.

Total investment

We can now obtain an equation for total investment I_t when $\theta = 1$ or $\frac{1}{2}$ by adding the respective regression equations for investment in fixed capital and investment in inventories. We obtain for $\theta = 1$:

$$I_t = 0.634S_{t-1} + 0.293(P_{t-\frac{1}{2}} - P_{t-\frac{3}{2}}) + 0.215(O_{t-\frac{1}{2}} - O_{t-\frac{3}{2}}) + 1.68$$

and for $\theta = \frac{1}{2}$:

$$I_t = 0.762S_{t-\frac{1}{2}} + 0.194(O_t - O_{t-1}) + 0.16$$

According to these equations, total investment is determined by both the level of economic activity and the rate of change in this level at some earlier time.

Part V

The Business Cycle

11. The Mechanism of the Business Cycle

Equations determining the dynamic process

We shall assume in this chapter that both foreign trade and the government budget are balanced and that workers do not save. It was shown above in ch. 5 that, given this assumption, the level of economic activity is determined by investment. Moreover, it was shown in ch. 9 that investment is determined, with a certain time-lag, by the level of economic activity and the rate of change in this level. It follows that investment at a given time is determined by the level and rate of change in the level of investment at some earlier time. It will be seen below that this provides the basis for an analysis of the dynamic economic process, and in particular enables us to show that this process involves cyclical fluctuations.

In addition to assuming a balanced foreign trade and budget, we shall also assume that the price index for deflating investment is identical with that for deflating the gross product of the private sector. This assumption is not extravagant in view of the rather small cyclical fluctuations in the ratio of prices of investment and consumer goods (see pp. 223–5). At the same time a considerable simplification is achieved by it. Indeed, it appeared necessary above to use different deflators in different contexts for the same items. Thus investment, savings, and profits were deflated in chs. 4 and 5 by the same price index as that used to deflate the gross product of the private sector. But in ch. 9 investment in fixed capital, savings, and profits were all deflated by the index of prices of investment goods. However, now that the deflators have been assumed identical, 'real' investment, savings, and profits have one meaning only.

Let us now consider the equations which are relevant to our enquiry into the business cycle. From the assumption of a balanced foreign

trade and budget, it follows that saving is equal to investment:

$$S = I$$

Employing the same assumption, we may take from ch. 4 (see p. 248) the equation relating profits after tax P, with some time-lag, to investment:

$$P_t = \frac{I_{t-\omega} + A}{1 - q} \tag{8a}$$

This equation is based (i) on the equality between profits and investment plus capitalists' consumption, and (ii) on the relation between capitalist consumption and profits at some earlier time. (A is the stable part of capitalist consumption and q is the coefficient of consumption out of an increment of profits.)

Furthermore, we derive from equations (10) and (9a) in ch. 5 (see p. 260) the relation between gross product O and profits after tax P:

$$O_t = \frac{P_t + B'}{1 - \alpha'} + E \tag{10a}$$

This equation reflects (i) the factors determining the distribution of national income, (ii) the system of profit taxes, and (iii) the level of indirect taxes. (The constant B' and the coefficient α' reflect the 'distribution of income factors' and the system of profit taxes; the constant E stands for aggregate indirect taxes.)

Finally, chapter 9 gives us the equation determining investment:

$$I_{t+\theta} = \frac{a}{1+c} S_t + b' \frac{\Delta P_t}{\Delta t} + e \frac{\Delta O_t}{\Delta t} + d' \tag{19}$$

This equation expresses (i) the relation, with a time-lag, between investment in fixed capital on the one hand and savings, the rate of change in profits, and the rate of change in the stock of capital equipment on the other (the effect of the change in the stock of capital being reflected in the denominator of the coefficient $a/(1 + c)$); and (ii) the relation between investment in inventories and the rate of change in output.

From the latter equation and the assumed equality between savings and investment it follows:

$$I_{t+\theta} = \frac{a}{1+c} I_t + b' \frac{\Delta P_t}{\Delta t} + e \frac{\Delta O_t}{\Delta t} + d' \tag{20}$$

The equation of the business cycle

Equations (8a), (10a), and (20) apply to the dynamic process in general. At present, however, we intend to concentrate on the process of the business cycle as distinct from the process of long-run development. For this purpose we shall consider a system which is *not* subject to long-run development, i.e. a system which is static except for cyclical fluctuations. It will be shown in ch. 14 that the actual dynamic process can be analysed into (i) cyclical fluctuations, the pattern of which is the same as that in the static system described below, and (ii) a smooth long-run trend.

To render our system 'static', we shall postulate that the parameters A, B', and E, which we have assumed throughout to be subject to long-run changes, are strictly constant. It follows directly, then, from equation (8a) that:

$$\frac{\Delta P_t}{\Delta t} = \frac{1}{1-q}\frac{\Delta I_{t-\omega}}{\Delta t}$$

and from equation (10a) that:

$$\frac{\Delta O_t}{\Delta t} = \frac{1}{1-\alpha'}\frac{\Delta P_t}{\Delta t}$$

or

$$\frac{\Delta O_t}{\Delta t} = \frac{1}{(1-q)(1-\alpha')}\frac{\Delta I_{t-\omega}}{\Delta t}$$

Both the rate of change in profits and the rate of change in output are here expressed in terms of the rate of change in investment (with a certain time-lag). Substituting these expressions of $\Delta P/\Delta t$ and $\Delta O/\Delta t$ in equation (20), we obtain:

$$I_{t+\theta} = \frac{a}{1+c}I_t + \frac{b'}{1-q}\frac{\Delta I_{t-\omega}}{\Delta t} + \frac{e}{(1-q)(1-\alpha')}\frac{\Delta I_{t-\omega}}{\Delta t} + d'$$

or

$$I_{t+\theta} = \frac{a}{1+c}I_t + \frac{1}{1-q}\left(b' + \frac{e}{1-\alpha'}\right)\frac{\Delta I_{t-\omega}}{\Delta t} + d' \qquad (21)$$

Thus, investment at time $t + \theta$ is a function of investment at time t and of the rate of change in investment at time $t - \omega$. The first term on the right-hand side of the equation represents the influence on investment decisions of current savings (coefficient a) and also the negative effect of the increase in capital equipment (coefficient $1/(1 + c)$). It should be remembered that $a/(1 + c) < 1$. The second term represents the influence of the rate of change in profits (coefficient $b'/(1 - q)$) and in output coefficient $e/[(1 - q)(1 - \alpha')]$.

In line with our tentative leaving aside of long-run changes we assumed above that A, B', and E are strictly constant. The same must be assumed about d', but it will be seen that in addition the level of d' must conform to another condition if the system is to be 'static'. Indeed, such a system must be capable of being at rest at the level of investment equal to depreciation, δ. For this state of the system investment I is permanently stable at the level δ and $\Delta I/\Delta t$ is, of course, equal to zero. Equation (21) is thus reduced to:

$$\delta = \frac{a}{1+c}\delta + d' \qquad (22)$$

which is the condition d' must fulfil if the system is to be static in the sense that there is no long-run change. By subtracting equation (22) from equation (21) we obtain:

$$I_{t+\theta} - \delta = \frac{a}{1+c}(I_t - \delta) + \frac{1}{1-q}\left(b' + \frac{e}{1-\alpha'}\right)\frac{\Delta I_{t-\omega}}{\Delta t}$$

Let i denote $I - \delta$, the deviation of investment from depreciation. As δ is a constant,[61] $\Delta i/\Delta t = \Delta I/\Delta t$ and we have:

$$i_{t+\theta} = \frac{a}{1+c}i_t + \frac{1}{1-q}\left(b' + \frac{e}{1-\alpha'}\right)\frac{\Delta i_{t-\omega}}{\Delta t} \qquad (23)$$

This is the equation which will serve as the basis of our analysis of the mechanism of the business cycle. For the sake of convenience we shall denote:

$$\frac{1}{1-q}\left(b' + \frac{e}{1-\alpha'}\right)$$

by μ. Equation (23) can then be written:

$$i_{t+\theta} = \frac{a}{1+c}i_t + \mu\frac{\Delta i_{t-\omega}}{\Delta t} \qquad (23a)$$

[61] As a matter of fact, depreciation fluctuates slightly in the course of the cycle, but δ may be conceived of as the average level of depreciation.

The automatic business cycle

We shall now discuss the cyclical tendency inherent in equation (23a). In all this discussion, the assumption that the coefficient $a/(1 + c)$ falls short of 1 is of crucial importance.

Let us imagine that we start from the position where $i_t = 0$, that is, from the point A where investment is equal to depreciation (see Fig. 29). Let us imagine further that $(\Delta i_{t-\omega}/\Delta t) > 0$. This means that, before A was reached, investment was below, but increasing towards, the level of depreciation. It is clear that $i_{t+\theta}$ is positive, because the first component on the right-hand side of equation (23a) $[a/(1 + c)]i_t = 0$ and the second $\mu(\Delta i_{t-\omega}/\Delta t) > 0$. In other words, i has thus increased to point B above the depreciation level.

After i has become positive, however, the question of its continuing rise, that is, whether $i_{t+\theta}$ is higher than i_t, depends on the value of the coefficients $a/(1 + c)$ and μ. Indeed, the first component of $i_{t+\theta}$, that is $[a/(1 + c)]i_t$, is lower than i_t because we assumed that the coefficient $a/(1 + c)$ was less than 1; and this tends to reduce $i_{t+\theta}$ below the level of i_t. On the other hand, the second component $\mu(\Delta i_{t-\omega}/\Delta t)$ is positive because i was rising before it reached the level of i_t and this tends to increase $i_{t+\theta}$ above the level of i_t. There are, therefore, 2 alternatives here: that the coefficients $a/(1 + c)$ and μ are such that the rise of investment comes finally to a halt at point C; or that the rise continues until economic activity reaches a level where a further rise is prevented by scarcities in existing productive capacities or in available labour.

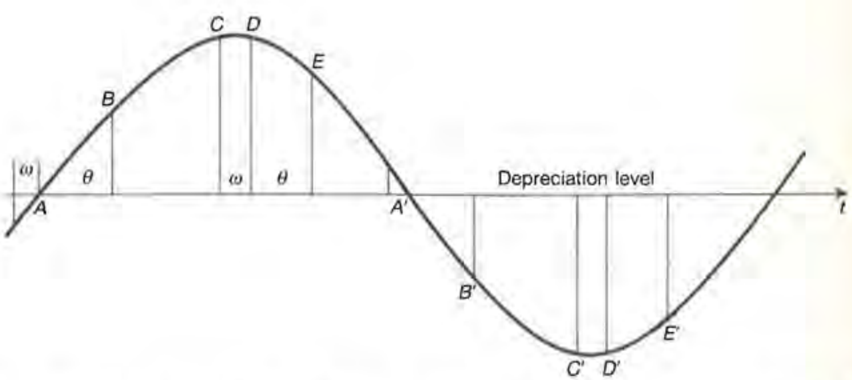

FIG. 29. *Hypothetical Time-Curve of Investment. Illustration of Cyclical Components of Gross Investment.*

Let us consider the first alternative. After investment has come to a halt at C it cannot be maintained at this level, but must decline from D to E. Indeed, denoting the top level of i by i_{top} we have for point D:

$$i_t = i_{\text{top}}; \quad \frac{\Delta i_{t-\omega}}{\Delta t} = 0$$

Thus for $i_{t+\theta}$ at point E the component $\mu(\Delta i_{t-\omega}/\Delta t)$ is equal to zero and the component $[a/(1 + c)]i_{\text{top}}$ is less than i_{top} because $a/(1 + c) < 1$. Consequently, $i_{t+\theta}$ is less than i_{top}, and investment declines from its highest level to that of point E.

Subsequently investment will move downwards, that is, $i_{t+\theta}$ will be lower than i_t for 2 reasons: the component $[a/(1 + c)]i_t$ will be less than i_t and the component $\mu(\Delta i_{t-\omega}/\Delta t)$ will be negative. In this way i will finally fall to zero, i.e. investment will decline to the level of depreciation.

From this point on, the pattern of the boom will be repeated in reverse in the slump. After the depreciation level has been crossed downwards at A', the decline of investment will continue until it finally comes to a halt at C'. Investment will not be maintained in this position, however, but will increase from D' to E' and will again reach the depreciation level.

These fluctuations in investment will be accompanied by fluctuations in incomes, output, and employment. The nature of the relationship between investment on the one hand and the aggregate real income and output of the private sector on the other are set forth in ch. 5. (See also pp. 309–11 below.)

The above mechanism of the business cycle is based on 2 elements.

(i) When investment reaches the depreciation level from below (at point A), it does not stop at this level but crosses it, moving upwards. This happens because the rise in investment and consequently the rise in profits and in aggregate output before the depreciation level is reached causes investment to be higher than that level in the subsequent period. Static equilibrium can come into existence only if investment is at the depreciation level, and if in addition it has not changed its level in the recent past. The second condition is not fulfilled at A, and this is the reason why the upward movement continues. When investment reaches the depreciation level from above (at A'), the situation is analogous, i.e. investment does not stop but crosses the depreciation level moving downwards.

(ii) When the upward movement of investment comes to a halt it does not stay at this level, but starts to decline. This happens because the coefficient $a/(1 + c)$ is less than 1, which reflects the negative influence upon investment of the increasing capital equipment ($c > 0$) and possibly also the factor of incomplete reinvestment of saving (if $a < 1$). If there were a full reinvestment of saving (i.e. $a = 1$) and if the accumulation of capital equipment could be disregarded (i.e. if c were negligible), the system would be maintained at its top level. But, in fact, the accumulation of capital equipment, which with a stable level of economic activity makes for a falling rate of profit, does have a tangible adverse effect on investment (i.e. c is not negligible). Moreover, the reinvestment of savings may be incomplete (i.e. $a < 1$).[62] As a result, investment declines and thus the slump is started.[63]

The position at the bottom of the slump is analogous to that at the top of the boom. While the rate of profit is falling at the top of the boom because of additions to the stock of capital equipment, it is rising at the bottom of the slump because depreciation of capital equipment is not being made good.[64]

But it may be questioned whether this situation is symmetrical with that at the top of the boom. It may indeed be claimed that the effect of capital destruction upon investment decisions during the slump is much weaker than that of capital accumulation in the boom because the equipment 'destroyed' in the slump is frequently idle in any case. As a result, slumps might be very long. This possibility is, in fact, not excluded in the static system which we consider in this chapter.[65] But it should be observed that the situation is different in an economy enjoying long-run growth. It will be shown below that in such an economy the business cycle as described above is superimposed upon the smooth long-run trend. (See Fig. 37, p. 324.)

[62] The importance of the 'incomplete reinvestment' factor for the explanation of the turning-point in the boom was emphasized for the first time by the late E. Rothbarth in a lecture to the Economic Society of the London School of Economics in 1939.

[63] This analysis shows clearly that the assumption $a/(1 + c) < 1$ is a necessary condition for the existence of the business cycle (see p. 290).

[64] If $a < 1$ this will be an additional factor in the recovery of investment from the bottom of the slump. The condition $a < 1$ means in this context that fixed-capital investment decisions fall in the slump less than savings, if we ignore the influence of the rate of change in profits and in capital equipment.

[65] In such a case c is smaller, and thus $a/(1 + c)$ is larger, in the depression than in the boom.

The 'ceiling' and the 'floor'

The above considerations were based on the assumption that the coefficients of $a/(1 + c)$ and μ are such as to cause an automatic halt to the rise of investment in the boom and to its fall in the slump. In the alternative case, the rise of investment in the boom will not come to a halt until hampered by shortages of equipment or labour. When this position is reached, unfilled orders will pile up rapidly while deliveries will lag behind requirements. This will result in the rise coming to an end or even in a fall of investment in inventories. Investment in fixed capital may be similarly affected by shortages in this sector. The period of execution of investment orders will lengthen, and the rise of investment in fixed capital will have to taper off.

After the rise in the rate of investment has come to a halt and the level of economic activity has been maintained for some time at this ceiling, the mechanism of the business cycle begins to operate. Investment starts falling, as in the case considered above, as a result of increases in the stock of capital equipment and possibly also because of an incomplete reinvestment of savings (which factors make $a/(1 + c) < 1$). Having started in this fashion, the slump continues in the same way as the 'automatic' business cycle.

The question arises whether there is a floor to the slump in the same sense that there is a ceiling to the boom. Such a floor certainly exists in the case of investment in fixed capital, since its gross value cannot fall below zero. However, there is no analogous limit to disinvestment in inventories. Thus when gross investment in fixed capital reaches the zero level, the slump may be slowed down but not halted, since disinvestment in inventories may gather momentum. If, however, the slump does come to a halt, the process of recovery is much like that described in the preceding section.

Explosive and damped fluctuations

Let us turn back to the case of the automatic business cycle. It appears that the cyclical fluctuations inherent in the equation

$$i_{t+\theta} = \frac{a}{1+c} i_t + \mu \frac{\Delta i_{t-\omega}}{\Delta t} \tag{23a}$$

may be stable, explosive, or damped (see Fig. 30), depending on the value of the coefficients, $a/(1 + c)$ and μ, and the time-lags θ and ω.

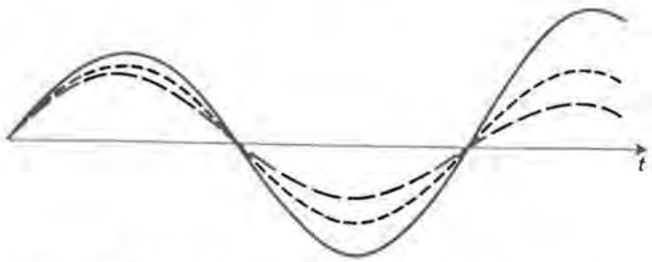

FIG. 30. *Stable, Damped, and Explosive Fluctuations*

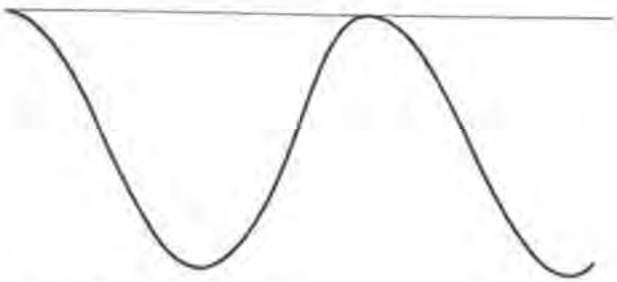

FIG. 31. *Explosive Fluctuations with a 'Ceiling'*

Given a certain set of these values, the amplitude of fluctuations is constant. But if the coefficient μ is increased while $a/(1 + c)$, θ, and ω remain unchanged, the fluctuations become explosive; and if μ is reduced they become damped.

Let us first consider the case of explosive fluctuations. It is clear that, because of the increasing amplitude of the fluctuations, investment during the boom phase must sooner or later strike the ceiling. After this, as shown above, there follows a slump, the recovery from which brings investment back again to the level of the ceiling, and so on. (See Fig. 31.) The bottom of the slump is maintained at the same level because the course of the downswing is fully determined, according to equation (23a), by the level i at the top of the boom, the coefficients $a/(1 + c)$ and μ, and the time-lags θ and ω.

In the case of damped fluctuations the amplitude will continuously decline, so that it might appear in this case that the cycle would dwindle into insignificance. This, however, is not correct, for the following reasons. The relations between investment, profits, and

output, on which equation (23a) is based, are 'stochastic', i.e. subject to random disturbances. (The deviations of the actual from the calculated values in the statistical illustrations given above may be interpreted as such disturbances.) Thus equation (23a) really should be written:

$$i_{t+\theta} = \frac{a}{1+c} i_t + \mu \frac{\Delta i_{t-\omega}}{\Delta t} + \varepsilon \tag{23b}$$

where ε is a random disturbance. Now it appears that the effect of 'erratic shocks', ε, in equation (23b) counteracts the damping inherent in the basic mechanism. As a result, some sort of semi-regular cyclical movement is generated, the amplitude of which is determined by the magnitude and pattern of shocks, ε, and by the parameters of equation (23a).[66]

This result is of considerable importance. It shows the possibility of cyclical fluctuations which do not touch the ceiling, and thus helps to explain the fact that such is frequently the pattern of actual fluctuations. A serious difficulty arises, however, in the application of the theory. The experiments made seem to suggest that, if the damping is not weak, the resulting cycle is very irregular and its amplitude is of the order of magnitude of the shocks. Since there is no reasonable basis for the assumption that the interrelations between investment, profits, and output should necessarily be such as to produce a weak damping, the value of the theory becomes questionable. This difficulty is dealt with in chapter 13, where it is shown that if certain justifiable assumptions are made about the character of the shocks, a fairly regular cycle with a relatively large amplitude emerges even when the damping is substantial.

The business cycle and utilization of resources

It has already been stated above (see p. 305) that fluctuations in investment will cause corresponding fluctuations in economic activity as a whole. Indeed, aggregate output is related to investment through equations (8a) and (10a). Also, it has been stated that aggregate output and consumption show smaller relative fluctuations than investment (see p. 255).

[66] It also appears that if the basic mechanism tends to produce fluctuations of a constant amplitude, erratic shocks cause the cycle to become explosive. Consequently, sooner or later the ceiling is reached and from then on the amplitude does not change.

We have, however, not yet examined the problem of fluctuations in the utilization of capital equipment. We shall see below that the volume of fixed capital fluctuates relatively little in the course of the cycle, so that fluctuations in output mainly reflect changes in the degree of utilization of equipment.

This can be shown by the following example, which is relevant to developed capitalist economies. We assume that the depreciation level is 5% p.a. of the average volume of fixed capital equipment, and that gross investment in fixed capital fluctuates between 7.5% and 2.5% of this volume. Thus, investment falls in the slump to one-third of the boom level. We assume, moreover, that at the top of the boom gross investment in fixed capital constitutes 20% of the aggregate output (i.e. the gross product of the private sector). Thus, since investment falls from the top of the boom to the bottom of the slump by two-thirds, the drop in investment amounts to about 13% of the boom aggregate output. We further assume that the change in output, ΔO, is equal to 2.5 times the change in investment, ΔI.[67] It follows that the fall in output from the top of the boom to the bottom of the slump is equal to 2.5 times 13%, that is, 33% of the boom output level. Thus, output falls by about one-third from the top of the boom to the bottom of the slump. It will easily be seen that the amplitude of fluctuations is about 20% of the average level.[68]

Let us now calculate the amplitude of fluctuations of the stock of capital equipment. The largest addition of fixed capital takes place in the period MN (see Fig. 32), because this is the stretch of time in which gross investment in fixed capital is over the depreciation level.

The highest level of gross investment in the boom has been assumed to be 7.5% of the average volume of the capital equipment, and therefore, with depreciation equal to 5%, the highest net investment is 2.5%.[69] We assume the length of the cycle to be 10 years, and thus the length of the period MN is 5 years. If throughout that period investment in fixed capital were at the highest level, the total addition to the volume of capital equipment would be 12.5% of its average level. In fact, however, as may be seen from Fig. 32, this addition will

[67] According to p. 259 a change in investment of ΔI in the USA in 1929–40 was accompanied by a change in real income of the private sector of 2.72 ΔI.

[68] $\frac{1}{2} \times \frac{1}{3} : (1 - \frac{1}{2} \times \frac{1}{3}) = \frac{1}{5}$.

[69] Maximum investment in fixed capital is approximately equal to maximum total investment; indeed, investment in inventories at the top of the boom is small because of the levelling off of the aggregate output.

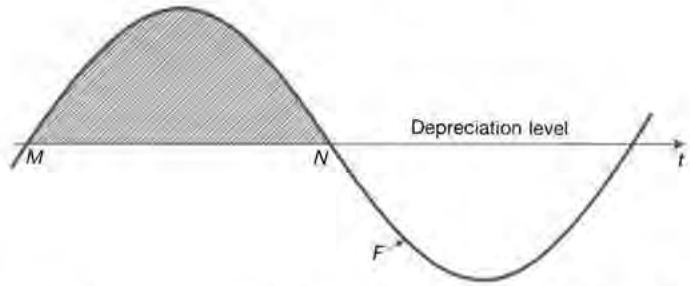

FIG. 32. *Effect of Fluctuations in Investment in Fixed Capital, F, upon the Stock of Capital Equipment*

only be around two-thirds of 12.5% or 8%. Consequently, the amplitude of fluctuations in the stock of fixed capital in relation to its average level will be around 4% as compared with 20% for output.

It is thus clear that fluctuations in the degree of utilization of equipment are of a similar order to those in aggregate output. A considerable proportion of capital equipment lies idle in the slump. Even on average, the degree of utilization throughout the business cycle will be substantially below the maximum reached during the boom. Fluctuations in the utilization of available labour parallel those in the utilization of equipment. Not only is there mass unemployment in the slump, but average employment throughout the cycle is considerably below the peak reached in the boom. The reserve of capital equipment and the reserve army of unemployed are typical features of capitalist economy, at least throughout a considerable part of the cycle.

12. Statistical Illustration

Deriving the 'business cycle equation'

We shall now illustrate the above theory of the business cycle by a model based on the US data for 1929–40. This model, however, does not present an exact picture of developments in the USA in the period considered. Since it is based on equations corresponding to those underlying the theory developed in the preceding chapter, the simplifying assumptions introduced there have to be maintained. Thus we shall continue to assume that the foreign trade and the government budget are always balanced, although this was certainly not the case in the USA in 1929–40. We shall also continue to assume that the price index used to deflate investment is identical with that used to deflate gross product of the private sector. Finally, we shall disregard the trend elements in the relevant equations so as to obtain pure cyclical fluctuations.

In accordance with the above we assume the equality of saving and investment:

$$S = I$$

The equation relating profits after tax P to investment I is based on that obtained on p. 251 above. Actually, the latter relates profits P to I', the sum of investment, export surplus, and the budget deficit.[70] However, it follows from the argument in ch. 4 that this relation does not depend on whether I' is fully accounted for by investment I, or whether the export surplus and budget deficit also enter the picture. Consequently, since we assume that the latter items are equal to zero, this relation can now be written for profits after tax P and investment I.[71] We thus have (neglecting the trend element):

$$P_t = 1.34 I_{t-\frac{1}{4}} + 13.4$$

The relation between gross income of the private sector Y and profits after tax P may be expressed (see p. 258):

$$Y_t = 2.03 P_t + 10.4$$

We assume as above (see p. 259), although this again is not true of the period considered, that the difference E between the gross product O and the gross income of the private sector Y, which is due to indirect taxes, is constant:

$$O = Y + E$$

From these equations we obtain the relation between the rate of change in profits and that in investment:

$$\frac{\Delta P_t}{\Delta t} = 1.34 \frac{\Delta I_{t-\frac{1}{4}}}{\Delta t} \tag{24}$$

[70] In fact I' also includes brokerage fees.

[71] It should be added that, while we assumed in the preceding chapter, in order to simplify the presentation, that workers do not save, the present equation is to some extent affected by workers' savings. This, however, touches only the interpretation of the coefficients of equation (8a) on p. 301, but does not affect the pattern of the business cycle.

and the relation between the rate of change in gross income and that in profits and investment:

$$\frac{\Delta Y_t}{\Delta t} = 2.03 \frac{\Delta P_t}{\Delta t} = 2.72 \frac{\Delta I_{t-\frac{1}{4}}}{\Delta t}$$

Finally, E being a constant, the rate of change in output is equal to that in gross income and thus is related to the rate of change in investment:

$$\frac{\Delta O_t}{\Delta t} = \frac{\Delta Y_t}{\Delta t} = 2.72 \frac{\Delta I_{t-\frac{1}{4}}}{\Delta t} \tag{25}$$

For the equation determining investment, we have 2 variants corresponding to the assumptions of a 1-year and a half-year time-lag between investment and its determinants (see p. 299). For the time-lag $\theta = 1$ we have

$$I_t = 0.634 S_{t-1} + 0.293(P_{t-\frac{1}{2}} - P_{t-\frac{3}{2}}) + 0.215(O_{t-\frac{1}{2}} - O_{t-\frac{3}{2}}) + 1.68 \tag{26}$$

where S is savings, P profits after tax, and O aggregate output.

The equation corresponding to the time-lag $\theta = \frac{1}{2}$ year is:

$$I_t = 0.762 S_{t-\frac{1}{2}} + 0.194(O_t - O_{t-1}) + 0.16 \tag{27}$$

In obtaining the latter equations in ch. 10, investment in fixed capital, savings, and profits were deflated by the price index of investment goods, while investment and profits in the preceding equations were deflated by the price indices used to deflate gross product. Since, however, in the present model the price index of investment goods is assumed to be the same as the price index of the gross product, no problem arises on this score.

We can now substitute in the last 2 equations investment I for savings S. Moreover, according to equations (24) and (25) we have:

$$P_{t-\frac{1}{2}} - P_{t-\frac{3}{2}} = 1.34(I_{t-\frac{3}{4}} - I_{t-\frac{7}{4}})$$
$$O_{t-\frac{1}{2}} - O_{t-\frac{3}{2}} = 2.72(I_{t-\frac{3}{4}} - I_{t-\frac{7}{4}})$$

and

$$O_t - O_{t-1} = 2.72(I_{t-\frac{1}{4}} - I_{t-\frac{5}{4}})$$

Thus equations (26) and (27) can now be expressed in terms of investment I alone:

$$I_t = 0.634 I_{t-1} + 0.978(I_{t-\frac{3}{4}} - I_{t-\frac{7}{4}}) + 1.68 \tag{28}$$

and

$$I_t = 0.762 I_{t-\frac{1}{2}} + 0.528(I_{t-\frac{1}{4}} - I_{t-\frac{5}{4}}) + 0.16 \tag{29}$$

We shall alter the first of these equations somewhat for the sake of convenience in the subsequent analysis. We introduce the approximation:

$$I_{t-\frac{1}{4}} = \tfrac{3}{4} I_t + \tfrac{1}{4} I_{t-1}$$

as a result of which equation (28) may be written:

$$I_t = 0.634 I_{t-1} + 0.978(\tfrac{3}{4} I_{t-\frac{1}{2}} + \tfrac{1}{4} I_{t-\frac{3}{2}} - \tfrac{3}{4} I_{t-\frac{3}{2}} - \tfrac{1}{4} I_{t-\frac{5}{2}}) + 1.68$$

or

$$I_t = 0.634 I_{t-1} + 0.734 I_{t-\frac{1}{2}} - 0.489 I_{t-\frac{3}{2}} - 0.245 I_{t-\frac{5}{2}} + 1.68 \tag{28a}$$

Derivation of cyclical fluctuations

Let us write equations (28a) and (29) obtained above, dropping the constant and substituting i, the deviation from the long-run level, for I.[72] We then have for the variant $\theta = 1$:

$$i_t = 0.634 i_{t-1} + 0.734 i_{t-\frac{1}{2}} - 0.489 i_{t-\frac{3}{2}} - 0.245 i_{t-\frac{5}{2}} \tag{28b}$$

and for the variant $\theta = \frac{1}{2}$:

$$i_t = 0.762 i_{t-\frac{1}{2}} + 0.528 i_{t-\frac{1}{4}} - 0.528 i_{t-\frac{5}{4}} \tag{29a}$$

Let us examine the first variant. i_t is a linear function of $i_{t-\frac{5}{2}}$, $i_{t-\frac{3}{2}}$, i_{t-1}, and $i_{t-\frac{1}{2}}$. We can add to these i_{t-2} assuming that its coefficient is zero. Thus, if we divide the time into half-yearly intervals, i is a linear function of the 5 preceding values of i. Let us choose as the first five values $i_0 = -2$; $i_1 = -1$; $i_2 = 0$; $i_3 = +1$, and $i_4 = +2$. From equation (28b) we can now easily determine the value of i_5. On the basis of i_1, i_2, i_3, i_4, and i_5 we can determine i_6, and so on. The results can be seen in Fig. 33. We obtain a mildly damped cycle (a damping of about 1.5% p.a.). The period of the cycle is about 17 half-yearly intervals or 8.5 years.[73]

[72] Only if the system were actually static would i be the deviation from the depreciation level as in ch. 11.

[73] If the first 5 values of i were chosen differently, this would of course affect the subsequent values of i, but finally the cycle would 'settle down' to the period and rate of change in amplitude indicated in Fig. 33.

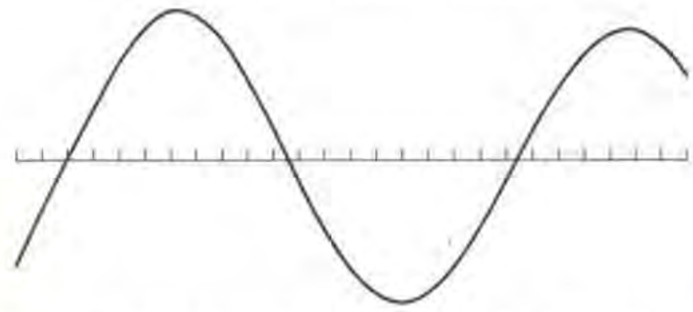

FIG. 33. *Fluctuations of Investment inherent in the USA, 1929–1940 Model, Variant $\theta = 1$*

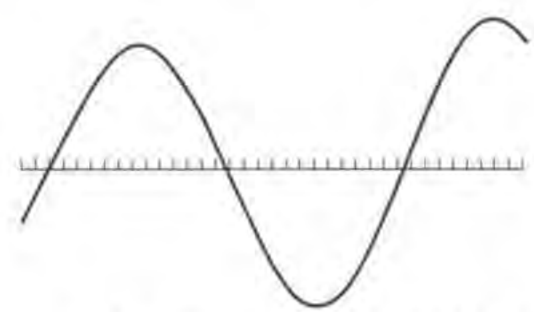

FIG. 34. *Fluctuations of Investment inherent in the USA, 1929–1940 Model, Variant $\theta = \frac{1}{2}$*

In the second variant, i_t is a linear function of $i_{t-\frac{5}{4}}$, i_{t-1}, $i_{t-\frac{3}{4}}$, $i_{t-\frac{1}{2}}$, and $i_{t-\frac{1}{4}}$, the coefficients of $i_{t-\frac{3}{4}}$ and i_{t-1} being equal to zero. Thus, if we divide the time into quarterly intervals, i is a linear function of the 5 preceding values of i. Assuming the 5 initial values to be -1, -0.5, 0, $+0.5$, and $+1$, we can calculate from equation (29a) the ordinates of the time curve. This is shown in Fig. 34. We obtain a mildly explosive cycle (the increase in amplitude being about 3% p.a.). The period of the cycle is about 25 quarters or 6.3 years.[74]

The length of major cycles is usually assumed to range from 6 to 10 years. The period of either variant lies within these limits, but the period of the first variant (8.5 years) is more typical. The cycle of this variant is slightly damped. Under the influence of shocks it would be transformed into a fairly regular cycle of constant amplitude (see

[74] See n. 73 above.

ch. 13). The cycle of the second variant is explosive. According to the above (see p. 308), it would, after some lapse of time, be transformed into a cycle of constant amplitude striking the 'ceiling'.

It may be asked how it is possible that developments in the USA in the 1930s are represented by a damped cycle in one variant and an explosive cycle in another. It should be noted, as pointed out at the beginning of this chapter, that the models in question do *not* represent actual developments in the USA in the period considered because the above equations reflect only some elements of these developments, being based partly on simplifying assumptions which were *not* fulfilled in actual fact. It should also be kept in mind that the period considered covers less than 2 full cycles.

As already mentioned in the foreword, the statistical analysis does not aim here at obtaining the most likely coefficients of the relations considered, but merely attempts to provide an illustration for the theories developed above.

13. The Business Cycle and Shocks

Illustration of the problem

It was indicated in ch. 10 that the influence of erratic shocks prevents the damping of fluctuations in investment. That is, if a damped cycle is inherent in the equation:

$$i_t = \frac{a}{1+c} i_{t-\theta} + \mu \frac{\Delta i_{t-\theta-\omega}}{\Delta t} \tag{23a}$$

then, when ε_t is the erratic shock at time t, the equation:

$$i_t = \frac{a}{1+c} i_{t+\theta} + \mu \frac{\Delta i_{t-\theta-\omega}}{\Delta t} + \varepsilon_t \tag{23b}$$

will represent semi-regular undamped fluctuations. In the investigations made on the subject it appeared (as stated above) that this cycle was fairly regular, and of an amplitude appreciably greater than that of erratic shocks if the damping was mild. With heavier damping, the cycle generated became irregular and its amplitude of the same order of magnitude as that of the shocks. The above can be illustrated by the following example. The first variant of the business cycle model, obtained above from the US data for 1929–40, involves mildly

damped fluctuations. The damping is about 1.5% p.a. and the period is 8.5 years. If we introduce erratic shocks in this model, it will be seen that fairly regular cyclical fluctuations are generated.

Our equation is:

$$i_t = 0.734 i_{t-\frac{1}{2}} + 0.634 i_{t-1} - 0.489 i_{t-\frac{3}{2}} - 0.245 i_{t-\frac{5}{2}} + \varepsilon_t \tag{28c}$$

In order to produce erratic shocks, 160 random digits ranging from 0 to 9 were taken from Tippetts' *Random Sampling Numbers.*[75] The deviations of these digits from the mean, i.e. from 4.5, were taken to be the erratic shocks, ε.

The calculation of i_t from the above equation for a few unit periods is illustrated in Table 52. The first five shocks, $\varepsilon_0, \varepsilon_1, \varepsilon_2, \varepsilon_3$, and ε_4, are also taken as the initial values of i_t. They thus appear both in the second and in the third column. For period 5, according to the above equation, i_0, i_1, i_2, i_3, and i_4 are multiplied by the coefficients 0.734, 0.634, -0.489, 0, and -0.245 respectively and added. This sum, plus shock ε_5, gives us i_5. Similarly, we multiply i_1, i_2, i_3, i_4, and i_5 by the same coefficients, and add ε_6 to this sum to obtain i_6, and so on. The i_t obtained correspond to half-yearly intervals. Curve *A* in Fig. 35 represents annual data for i, i.e. the arithmetical averages $(i_5 + i_6)/2$, $(i_7 + i_8)/2$, etc., numbered 1, 2, etc.

Table 52. *Erratic Shocks and Cyclical Fluctuations*

t in half-years	ε_t	i_t
0	-2.5	-2.5
1	$+4.5$	$+4.5$
2	$+0.5$	$+0.5$
3	-2.5	-2.5
4	-0.5	-0.5
5	-3.5	-5.1
6	$+1.5$	-2.4
7	$+2.5$	-2.3
8	-2.5	-2.6
9	$+2.5$	$+0.4$
10	-1.5	-0.5

[75] Tippetts' tables consist of columns of figures of 4 digits. We took the digits of the 1st number, then of the 2nd number, etc., in the 1st column. We used the first 40 figures, thus obtaining 160 digits.

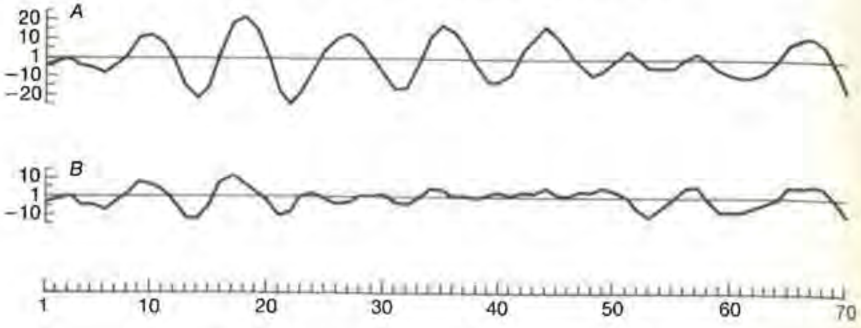

FIG. 35. *Cycles Derived from Erratic Shocks*

It will be seen that the fluctuations obtained exhibit a fairly regular cycle, with an average period of about 8 years. (The period of the original damped cycle is 8.5 years.) The amplitudes of the cycles range from 12 to 25 and thus are appreciably higher than the maximum absolute magnitude of shocks, which is only 4.5.

It is clear that the mildly damped cycle of our US model cannot claim to be the pattern of the business cycle in general. There might have been much heavier damping. Let us therefore calculate the effect of heavier damping, e.g. when all the coefficients except that of i_{t-1} in equation (28c) are reduced by 20%. The new equation (with rounded coefficients) is thus:

$$i_t = 0.6i_{t-\frac{1}{2}} + 0.6i_{t-1} - 0.4i_{t-\frac{3}{2}} - 0.2i_{t-\frac{5}{2}} + \varepsilon_t$$

The cycle based on this equation is fairly heavily damped, the damping being about 14% p.a. The period is about 8 years. We now introduce in this model the same series of shocks as those employed above. The results are represented by curve *B* in Fig. 35. Curve *B* is thus the counterpart of curve *A* with much heavier damping.

The change of pattern which results from the heavier damping is easy to observe. At one stretch of the curve no regular cycle is discernible at all. The amplitude is about 12 at its highest, but is on the whole much lower, frequently sinking below the maximum absolute value of shocks (i.e. 4.5).

This shows clearly the difficulties involved in the above theory. It is impossible to assume that the coefficients of the 'business cycle equation' are necessarily such as to produce mild damping (as is the case in the US model for 1929–40). On the other hand, heavy damping

leads to a rather irregular cycle with a small amplitude. These grounds have led some authors to venture the risky assumption that the original business cycles are not damped, and that consequently they are transformed sooner or later into cycles of constant amplitude striking the ceiling. However, there is no confirmation for the theory that the ceiling is usually reached in the boom. We arrive, therefore, at a sort of impasse.

A solution to this problem is suggested in the next section, where I attempt to show that the difficulties encountered were due to the type of shock considered, and that another and (I think) more realistic pattern of shocks tends to generate business cycles which do not 'disintegrate' with heavier damping.

The new approach

The erratic shocks used above were of even frequency distribution, that is, the shocks with larger or smaller deviations from the mean were equally frequent. (For instance, the frequency of 5 with the deviation from the mean of $+0.5$ was the same as that of 9 with the deviation from the mean of $+4.5$.) In the experiments in cyclical fluctuations generated by shocks, which were first carried out by Slutsky,[76] and in specific application to economic cycles by Frisch,[77] shocks of even frequency distribution were also used.

However, random errors are usually assumed to be subject to normal frequency distribution. This is based on the hypothesis that they themselves are sums of numerous elementary errors, and on the Laplace–Liapounoff theorem according to which such sums conform to normal frequency distribution. This, in fact, constitutes the theoretical basis for the application of the least squares method.

Now, whether the erratic shocks encountered in economic phenomena can or cannot be considered sums of numerous elementary random shocks, it seems reasonable to assume that large shocks have a smaller frequency than small shocks. Thus, the assumption of normal frequency distribution appears to be more reasonable than that of even frequency distribution. An experiment which I have carried out on these lines yielded, as will be seen below, very interesting results.

[76] 'The Summation of Random Causes as the Source of Cyclic Processes', in *Problems of Economic Conditions*, Moscow, Institute for Business Studies, 1927.
[77] *Economic Essays in Honour of Gustav Cassel*, London, Frank Cass, 1933.

In order to obtain a series of shocks of approximately normal frequency distribution, sums of 50 digits each were calculated from the Tippetts tables referred to above.[78] The deviations of these sums from their mean (that is, from $4.5 \times 50 = 225$) were subjected to the same operation as that in our first experiment. i_t was calculated first from the equation:

$$i_t = 0.734 i_{t-\frac{1}{2}} + 0.634 i_{t-1} - 0.489 i_{t-\frac{3}{2}} - 0.245 i_{t-\frac{5}{2}} + \varepsilon_t \quad (28c)$$

in which mild damping is involved; and next from the equation

$$i_t = 0.6 i_{t-\frac{1}{2}} + 0.6 i_{t-1} - 0.4 i_{t-\frac{3}{2}} - 0.2 i_{t-\frac{5}{2}} + \varepsilon_t$$

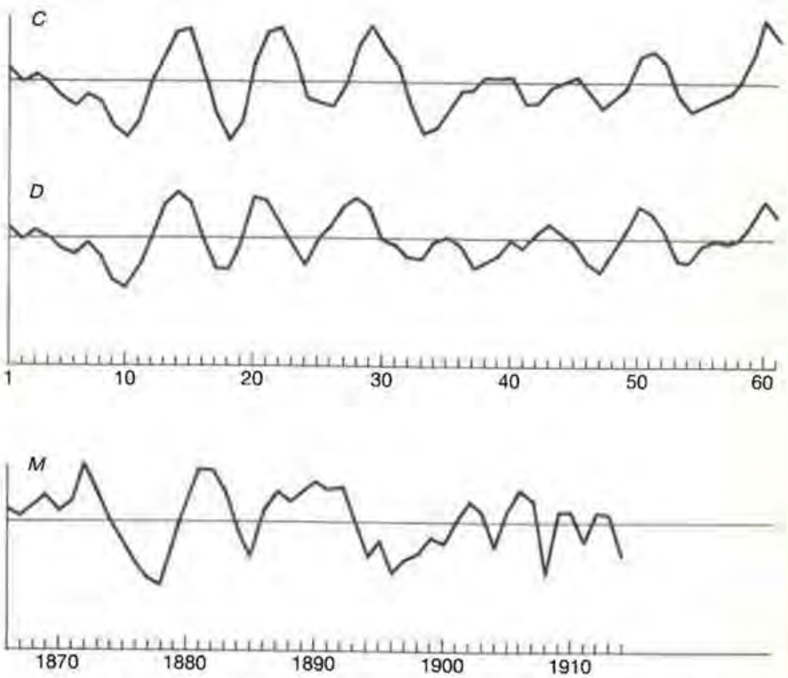

FIG. 36. *Cycles Derived from Normally Distributed Erratic Shocks (C and D) and Actual Cyclical Fluctuations in the USA, 1866–1914 (M)*

[78] Each page of these tables comprises 8 columns of 50 figures of 4 digits. These can be read as 32 columns of 50 digits. Each of such columns was added vertically, and thus 32 sums of 50 random digits each were obtained. The first 4 pages were handled in this way, so that a series of 128 shocks with approximately normal distribution was obtained.

in which heavier damping is inherent. The respective curves C and D are given in Fig. 36.

It will be seen immediately that the position is very different here from that in our preceding experiment. Curve D, which corresponds to much heavier damping, shows a pattern very similar to that of curve C. Both have a fairly clear-cut average period amounting for curve C to about 8 years, and for curve D to about 7.5 years. (The periods of the original cycles are 8.5 and 8 years respectively.) The amplitude of curve D is only moderately smaller than that of curve C.

Although these results still require a mathematical explanation, the phenomenon itself is virtually certain: the cycle generated by shocks with a normal frequency distribution shows a considerable stability with respect to changes in the basic equation which involve substantial increases in damping. Thus, even with relatively heavy damping such shocks generate fairly regular cycles.

This result is of considerable importance. It shows that a semi-regular cycle may be in existence even though the 'business cycle equation' involves substantial damping. It thus dispenses with the necessity of accepting the explosive cycle as the general pattern of economic fluctuations which we considered unrealistic.[14]

It may be of interest to compare the actual economic fluctuations over a number of years with the artificial series constructed above. In Fig. 36 the reader will find curve M representing the relative deviation from trend of the combined index of US manufacturing, transport, and trade for 1866–1914 according to Frickey.[79] The actual fluctuations differ from our shock-generated ones only in that they are somewhat less regular.

[79] E. Frickey, *Economic Fluctuations in the United States*, Cambridge, Mass., Harvard Univ. Press, 1942.

Part VI

Long-Run Economic Development

14. The Process of Economic Development

The long-run trend and the business cycle

We have established above a number of relations between investment, profits, and aggregate output. We have emphasized at many points that certain constants in these relations are subject to long-run economic changes even though we assumed them stable for the sake of the business cycle analysis. It will be seen below that changes in these constants in the course of the long-run economic development of the capitalist economy make for the continuation of this development. This in turn causes new changes in the constants in question, and so on.

As in the analysis of the business cycle, we assume here that foreign trade and the government budget are balanced and that workers do not save. Also, we continue to assume that the price indices used to deflate investment and aggregate output are identical. Thus all the equations used with respect to the business cycle (see p. 301) remain valid, although we shall now emphasize the long-run changes in certain constants. For this reason the constants concerned are now written with a subscript t. We thus have: (i) the equality of saving and investment,

$$S = I$$

(ii) the relation of profits to investment at some previous time,

$$P_t = \frac{I_{t-\omega} + A_t}{1 - q}$$

(iii) the relation of output to profits,

$$O_t = \frac{P_t + B'_t}{1 - \alpha'} + E_t$$

and finally, (iv) the equation determining investment,

$$I_{t+\theta} = \frac{a}{1+c} S_t + b' \frac{\Delta P_t}{\Delta t} + e \frac{\Delta O_t}{\Delta t} + d'_t$$

As indicated above, A, the stable part of capitalist consumption, B', reflecting mainly the overhead character of salaries, and E, aggregate indirect taxes, are no longer assumed to be constant as they were in the business cycle analysis, but are taken to be subject to long-run changes. Thus they are now denoted by A_t, B'_t, and E_t.

It follows from the above equations that:

$$I_{t+\theta} = \frac{a}{1+c} I_t + \frac{1}{1-q}\left(b' + \frac{e}{1-\alpha'}\right)\frac{\Delta I_{t-\omega}}{\Delta t} + L_t + d'_t \qquad (30)$$

where L_t is the abbreviation for the expression:

$$\frac{1}{1-q}\left(b' + \frac{e}{1-\alpha'}\right)\frac{\Delta A_t}{\Delta t} + \frac{e}{1-\alpha'}\frac{\Delta B'_t}{\Delta t} + e\frac{\Delta E_t}{\Delta t}$$

As in the business cycle equation (p. 303) we shall denote:

$$\frac{1}{1-q}\left(b' + \frac{e}{1-\alpha'}\right)$$

by μ. Thus we have:

$$I_{t+\theta} = \frac{a}{1+c} I_t + \mu \frac{\Delta I_{t-\omega}}{\Delta t} + L_t + d'_t \qquad (30a)$$

where

$$L_t = \mu \frac{\Delta A_t}{\Delta t} + \frac{e}{1-\alpha'}\frac{\Delta B'_t}{\Delta t} + e\frac{\Delta E_t}{\Delta t} \qquad (31)$$

$L_t + d'_t$ in equation (30a) is subject to changes as a result of the long-run trend in investment, changes which in turn help to perpetuate the trend in investment. The long-run change in I will cause a long-run change in $L_t + d'_t$; this through equation (30a) will effect a new long-run change in I, and so on. Let us denote the ordinate of the smooth time-curve representing this long-run movement of investment by y_t. It follows from the above that y_t is a smoothly changing variable which satisfies equation (30a). Consequently:

$$y_{t+\theta} = \frac{a}{1+c} y_t + \mu \frac{\Delta y_{t-\omega}}{\Delta t} + L_t + d'_t \qquad (32)$$

If we now subtract equation (32) from equation (30a) and denote

$I_t - y_t$ by i_t, we obtain:

$$i_{t+\theta} = \frac{a}{1+c} i_t + \mu \frac{\Delta i_{t-\theta}}{\Delta t} \tag{23a}$$

This equation is identical with the 'business cycle equation' in ch. 10 (see p. 303). There i_t denoted the deviation of investment from the depreciation level in a static system. It was shown that, according to equation (23a), i_t fluctuates around the zero level, which meant there that investment fluctuates around the depreciation level. In the present context, i_t is the deviation of I_t from the trend level y_t, and thus the fact that i_t satisfies equation (23a) means here that investment fluctuates around the long-run trend line (see Fig. 37).

In other words we have analysed investment into its trend and cyclical components:

$$I_t = y_t + i_t$$

where y_t is subject to a smooth long-run movement related to the long-run changes in $L_t + d'_t$, and where i_t fluctuates around the zero level.

Before passing to an analysis of the process of long-run development reflected in the movement of y, it should be noticed that this process also affects the amplitude of fluctuations in i. As shown above, this amplitude is either proportional to the magnitude of erratic shocks or is determined by the 'ceiling' of the supply of productive resources. The magnitude of shocks is clearly related to the size of

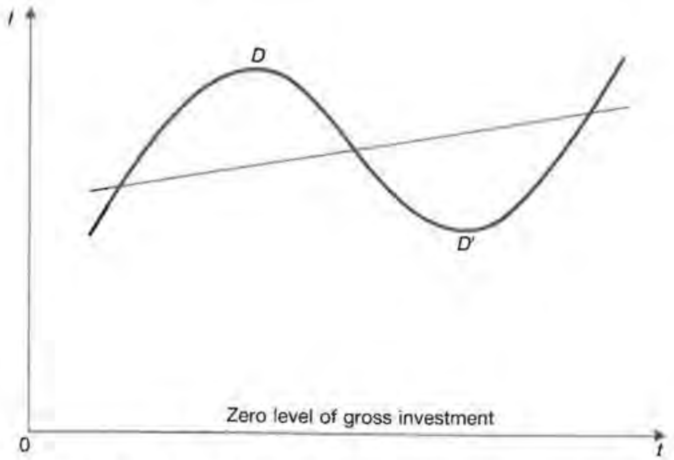

FIG. 37. *Trend and Cyclical Components of Gross Investment*

the economy, the long-run growth of which tends thus to increase the magnitude of shocks. The ceiling also will move more or less proportionally with the trend component y, so that the distance between the 'ceiling line' and the trend line increases with the general growth of the economy as well.

Assumption about long-run changes in L

It follows that the movement of the long-run level of investment, y, is determined only if definite assumptions are made about the impact of this movement upon L and d'. We shall first consider the problem of long-run changes in L which is determined by the equation:

$$L_t = \mu \frac{\Delta A_t}{\Delta t} + \frac{e}{1-\alpha'} \frac{\Delta B'_t}{\Delta t} + e \frac{\Delta E_t}{\Delta t} \tag{31}$$

We shall assume as a working hypothesis that A, B', and E in the long run vary proportionally with the long-run level of investment y, and consequently that L varies proportionally with $\Delta y / \Delta t$. The reasons for adopting this working hypothesis are given below.

As recalled on p. 323, A is that part of capitalist consumption which remains stable in the short run. In the long run, however, capitalist consumption may be assumed to show a tendency to adapt itself proportionally to the amount of profits. Thus A may be assumed in the long run to vary proportionally with profits. It follows directly then from the equation:

$$P_t = \frac{I_{t-\omega} + A_t}{1-q}$$

that both profits P_t and A_t in the long run vary proportionally with the long-run level of investment, $y_{t-\omega}$.[80]

As also recalled on p. 323, B' reflects the overhead character of salaries which in the short run tends to make their aggregate more stable than aggregate output. E represents aggregate indirect taxes which were assumed to be stable in the course of the business cycle. In the long run we can assume that B' and E vary proportionally with the aggregate output O. It then follows from the equation

$$O_t = \frac{P_t + B'_t}{1-\alpha'} + E_t$$

[80] It will be recalled that ω is the time-lag between investment and profits resulting from the time-lag between profits and capitalist consumption.

that O_t, B'_t, and E vary in the long run proportionally with profits, P_t. Since profits in the long run vary, according to the above hypothesis, proportionally with the long-run level of investment, $y_{t-\omega}$, the same is true of B'_t, E_t, and the aggregate output Q_t. Thus we assume that A_t, B_t, and E_t all vary proportionally in the long run with $y_{t-\omega}$, or, what amounts to the same thing, that investment, profits and aggregate output vary proportionally in the long run. (This will be the case, however, only if the coefficients q and α' remain unchanged.)

It follows directly now from equation (31) that L_t varies proportionally with the *rate of change* in the long-run level of investment, $y_{t-\omega}$:

$$L_t = \sigma \frac{\Delta y_{t-\omega}}{\Delta t}$$

Our equation (32) thus becomes:

$$y_{t+\theta} = \frac{a}{1+c} y_t + (\mu + \sigma)\frac{\Delta y_{t-\omega}}{\Delta t} + d'_t \tag{33}$$

The fact that the coefficient of $\Delta y_{t-\omega}/\Delta t$ is now not μ but $\mu + \sigma$ shows the influence of the long-run adaptation of profits and aggregate output to the long-run level of investment.

Assumption about long-run changes in d'

In order to simplify equation (33) let us denote $a/(1 + c)$ by n and $\mu + \sigma$ by m. We thus have:

$$y_{t+\theta} = ny_t + m\frac{\Delta y_{t-\omega}}{\Delta t} + d'_t \tag{33a}$$

Let us remember that n was postulated to be lower than 1 (see p. 290).

A special case of this equation corresponds to the 'equilibrium position' of the static system considered in ch. 11 (see p. 303). For such a system the long-run level of investment y is stable and equal to depreciation δ, so that we have:

$$y_{t+\theta} = y_t = \delta \quad \text{and} \quad \frac{\Delta y_{t-\omega}}{\Delta t} = 0$$

It follows from equation (33a) that:

$$\delta = n\delta + d'$$

and thus:

$$d' = (1 - n)\delta^{[15]}$$

Moreover, denoting the ratio of depreciation to the stock of capital K by β, we have:

$$d' = (1 - n)\beta K$$

Imagine now that some factors, e.g. innovations, lift d' above the level corresponding to the static state. Imagine further that the effect of these factors is, *ceteris paribus*, the greater the larger the stock of capital. We then postulate the general case:

$$d'_t = (1 - n)\beta K_t + \gamma K_t$$

where γ, which is positive, measures the intensity of the 'development factors'.

We can now write equation (33a) as follows:

$$y_{t+\theta} = ny_t + m\frac{\Delta y_{t-\omega}}{\Delta t} + (1 - n)\beta K_t + \gamma K_t \tag{34}$$

The long-run trend

It is clear that the above equation is incompatible with a static system if γ is positive. Indeed, assuming that y_t is equal to depreciation, βK_t, and $\Delta y_{t-\omega}/\Delta t = 0$, we obtain:

$$y_{t+\theta} = \beta K_t + \gamma K_t$$

which means that investment cannot be maintained at the level of depreciation, βK_t, but tends to be higher.

Thus equation (34) represents a system in which the long-run level of investment exceeds that of depreciation. Consequently the stock of capital, K_t, increases; and so of course does $(1 - n)\beta K_t + \gamma K_t$, which reflects a proportionally higher depreciation, βK_t, and 'innovation effect', γK_t. This gives a further stimulus to investment, and so on. As investment is rising, the term $m\Delta y_{t-\omega}/\Delta t$ is positive, which adds to the rate of increase in y_t. This latter reflects the effect of the rate of increase in profits upon investment in fixed capital and the effect of the rate of increase in aggregate output upon investment in inventories.

In other words, the 'development factors' such as innovations prevent the system from settling to a static position and engender a long-run upward trend. The accumulation of capital, which results from the fact that long-run investment is above the depreciation level, in turn increases the scope of the influence of the development factors and thus contributes to the maintenance of the long-run trend. The rise in profits and output which occurs as a result of the upward movement of investment makes for a higher rate of growth.

The process of adjustment

It should be noticed that the *transition* from the static state to that of the long-run upward trend is not adequately represented by equation (34). Indeed, such a transition is reflected first in a disturbance in the cyclical fluctuations; and it is through this change in the course of fluctuations that the readjustment is made. The boom is more pronounced than the slump and, as a result, a new long-run position with a higher level of investment is attained.

The change from the static state to a long-run upward trend corresponds to the change in the value of the intensity of the development factors, γ, from zero to a definite positive value. Now, the same pattern applies to any change in γ or in another parameter of equation (34). A reduction in the intensity of innovations reflected in a fall in γ, for instance, will also initially cause a disturbance in the cyclical fluctuations and, by means of a slump more pronounced than the boom, will make for a lower long-run level of investment.

The 'trend equation' with given parameters represents in the light of the above the long-run trend to which the system has settled down *after* the process of adjustment. It will be seen below that, under certain conditions, this equation represents growth at a constant percentage rate, i.e. a uniform trend.

The uniform trend

In order to facilitate the enquiry into this problem, let us first divide both sides of equation (34) by y_t:

$$\frac{y_{t+\theta}}{y_t} = n + \frac{m}{y_t}\frac{\Delta y_{t-\omega}}{\Delta t} + (1-n)\beta\frac{K_t}{y_t} + \gamma\frac{K_t}{y_t} \tag{34a}$$

If the system *is* subject to a uniform trend at a rate of growth v, we shall have the following relations. The net investment at time t is equal to vK_t because capital grows at rate v. As depreciation is βK_t, the gross investment y_t is equal to $(\beta + v)K_t$. Thus we have:

$$\frac{K_t}{y_t} = \frac{1}{\beta + v}$$

It follows, moreover, that gross investment y_t also increases at the rate v because it varies proportionally with the capital stock K_t. Thus:

$$\frac{1}{y_t}\frac{\Delta y_t}{\Delta t} = v$$

If we assume the rate of growth to be small (a few per cent), we obtain by neglecting the small magnitudes of the second degree:

$$\frac{1}{y_t}\frac{\Delta y_{t-\omega}}{\Delta t} = v$$

Finally we have:

$$\frac{y_{t+\theta}}{y_t} = 1 + \theta v$$

the relative growth in the period θ being θv.[81]

We thus can write equation (34a), using the above relations, as follows:

$$1 + \theta v = n + mv + \frac{(1-n)\beta + \gamma}{\beta + v}$$

or

$$1 + \frac{\theta - m}{1-n}v = \frac{\beta + \dfrac{\gamma}{1-n}}{\beta + v} \tag{35}$$

Since n is smaller than one, $1 - n$ is positive. The intensity of the development factors, γ, is also positive.

Let us examine equation (35) graphically. We take as abscissa the rate of growth v and draw the lines corresponding to both sides of equation (35):

$$z = 1 + \frac{\theta - m}{1-n}v \quad \text{and} \quad z' = \frac{\beta + \dfrac{\gamma}{1-n}}{\beta + v}$$

The point of intersection of these lines, if any, has as abscissa that value of v which satisfies equation (35). Thus the existence of the point of intersection will be decisive in determining whether or not a uniform trend is possible.

z is a straight line cutting the ordinate axis at the point 0, 1. (See Fig. 38, where 3 variants of the position of the straight line are shown.)

[81] In fact there is also involved here an approximation based on the neglect of the small magnitudes of the second degree.

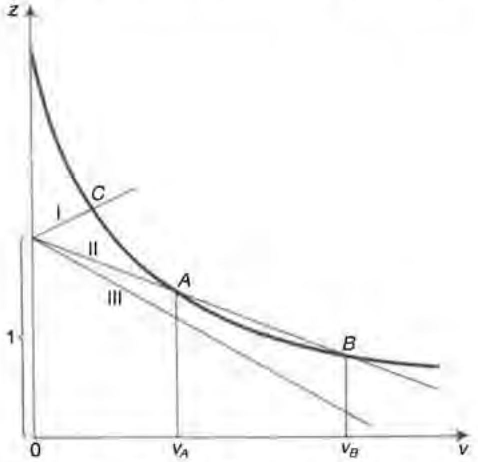

FIG. 38. *Uniform Trend: Determination of the Rate of Growth*

z' is a hyperbola with the following characteristics. (i) It cuts the ordinate axis above the point 0, 1 because for $v = 0$

$$z' = \frac{\beta + \dfrac{\gamma}{1-n}}{\beta}$$

and thus $z' > 1$ since γ and $1 - n$ are positive. (ii) It slopes downwards and approaches the abscissa axis asymptotically because z' falls when v is rising and approaches zero for sufficiently large values of v.

Fig. 38 shows 3 possible positions of the straight line z obtained by varying m. In case I, where $m < \theta$, the inclination of the straight line $(\theta - m)/(1 - n)$ is positive. In case II, where $m > \theta$, the line slopes downwards. The same is true of case III, but as $m - \theta$ is assumed to be larger than in case II the downward slope is steeper.

In case III, where the straight line does not intersect the hyperbola a uniform trend clearly cannot appear because no value of the rate of growth v will satisfy equation (35). Such values of v exist, however, in cases I and II, where there are 1 and 2 points of intersection respectively. We shall first consider case II.

In case II the straight line intersects the hyperbola at points A and B. The abscissae of both points satisfy equation (35). There is, however, a considerable difference in the significance of the rates of growth v_A and v_B. Indeed, let us assume that the intensity of the development

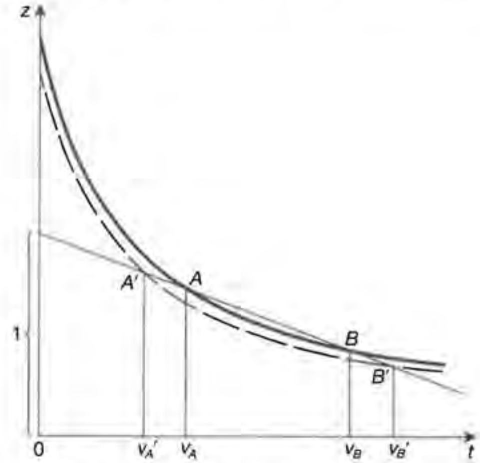

FIG. 39. *Uniform Trend: Analysis of Stability*

factors, γ, falls somewhat. This will be reflected (see Fig. 39) in a small downward shift of the hyperbola z'.

It will be seen that the point of intersection A' in the new position lies to the left of point A. Thus, the rate of growth v'_A is lower than v_A as a result of the reduction in the intensity of the development factors γ. However, the second point of intersection B' lies to the *right* of point B, and thus $v_{B'}$ is *higher* than v_B.[16] Now it is clear that, if the system were subject to the rate of growth v_B, a *reduction* in the intensity of the development factors could not have brought the system to a position where the rate of growth would be *higher*. In fact, there would then be a shift from position B to position A'. It will thus be seen that only the rate v_A corresponds to a stable moving equilibrium, and that growth at a rate v_B is of an ephemeral nature.

In case I it is easy to see that the single point of intersection, C, is of the same nature as A in case II (see Fig. 38). It can thus be concluded that in cases I and II a 'stable' uniform trend is generated (at rates of growth v_C and v_A respectively), while in case III a uniform trend cannot appear.

If $\delta = 0$, i.e. if the effect of the development factors is nil, $z' = 1$ so that the hyperbola passes through the point 0, 1. Only cases I and II are relevant then. In case I, v_C and in case II v_A is equal to zero. v_B in case II is positive but of ephemeral nature, as shown above. It may be thus concluded that, in the absence of development factors, the system lapses into a stationary state. These factors thus appear to be a prerequisite of a steady growth.[17]

Uniform and retarded growth

In the case of uniform growth, both current investment and the stock of capital increase at the same constant rate. If, in addition, it is assumed as above (see p. 325) that profits and output bear in the long run a constant relationship to investment, it follows that investment, profits, output, and capital all expand in the long run at the same rate. The rate of profit and the ratio of output to capital thus remain stable in the long run.

This is the familiar picture of an economy growing in *size* without a change in the *proportions* of its basic variables. Indeed, many authors assume that a uniform trend is an automatic tendency inherent in the capitalist economy. However, the process of uniform growth which emerges from our discussion is based on development factors such as innovations, in the absence of which the capitalist economy would remain static. It is for this reason that we devote the next chapter to a discussion of these factors.

At the present stage it should still be recalled that the uniform trend discussed above depends on a stable intensity of the development factors γ, i.e. on the scope of the influence of these factors increasing proportionally with the stock of capital. It is clear that if this intensity tends to decline the process of economic growth will be retarded. Capital will accumulate at a diminishing rate or, in other words, the ratio of net investment to capital will be falling. The same will be true of gross investment. From the assumption that profits and output vary in the long run proportionally with investment it follows that both the rate of profits and the ratio of output to capital will be declining. Thus retarded growth has far-reaching repercussions upon the capitalist economy: the slowing down of the rate of progress is associated with a falling rate of profit and a reduction in the degree of utilization of capital equipment.[82]

If this process is accompanied by a shift from wages to profits, for instance as a result of the increase in the degree of monopoly, this will not halt the decline in the rate of profit but will make the rise in under-

[82] However, if capital intensity, i.e. the ratio of real value of capital to industrial capacity, increases sufficiently, the degree of utilization may not fall. The decline in the ratio of output to capital would then merely reflect the rise in capital intensity.

utilization of equipment more acute (see p. 253). Indeed, a rise in the relative share of profits in the national income means that aggregate output will grow at a lower rate than investment and profits. Thus output will fall even more in relation to capital than in the case of retarded growth considered above, where investment, profits, and output were assumed to vary proportionally although all of them were increasing at a lower rate than the stock of capital.

15. The Development Factors

Recapitulation of the theory of investment

In order to place the factors determining the economic development of the capitalist economy in their proper perspective, it is necessary to restate briefly our basic theory of investment. According to this theory, investment in fixed capital per unit of time is determined (with a time-lag) by three factors: by the current 'internal' gross savings of firms, by the rate of increase in profits, and by the rate of increase in the volume of capital equipment. The first two influences are positive and the third is negative. Investment in inventories is taken to be determined by the rate of increase in output.

Let us consider again for a moment the case of a static economy. Let us imagine that when total gross savings are equal to depreciation they accrue fully to firms, and let us leave aside such 'external' factors as innovations. (Let us also continue to assume a balanced foreign trade and government budget.) It is clear that the economy can be maintained in a static state, and that disturbances will bring about only cyclical fluctuations. Indeed, if gross investment in fixed capital is at the depreciation level, it will generate total gross savings which are equal to it, and as these savings accrue fully to firms they will tend to be duly reinvested. Moreover, the volume of capital equipment will be maintained at a constant level; profits and output will remain unchanged because they are determined by the level of investment; and, since output is stable, no change in inventories will occur. As long as the above conditions are fulfilled the system is static, with the exception of cyclical fluctuations around the level where investment equals depreciation.

The position changes, however, if we drop some of the assumptions. We shall argue that innovations tend to increase the long-run level of investment and thus make for a long-run upward trend. On the other hand, the existence of current savings outside firms, which we shall call 'rentiers' savings', tend to depress investment and thus to detract from long-run development.

Innovations

Inventions which occur in the course of a given period make certain new investment projects more attractive. The influence of this factor is analogous to that of an increase in aggregate profits which, in the course of a given period, makes investment projects generally more attractive than they were at the beginning of this period. Each new invention, like each increase in profits, gives rise to certain additional investment decisions. A steady stream of inventions is comparable in its effect upon investment to a steady rate of increase in profits. Thus such a stream adds to the level of investment per unit of time which would otherwise obtain. This is the immediate impact of new inventions upon investment. Innovations in the sense of gradual adjustments of equipment to the current state of technology are assumed to be part and parcel of 'ordinary' investment as determined by the 'normal' factors described above.

It is now clear that a steady stream of inventions adds to investment over and above the level resulting from our basic determinants. Thus inventions transform a static system into one subject to an upward trend. It should be added that the effect of innovations upon the level of investment can be assumed *ceteris paribus* to be higher the larger the volume of capital equipment. In accordance with this, we assumed in our model of the trend that this effect is proportional to the stock of capital (see p. 327). The weakening intensity of innovations is thus reflected in a decline in this effect in relation to the stock of capital. It will cause, as shown above, a retardation of the process of long-run development.

We have identified innovations here with developments in technology. However, the definition of innovations can be easily broadened to include kindred phenomena, such as the introduction of new products which require for their manufacture new equipment, the opening up of new sources of raw materials which make necessary new investment in productive and transportation facilities, etc. The above argument also fully applies to these cases.

The slowing down in the growth of capitalist economies in the later stages of their development is probably accounted for, at least partly, by the decline in the intensity of innovations. Three broad reasons may be given for such a tendency. The most obvious is the diminishing importance of opening up new sources of raw materials, etc. Another is the hampering of application of new inventions which results from the increasingly monopolistic character of capitalism. Finally, 'assembly industries', such as those manufacturing automobiles, wireless, and other durable mass consumer goods, are gaining in importance, and in such industries technological progress is largely concentrated on a 'scientific organization' of the assembly process which does not involve heavy investment.

Rentiers' savings

Let us assume that when total gross savings are equal to depreciation, some outside current savings which we call 'rentiers' savings' are in existence. Thus, the internal savings of firms (equal to depreciation minus rentiers' savings) are below the depreciation level, which tends to depress investment below that level as well. This introduces a negative trend in the system in somewhat the same way that innovations inject a long-run upward tendency. In line with our argument in chapter 14, rentiers' savings will tend to generate a uniform negative trend if their real value is a constant proportion of the real value of the stock of capital. If rentiers' savings are increasing in relation to capital, the negative trend will be accelerated.

It is clear from the above that, if the effect of innovations is combined with that of rentiers' savings, it is their net effect which determines the long-run development. The trend will be positive only if innovations exert a stronger influence than rentiers' savings. It is also clear that a decline in the intensity of innovations or a rise in rentiers' savings in relation to the stock of capital will produce a retardation in this trend.

Growth in population

It is frequently assumed that growth in population is an important stimulus to economic development. It is true that if the population is stagnant, output can increase only by virtue of an increasing productivity of labour or a drawing upon the reserve army of unemployed. Thus growing population widens the *potentialities* of the long-run expansion in output. It remains to be seen, however, whether an increase in population also provides a stimulus to long-run development which contributes to the effective use of these potentialities.

In order to answer this question, let us consider a static system and superimpose on it a rising population. Since output initially remains stable, in the long run there will be an increase in unemployment. This exerts a pressure on money wages which consequently tend to fall. We are thus faced with the question whether a long-run fall in wages provides a stimulus to development in a capitalist economy.

It should be noticed first that a long-run fall in money wages—which is associated with the weakening of trade unions—will, according to our discussion in ch. 1 (p. 216), tend to increase the degree of monopoly and thus to cause a shift from wages to profits. Far from stimulating the long-run rise in output, this, as shown above (see p. 253), will tend to affect it unfavourably.

There is, however, a channel through which the fall in money wages might, at least in theory, stimulate the long-run upward trend of a capitalist economy. A long-run fall in money wages causes a fall in prices and thus, with stable output, a fall in the money volume of transactions. If the supply of cash by banks is not proportionally reduced, this leads in turn to a long-run fall in the short-term rate of interest, and thence to a fall of the long-term rate of interest. Such a fall would be equivalent in its impact on investment to a long-run rise in profits, and thus would cause an upward trend movement. But the increase in output in such a case cannot be great enough to prevent a long-run increase in unemployment, for in such a case the very cause of the trend would disappear.

It is, however, highly doubtful whether the mechanism described will be effective in increasing output at all. The connection between the fall in turnover and the fall in the short-term rate of interest is in fact fairly uncertain in the long run. If the fall in turnover continues over a long period, the banking policy may easily adapt itself to this secular fall in such a way as to reduce the supply of balances *pari passu* with turnover and thus to sustain the short-term rate of interest.

It should be noticed that some authors have taken into consideration other channels through which growth in population may stimulate economic development. They have maintained that an increase in

population encourages investment because entrepreneurs can then anticipate with some certainty a broadening market for their products. What is important, however, in this context is not an increase in population but an increase in purchasing power. An increase in the number of paupers does not broaden the market. For instance, increased population does not necessarily mean a higher demand for houses: without an increase in purchasing power, the result may well be the crowding of more people into existing dwelling space.

Concluding remarks

Our analysis shows that long-run development is not inherent in the capitalist economy. Thus specific development factors are required to sustain a long-term upward movement. Amongst such factors we singled out innovations in the broadest sense as the most important promoter of development. Another long-run influence considered, rentiers' savings, was found to be an obstacle rather than a stimulus to development.

A decline in the intensity of innovations in the later stages of capitalist development results in a retardation of the increase in capital and output. Moreover, if the effect of the increase in the degree of monopoly upon the distribution of national income is not counteracted by other factors there will be a relative shift from wages to profits, and this will constitute another reason for the slowing down of the long-run rise in output.

If the rate of expansion in output falls below the combined rate of increase in productivity of labour and in population, unemployment will show a long-run rise. According to the above, this is not likely to set forces to work which would automatically mitigate the rise in unemployment by inducing a higher rate of increase in output.

Statistical Appendix to *Theory of Economic Dynamics*

Notes to Part I

1. Data for 1899–1914 are given below for: (i) the value of fixed capital in US manufacturing according to Paul H. Douglas, *The Theory of Wages*; (ii) US manufacturing production according to the NBER; and (iii) the value added minus wages in US manufacturing according to the census of manufactures.

Table A1

Year	Book value	Value of fixed capital		Production	Value added minus wages in current values
		At reproduction cost	At constant prices		
1899	100	100	100	100	100
1904	137	136	138	124	130
1909	203	216	198	158	180
1914	256	280	240	186	205

2. The ratio of proceeds to prime costs, the ratio of the materials bill to the wage bill, and the relative share of wages in the value added in US manufacturing discussed in chs. 1 and 2 are based on the US census of manufactures. The census underwent considerable changes both in scope and method. In order to assure reasonable comparability over the period considered (1899–1937) the series were 'linked' in the years in which changes occurred. 1899 was chosen as the base year. Changes in the scope of the census took place in that year and in 1914. Since for these 2 years data were available both on the 'old' and the 'new' basis, it was possible to link all the years to the base year 1899. There were also several changes in the method of the census. (i) In 1929, 1931, and 1933 the so-called work and shop supplies were included in the value added rather than in the cost of materials as was the case in other years. This item, according to the census of 1904, where it is shown separately, amounted to about 0.9% of the cost of materials. In order to allow approximately for this change, costs of materials in 1929, 1931, and 1933 were accordingly reduced and the value added was increased. (ii) Prior to 1931 the tax on tobacco manufactures was included in the value added, while from 1931 onwards this item was incorporated in the cost of materials. Since for 1931 both variants were given, it was possible to link 1931 and the subsequent years to the base year 1899. (iii) Prior to 1935 the cost of work given out was included in the value added, while from 1935 onwards this item was included in the cost of materials. Since for 1935 both variants were given,

it was possible to link 1935 and the subsequent years to the base year 1899. The figures obtained as a result of the above adjustments are given for selected years in the table below.

Table A2

Year	Ratio of proceeds to prime costs (%)	Ratio of materials bill to wage bill (%)	Relative share of wages in value added (%)
1879	122.5	382	47.8
1889	131.7	291	44.6
1899	133.3	337	40.7
1914	131.6	370	40.2
1923	133.0	329	41.3
1929	139.4	346	36.2
1931	143.3	314	35.7
1933	142.8	331	35.0
1935	136.6	349	37.9
1937	136.3	338	38.6

3. The series of the ratio of proceeds to prime costs in US manufacturing, assuming stable industrial composition, was calculated by using a chain system. For instance, the ratio of proceeds to prime costs in 1889 was calculated on the assumption that the relative shares of major industrial groups in the aggregate proceeds as of 1879 obtained; this figure divided by the actual ratio of proceeds to prime costs in 1879 gave the 'link' 1889/1879. Then the 'link' 1899/1889 was similarly derived on the assumption that the relative industrial shares as of 1889 obtained and so on. The year 1899 was chosen as base in the sense that for that year the 'adjusted' ratio of proceeds to prime costs is identical with the actual ratio. The adjusted series could then be built up by means of the links.

The series of the ratio of the materials bill to the wage bill, assuming stable industrial composition of the materials bill, was similarly obtained. 1899 was again chosen as the base year in the above sense.

The adjusted series of the relative share of wages in the value added, w', was calculated from the adjusted ratio of proceeds to prime costs, k', and the adjusted ratio of the materials bill to the wage bill, j', by means of the formula:

$$w' = \frac{1}{1 + (k' - 1)(j' + 1)} \tag{3a}$$

(see p. 226). As k' is calculated on the assumption of stable industrial composition of the *proceeds* and j' on the assumption of stable industrial composition of the *materials bill*, w' is the relative share of wages on the assumption of stable industrial composition of the *value added* (the latter being the difference between proceeds and the materials bill). The series k', j', and w' are given in Tables 34 and 36.

4. The following indices for the USA during 1929–37 are given below. (i) The index of the wage bill in manufacturing according to US Dept. of Commerce *Survey of Current Business*, which agrees with the census of manufactures for the census years. (ii) The index of the wage and salary bill in agriculture, mining, construction, transport, and services according to US Dept. of Commerce *National Income Supplement to Survey of Current Business*, 1951. (iii) The combined index of these 2 series is taken to approximate the index of aggregate wages (see p. 234). The weights adopted are 1:1; the wage and salary bills of manufacturing, on the one hand, and of the industries enumerated under (ii) on the other hand, were approximately equal in 1929, and it may be assumed that the respective wage bills also did not differ very much. (iv) The index of the gross income of the private sector according to the *National Income Supplement*.

Table A3

Year	Wage bill in manufacturing	Wage and salary bill in agriculture, mining, construction, transport, and services	Combined index	Gross income of the private sector
1929	100	100	100	100
1930	80.9	90.6	85.7	86.0
1931	61.4	74.0	67.7	67.6
1932	42.3	55.0	48.6	48.3
1933	45.4	49.5	47.4	45.3
1934	58.4	55.6	57.0	54.1
1935	67.1	60.5	63.8	62.9
1936	77.7	69.6	73.6	70.1
1937	92.8	77.1	84.9	79.7

5. Wages plus salaries and the gross income of the private sector in the USA in 1929–41 according to the *National Income Supplement* are given on p. 341. (It is on these data that the first column in Table 40 is based.) It should be noticed that in the national balance sheet given in the *Supplement* there is a statistical discrepancy between national product derived from the income side and from the expenditure side. The figure of gross income in the 2nd column is derived from income statistics. In order to obtain consistent data, this figure is adjusted for the statistical discrepancy. (In this way we charge the statistical error fully to the income side, which is justified by the fact that the data on expenditures are on the whole more reliable than those on incomes.) The adjusted gross income of the private sector is given in the 3rd column. The adjusted wages plus salaries are assumed to be proportional to

the adjusted gross income, and thus the relative share of the former in the latter is not altered by the adjustment.

Table A4

Year	Private wages and salaries ($ billions, current prices)	Gross income of the private sector ($ billions, current prices)	Adjusted gross income of the private sector	Adjusted private wages and salaries
1929	45.2	90.4	90.4	45.2
1930	40.7	77.8	77.1	40.4
1931	33.6	61.1	62.3	34.2
1932	25.3	43.7	45.1	26.1
1933	23.7	40.9	42.2	24.4
1934	27.4	49.0	49.8	27.9
1935	30.0	56.9	56.5	29.8
1936	33.9	68.4	64.2	34.3
1937	38.4	72.1	71.1	37.9
1938	34.6	65.0	64.9	34.5
1939	37.5	70.1	68.8	36.8
1940	41.1	79.0	77.4	40.3
1941	51.5	100.2	98.6	50.7

6. The adjusted gross income of the private sector is deflated below by the index implicit in the deflation of the gross product of the private sector. (This index was obtained by dividing the current value of the gross product of the private sector by its value in constant prices as given in the *Supplement*.)

Table A5

Year	Price index implicit in deflation of gross product of the private sector (1939 = 100)	Adjusted gross income of the private sector	
		($ billions, current prices)	($ billions, 1939 prices)
1929	122	90.4	74.1
1930	117	77.1	65.9
1931	105	62.3	59.3
1932	94	45.1	48.0
1933	90	42.2	46.9
1934	96	49.8	51.9
1935	98	56.5	57.7
1936	98	64.2	65.5
1937	103	71.1	69.0
1938	101	64.9	64.3
1939	100	68.8	68.8
1940	102	77.4	75.9
1941	110	98.6	89.6

Notes to Part II*

7. Adjusted profits before and after taxes in current and 1939 prices for 1929–40 are given below. Adjusted profits before taxes in current prices are obtained as the difference of the adjusted gross income of the private sector and adjusted private wages and salaries as given in n. 5. Adjusted profits after taxes are obtained by deducting *all* direct taxes, both corporate and personal (direct taxes on workers having been small in the period considered). Finally, adjusted profits before and after taxes are deflated by the price index implicit in the deflation of the gross product of the private sector as given in n. 6.

Table A6

Year	Adjusted profits		Adjusted profits	
	Before taxes ($ billions, current prices)	After taxes	Before taxes ($ billions, 1939 prices)	After taxes
1929	45.2	41.2	37.0	33.7
1930	36.7	33.4	31.4	28.5
1931	28.1	25.7	26.7	24.5
1932	19.0	17.2	30.2	18.3
1933	17.8	15.8	19.8	17.6
1934	21.9	19.6	22.8	20.4
1935	26.7	23.9	27.3	24.4
1936	29.9	26.2	30.5	26.8
1937	33.2	28.8	32.2	27.9
1938	30.4	26.5	30.1	26.2
1939	32.0	28.1	32.0	28.1
1940	37.1	31.6	36.3	31.0

8. The sum of gross private investment, export surplus, budget deficit, and brokerage fees is given on p. 343. This sum is equal to gross savings plus brokerage fees (see p. 250). The corresponding 'real' values are obtained by using as a deflator the index implicit in the deflation of the gross product of the private sector (see n. 6).

9. Correlating the adjusted real profits after and before tax, P and π, as given in n. 7, we obtain the following regression equation:

$$P = 0.86\pi + 0.9$$

The correlation coefficient is equal to 0.991.

* Source of data used: US Dept. of Commerce, *National Income Supplement to Survey of Current Business, 1951.*

Table A7

Year	Gross private investment plus export surplus plus budget deficit plus brokerage fees	
	($ billions, current prices)	($ billions, 1939 prices)
1929	17.3	14.2
1930	11.9	10.2
1931	5.8	5.5
1932	3.0	3.2
1933	3.1	3.4
1934	5.8	6.0
1935	8.2	8.4
1936	11.4	11.6
1937	11.1	10.8
1938	9.1	9.0
1939	12.9	12.9
1940	16.2	15.9

Notes to Part IV*

10. The data on the volume of gross investment in fixed capital and the volume of the gross product of the private sector are given below. Fig. 17, which was used in the discussion of the 'acceleration principle', is based on these data.

Correlating gross investment with gross product and with time t, we obtain the following regression equation:

$$\text{investment} = 0.306\ (\text{product} - 1.45t) - 14.5$$

Table A8

Year	Gross investment in fixed capital ($ billions, 1939 prices)	Gross product of the private sector
1929	13.5	81.5
1930	10.2	73.5
1931	7.1	67.7
1932	4.0	57.4
1933	3.5	56.5
1934	4.4	62.0
1935	5.8	67.6
1936	7.9	76.4
1937	9.3	80.9
1938	7.2	76.4
1939	9.5	83.7
1940	11.4	92.1

* Source of data used: US Dept. of Commerce, *National Income Supplement to Survey of Current Business, 1951.*

where t is counted in years from the beginning of 1935. Fig. 17 shows the deviations of both sides of this equation from the mean. Thus fluctuations in gross investment in fixed capital and fluctuations in gross product are compared after they have been reduced to the same amplitude and the intervening trend has been eliminated.

11. Gross savings in current prices and in 1939 prices are given below. This series differs from that in n. 8 in that brokerage fees are not included. Moreover, the 'real' value is obtained here by deflating by the price index of investment goods rather than by the price index implicit in the deflation of the gross product of the private sector. (The price index of investment goods was arrived at by dividing the current value of investment in fixed capital by its value in constant prices.)

Table A9

Year	Gross savings ($ billions, current prices)	Price index of investment goods (1939 = 100)	Gross savings ($ billions, 1939 prices)
1929	15.5	105.9	14.6
1930	11.2	102.9	10.9
1931	8.4	94.3	8.9
1932	2.8	85.0	3.3
1933	2.7	82.9	3.3
1934	5.6	90.9	6.2
1935	7.9	89.7	8.8
1936	11.1	92.4	12.0
1937	10.8	97.8	11.0
1938	8.9	101.4	8.8
1939	12.7	100	12.7
1940	16.0	102.6	15.6

12. Profits for the years 1928–9, 1929–30, 1930–1, etc., running from mid-year to mid-year are required for the statistical illustration of the theory of determination of investment in fixed capital (see p. 295). As a first approximation the averages of profits in 1928 and 1929, in 1929 and 1930, in 1930 and 1931, etc., might be taken. But this approximation is not adequate here, because the series is to serve as a basis for the calculation of the rates of change in profits. It is clear that on the basis of such an approximation the rate of increase in profits in 1930 would be half of the difference between the levels in 1931 and 1929, which may obviously prove unsatisfactory. However, a 2nd approximation can be introduced as follows. We postulate a relation

between profits and private wages plus salaries which is shown here for 1929–30 by way of example:

$$\frac{\text{Profits 1929–30}}{\text{Wages and salaries 1929–30}} = \frac{\tfrac{1}{2}(\text{Profits 1929} + \text{Profits 1930})}{\tfrac{1}{2}(\text{Wages and salaries 1929} + \text{Wages and salaries 1930})}$$

This hypothesis is based on the fact that the relation of profits to wages plus salaries changes rather slowly (see Table 40). It follows directly from this

Table A10

Year	Adjusted Profits after taxes[a] ($ billions, current prices)	Averages of two successive years	'Correction factor'	Profits from mid-year to mid-year ($ billions, current prices)
				40.6[b]
1928	—	—	—	
1929	41.2	—	—	
		37.3	1.023	38.2
1930	33.4			
		29.5	1.003	29.6
1931	25.7			
		21.4	0.997	21.3
1932	17.2			
		16.5	0.934	15.4
1933	15.8			
		17.7	1.031	18.2
1934	19.6			
		21.7	0.989	21.5
1935	23.9			
		25.1	0.991	24.9
1936	26.2			
		27.5	1.017	27.9
1937	28.8			
		27.6	0.995	27.5
1938	26.5			
		27.3	0.992	27.1
1939	28.1			
		29.8	0.992	29.6
1940	31.6			

[a] As given in n. 7.
[b] Crudely estimated; but no significant error can be involved in view of the slowness of the changes in profits in the period concerned.

equation that:

$$\frac{\text{Profits 1929–30}}{\frac{1}{2}(\text{Profits 1929} + \text{Profits 1930})} = \frac{\text{Wages and salaries 1929–30}}{\frac{1}{2}(\text{Wages and salaries 1929} + \text{Wages and salaries 1930})}$$

Now the ratio on the right-hand side can be calculated on the basis of the *monthly* data on wages and salaries which are given in the above source. Applying this 'correction factor' to the average of profits in 2 successive years, we obtain a 2nd approximation for profits in the year running from the middle of the first to the middle of the 2nd year. This calculation is shown in Table A10.

Table A11

Year	Profits from mid-year to mid-year ($ billions, current prices)	Prices of investment goods (1939 = 100)	Averages of two successive years	Profits from mid-year to mid-year ($ billions, 1939 prices)
1928				
	40.6		105[a]	38.7
1929		105.9		
	38.2		104.4	36.6
1930		102.9		
	29.6		98.6	30.0
1931		94.3		
	21.3		89.7	23.7
1932		85.0		
	15.4		84.0	18.3
1933		82.9		
	18.2		86.9	20.9
1934		90.9		
	21.5		90.3	23.8
1935		89.7		
	24.9		91.1	27.3
1936		92.4		
	27.9		95.1	29.3
1937		97.8		
	27.5		99.6	27.6
1938		101.4		
	27.1		100.7	26.9
1939		100		
	29.6		101.3	29.2
1940		102.6		

[a] Crudely estimated; but no significant error can be involved in view of the slowness of changes in the prices of investment goods in the period concerned.

13. The profits for the years running from mid-year to mid-year obtained in the preceding note are now deflated by the price index of investment goods (see n. 11). As this index moves rather slowly, averages of 2 successive years were deemed to be adequate as deflators for profits from mid-year to mid-year. The calculation is shown in Table A11.

14. For reasons given in the footnote to p. 297, we assume in our enquiry that changes in farm inventories are excluded both from changes in total inventories and from the gross product of the private sector. This elimination is shown in Table A12.

Table A12

Year	Investment in inventories		Gross product of the private sector	
	Inclusive	Exclusive[a]	Inclusive[a]	Exclusive
	of investment in farm inventories ($ billions, 1939 prices)			
1929	1.5	1.7	81.5	81.7
1930	− 0.2	0	73.5	73.7
1931	− 1.1	− 1.4	67.7	67.4
1932	− 3.0	− 3.0	57.4	57.4
1933	− 1.8	− 1.5	56.5	56.9
1934	− 0.8	0.6	62.0	63.4
1935	0.9	0.5	67.6	67.2
1936	1.4	2.3	76.4	77.3
1937	2.1	1.7	80.9	80.5
1938	− 1.0	− 1.1	76.4	76.3
1939	0.4	0.3	83.7	83.6
1940	2.3	2.1	92.1	91.9

[a] Identical with the series given in n. 10.

15. The gross product of the private sector for periods running from mid-year to mid-year is required for the statistical illustration of the theory of determination of investment in inventories (see p. 297). This is estimated by a method similar to that applied to profits in n. 12. The ratio of aggregate money wages and salaries to the gross product of the private sector appears to change in the period considered rather slowly (cf. the last column of the table in n. 5 with the last column of Table A13). It follows from the argument in n. 12 that we can use for the calculation of the gross product of the private sector for mid-year to mid-year periods the 'correction factors' given in that note. The actual calculation is shown in Table A13.

Table A13

Year	Gross product of the private sector[a] ($ billions, 1939 prices)	Averages of 2 successive years	Correction factor	Gross product from mid-year to mid-year ($ billions, 1939 prices)
1928	—	—	—	80.4[b]
1929	81.7			
		77.7	1.023	79.5
1930	73.7			
		70.5	1.003	70.7
1931	67.4			
		62.4	0.997	62.2
1932	57.4			
		57.1	0.934	53.3
1933	56.9			
		60.1	1.031	62.0
1934	63.4			
		65.3	0.989	64.6
1935	67.2			
		72.3	0.991	71.6
1936	77.3			
		78.9	1.017	80.2
1937	80.5			
		78.4	0.995	78.0
1938	76.3			
		79.9	0.992	79.3
1939	83.6			
		87.7	0.992	87.0
1940	91.9	—	—	—

[a] Exclusive of farm inventories as given in the preceding table.
[b] Crudely estimated; but no significant error can be involved in view of the slowness of changes in the gross product in the period concerned.

PART 4

THE BUSINESS CYCLE AND ARMAMENTS AFTER THE SECOND WORLD WAR

Table A13

Year	Gross product of the private sector[a] ($ billions, 1939 prices)	Averages of 2 successive years	Correction factor	Gross product from mid-year to mid-year ($ billions, 1939 prices)
1928	—	—	—	80.4[b]
1929	81.7			
		77.7	1.023	79.5
1930	73.7			
		70.5	1.003	70.7
1931	67.4			
		62.4	0.997	62.2
1932	57.4			
		57.1	0.934	53.3
1933	56.9			
		60.1	1.031	62.0
1934	63.4			
		65.3	0.989	64.6
1935	67.2			
		72.3	0.991	71.6
1936	77.3			
		78.9	1.017	80.2
1937	80.5			
		78.4	0.995	78.0
1938	76.3			
		79.9	0.992	79.3
1939	83.6			
		87.7	0.992	87.0
1940	91.9	—	—	—

[a] Exclusive of farm inventories as given in the preceding table.
[b] Crudely estimated; but no significant error can be involved in view of the slowness of changes in the gross product in the period concerned.

PART 4

THE BUSINESS CYCLE AND ARMAMENTS AFTER THE SECOND WORLD WAR

The Impact of Armaments on the Business Cycle after the Second World War[1]

(1955)

This is a rather complex problem, and if we examine concrete phenomena, a number of complications arise which are not of primary importance and only obscure its essence. For this reason I decided to divide this study into 2 parts, presenting in the first a theoretical model of the impact of armaments on the capitalist economy and in the second an analysis of the American economy in 1950–4.

I. Theoretical Model of the Impact of Armaments on the Capitalist Economy

First I consider the theoretical problem: whether and under which conditions an increase in armaments can cause an increase in output and employment in the capitalist system. I divide this subject into 3 parts: the impact of armaments when they are entirely tax-financed, the impact of a budget deficit, and general conclusions.

The following assumptions are made:

First, it is assumed that we are dealing with a capitalist economy that has considerable reserves. An increase in demand does not require an immediate expansion of productive capacity, since part of this capacity is idle and the additional demand can be met with the existing capital equipment. This assumption is certainly correct if we presume that armament begins during a period when the industrial equipment of the capitalist economy is not fully employed. This condition is met, since we are discussing the impact of militarization on maintaining or increasing output and employment.

The second assumption is unrealistic, but I make it for reasons of simplicity: I assume that we have a closed system and ignore foreign trade. This assumption is completely different from the first. We leave out foreign trade to simplify the analysis. If we abandoned this assumption, there would be no essential changes in the analysis; however, since the problem is complicated enough, I prefer to simplify it in this way.

I begin with a case in which the budget is balanced and the increase in armaments is financed through tax increases. I divide the economy into four sectors:

I. the investment goods sector
II. the armaments sector
III. the consumer goods sector for workers
IV. the consumer goods sector for capitalists.

This division is similar to that of Marx's schemata, but there is a difference. I assume that each of these sectors includes production of its raw materials. Thus the production of investment goods or armaments covers not only finished products, i.e. the last phase of production, but also the production of raw materials required for them.

Let us first consider a variant which corresponds most closely to assumptions made in recent years in Polish and Soviet literature. I assume not only that armaments are entirely tax-financed, but moreover that the burden of these taxes falls exclusively on the working class. Then the result of armaments is relatively simple. Production increases by a certain amount in the armaments sector; at the same time, this amount is exacted from workers. Their consumption falls by the amount of increase in the production of armaments, since, for workers, a fall in income is identical with a fall in consumption.[2] Consequently, there will simply be a shift from sector III to sector II.

Hence output and employment will increase in the armaments sector and fall in the consumer goods sector for workers. What will happen in the other 2 sectors: in the investment goods sector and in the consumer goods sector for capitalists? Throughout this analysis I shall make the following assumption: in the first period after some change in the economic system, investments and the consumption of capitalists do not change, as they react to any changes only after a certain time-lag.

Let us now see whether, if capitalist consumption and investments have not changed in the first period, they will not change later. We can easily prove that they do not change, for in the first period total output remains unchanged. If no additional factor operates, the distribution of income will be the same as before; thus profits will be unchanged as well (profits will increase in the armaments industry and decline in the consumer goods industry, but total profits will be the same; since total profits are unchanged, one can assume that even after some time the consumption of capitalists and investments will be the same).

So what happens when armaments are financed in this way? As we see, real wages fall on account of the increase in taxes, and worker consumption falls; the consumption of capitalists, investments, and profits remain unchanged. In fact, one can say that in this case armaments contribute nothing to an increase in output and employment.

As we see from the experience of recent and past years, however, part of the tax burden also falls on capitalists. One can say that even then workers really pay these taxes, but this is rather vague. In reality, this surplus value belonged to capitalists and was not remitted to the state, but it is remitted to the state once taxes are imposed on them. If taxes are imposed on workers, we can assume that their consumption will fall immediately; if they are imposed on capitalists, then, as we assumed, their consumption will remain unchanged initially. Moreover, even later these taxes will have no great impact on capitalist consumption, since a large part of their income is accumulated; thus when their income is reduced by taxation, their consumption falls very little (this is certainly correct if we consider no very long period of time).

We shall now examine a second variant. In the first, as mentioned, the tax burden falls entirely on the working class. In the second I assume an intermediate situation: that armaments are financed in such a way that workers are taxed by exactly the same amount as the additional workers' wages paid in the armaments sector, and taxes on capitalists are equal to the additional surplus value in the armaments sector. In other words, if output in the armaments sector increased by $A + B$ (where A is the increase in workers' wage bill and B the increase in surplus value), then the increase of taxes on the working class will be equal to A and the increase of taxes on capitalists, B. One can show that, in this variant, total production will increase by exactly the amount of armaments production, but the output of the other sectors will be unchanged, i.e. worker consumption will be unaffected as well.

At first capitalist consumption and investments will be unchanged. One can easily show that worker consumption will also remain the same, since wages in the armaments sector will increase by A, but taxes imposed on the working class will also increase by A.

I shall now show that if the capitalist consumption and investments do not change immediately, they will also not change later, for total profits, as in the first variant, will not increase. The profits of capitalists in the armaments sector increased by B and taxes on them also increased by B, hence their profits did not change. If the profits of capitalists do not change in the first period, then capitalist consumption and investments do not change either, and in the long run the situation is the same as in the first period. Thus armaments increased by $A + B$, capitalist consumption and investments did not change, and worker consumption also remained the same. So we have the following situation. Total output and employment increase. Worker consumption is unchanged; workers' real wages fall on account of taxes, employment increases, but real wages fall by so much that the total real value of the wage bill is unchanged.

In this case armaments lead to an increase in output and employment. As regards worker consumption, however, the increase in employment is entirely offset by the fall in real wages. At the same time, as in the first case, the total surplus value remains the same.

I shall now take up a third variant. I have to say straightaway that it is fictional. In this variant, taxes fall exclusively on capitalists. There never was and never will be such a case, and I deal with it solely for methodological reasons.

Let the armaments output again increase by $A + B$ and let the taxes on capitalists also increase by $A + B$. Now the situation of workers will improve. Initially in the armaments industry there will be an increase in output and a corresponding increase in employment and wages. Since taxes are now not levied on workers at all, this will also cause an increase of production in the consumer goods sector for workers. For the time being, new taxes do not affect the capitalist consumption and investments since, as we assumed, they react to a change in the economic system only after some time. We shall again show that there will be no fall in investments and capitalist consumption even in a later period, since profits will remain unchanged even when the entire tax burden falls on capitalists.

It will be somewhat more difficult to demonstrate this, but it will also shed light on why profits remain unchanged in all 3 variants discussed here. Incidentally, this argument is similar to the analysis of exchange between departments I and II in Marx's equations of reproduction.[3]

Let us take the armaments sector in which workers' wages increased by A and the surplus value by B (for the moment we leave out taxes). We can now show that the surplus value in the consumer goods sector for workers increased by A. Workers from the armaments sector will purchase A more in the consumer goods sector for workers, which

means that the surplus above what is consumed by workers employed in that sector increased by A. If the surplus value in the armaments sector increased by B and the surplus value in the consumer goods sector for workers by A, then the entire surplus value increased by $A + B$. At the same time, the taxes on capitalists also increased by $A + B$, hence profits after taxes remained unchanged.

We examined 3 variants of taxation and in all cases found that the after-tax profits of capitalists were unchanged. The simple reason for this is that we are examining the financing of armaments through taxation, i.e. with a balanced budget.

Indeed, if we leave aside taxes, the profits of capitalists in the armaments sector will increase in all cases by B, profits in the consumer goods sector for workers by A, and thus total profits will increase by $A + B$. If taxes are imposed on capitalists, their profits will obviously be reduced by the same amount. If taxes are imposed on workers, this has a reverse effect to an increase in the wage fund in the armaments sector. Hence the change in profits is equal to A plus B minus the sum of taxes. Since $A + B$ is the increase in armaments and the budget is balanced, the difference equals zero, i.e. total profits are unchanged.[4]

Which variant will be possible in reality? We can completely reject the third variant. Taxes will never fall entirely on capitalists. Let us also reject the first variant, since with the present organization of the working class this would be an open provocation, and would not solve the political problems of the capitalist class. Hence reality lies somewhere between these extremes: taxes will be shared by workers and capitalists. So we know that real wages will fall in all cases. Whether the increase in total output will be smaller or greater than the increase in armaments will depend on whether the real situation lies between the first and the second or between the second and the third variant. In the former case, the increase in total output will be less than the increase in armaments, since worker consumption will then decline. In the latter case, the increase in total output will be greater than the increase in armaments, since worker consumption will then increase. If we assume a balanced budget, the total profits of capitalists will be unchanged.

In light of the above, let us now see to what extent armaments solve problems of the market in the capitalist system. Let us even assume that the situation lies between the second and third variant, and thus profits and investments as well as capitalist consumption have not changed, armaments have increased, and worker consumption has risen a little too.

The main question here is—for how long does this solve the problem of output and employment? The first thing that strikes us immediately is that if there is a one-off, even considerable increase in armaments, after which they remain on a constant level, we can easily show that this does not solve the problem of the market in the long run.

The reason is that capitalist profits have remained unchanged. Investments also stay on the former level, which can be assumed to be higher than the level of depreciation. Thus capital equipment expands, which is in fact necessary to meet the increased production of armaments. At the same time, profits remain unchanged, and hence the ratio of profits to capital will decline. If the expansion of armaments is stopped at their certain level, the normal mechanism which causes crisis in the capitalist system will start operating again. After a time, despite a high level of armaments, investments will fall, which will touch off an economic crisis.

Armaments do not solve the problem of the market in the long run, even if they are maintained on a high but constant level. In order to solve this problem, they must increase. Paradoxically, however, in the case of a balanced budget, even if armaments continually increase, it is possible (and even highly probable) that here too investments will start to fall after a certain time. For the paradox of financing armaments in this way is that capitalist profits will be unchanged. One can say that this is an unnatural situation. We have increased the output of armaments, we have indeed a very typical picture of imperialism, but profits none the less remain unchanged, and, even with increasing armaments, the rate of profit will fall.

In fact, although armaments continually increase, total profits will remain unchanged if armaments are entirely tax-financed. Investments will remain on a constant level, but since this level is higher than depreciation level, the volume of capital equipment will expand and the rate of profit will fall. Thus even if armaments continually increase, we will be in a situation in which, after a fairly long period of time, a crisis will occur.

Looking at the question very schematically, a continual increase in armaments will offer special incentives for investments. For capitalists, armaments represent a market in which there is no risk. One can say that the crisis will come much later than if armaments cease to

increase. Given the basic contradiction between expanding output and capital equipment on the one hand and a constant level of profits on the other, however, even continually increasing armaments financed from taxes do not solve the problem of realization in the long run. This brings me to the second part of this analysis: the importance of a budget deficit.

First of all, it turns out that even in the years 1951–4 in the USA and other imperialist countries, where it was declared that armaments would be financed from taxes, this proved to be not entirely possible; for example, in the USA the budget deficit also increased considerably.

There is a political mechanism which prevents armaments being entirely financed from taxes. First of all, one can assume that capitalists are unable to throw the entire tax burden on workers and must share part of it. Some budget deficit appears as a result of the struggle of individual groups of capitalists against these taxes. Even if such a deficit did not exist initially, then later, when capitalists became aware that armaments did not increase their total profits, the fight would begin over reducing taxes, which would result in a budget deficit. At the same time, this deficit solves the problem of realization to some extent.

Let us imagine that part of the taxes collected from capitalists is refunded to them in the form of treasury notes. The budget is thereby financed with loans, and capitalist profits increase by the value of these notes, that is, by the budget deficit. I have presented only a bare outline of deficit financing and will return to this question later. Now I wish to emphasize something else. The introduction of a budget deficit breaks the rule of constant total profits. Total profits increase by the sum of the deficit, and this stimulates investments and capitalist consumption. As a result, profits increase still further and a genuine boom takes place, instead of that paradoxical situation, for capitalism, of increasing output combined with profits at a constant level.

Indeed, this is how an upswing starts, and it can be continually stimulated with a further increase in armaments, always financing these increments from a budget deficit. Obviously, in one respect this case will be the same as that of a balanced budget. At the moment when this process stops, if armaments stay on a high but constant level, then even if they are partially financed by a budget deficit, there will be a return to the normal functioning of the crisis mechanism. In the meantime, this could have given a certain stimulus to investments. Nonetheless, as soon as armaments stabilize at a certain level, the business cycle mechanism starts working again, and—although not as quickly as in the case of a balanced budget—a downswing and crisis ensue. On the other hand, if armaments increase and are partially financed by a budget deficit, it is difficult to find the point at which a downswing must necessarily start.

Now we must examine the postulate that a budget deficit leads to inflation, and that this limits the possibility of using it as an instrument for stimulating a business upswing through armaments. This is a fundamental question and must be dealt with in some detail, although it is not directly related to our main subject of investigation.

Does a budget deficit indeed lead to inflation? It would, but only under special conditions which are not present in this case, since the financing of armaments with a deficit is aimed at overcoming a business crisis. Let us look again at the way the deficit is financed. A similar case to the simplified example considered above (capitalists, after paying taxes, receive a refund in the form of treasury notes) is the subscription of government loans. There is also another case: when the government sells its obligations to banks. Then the additional profits of capitalists, corresponding to the budget deficit, accumulate in bank accounts. In this case, it is often said that there is more money in circulation and that this causes inflation. Such reasoning is based on the primitive quantitative theory of money, which seems completely unfounded to me. I do not understand why it is assumed that capitalists will use the increasing bank accounts for consumption or for investments and that this will cause inflation similar, let us say, to the German inflation of 1923 or the Kuomintang one of 1946–9. I believe that this assumption is groundless, and that in this case we are carrying over the mechanism of hyper-inflation to a normal situation. With hyper-inflation a rapid increase in prices is commonly expected; there is thus a universal flight from money, and each emission of money adds to an increase in prices. This will not occur when a strong increase in prices is not expected.

In normal conditions the accumulation of reserves does not lead to an increase in spending, but merely to so-called liquidity in the money market. Capitalists, whose reserves have increased, will invest part of them in stocks and bonds sold by other capitalists. Their prices will rise, that is, their rate of interest will fall. Equilibrium will be reached when bank deposits become just as attractive as securities. No grounds for inflation can be seen here.

I must also say that those who assume that a budget deficit causes inflation simultaneously minimize the difficulties in achieving full employment in the capitalist system. Indeed, inflation arises due to an increase in demand. However, prices do not rise automatically because there is more money in circulation, but only because this money is spent. Before it causes price increases, though, it causes an increase in employment and output as well as a better utilization of those production reserves whose existence we assume. Well, from this theory of inflation we should conclude that every budget deficit, however small, will immediately generate full employment. This cannot be achieved quite so easily by capitalism. Thus I believe that this primitive doctrine of inflation must be rejected.

Of course, an increase in the budget deficit with high employment of the labour force and capital equipment will cause inflation, as any increase in demand in such a situation would do. This certainly does not apply, however, to the case of counteracting a business crisis, when considerable unemployment and a low level of utilization of capital equipment exist. Thus I must admit that I do not know why a budget deficit must cause inflation, if overcoming a crisis is being considered, that is, a situation in which we have unemployment and under-utilized capital equipment.

Let us now move on to another aspect of the budget deficit. A budget deficit means an increase in the government debt and in the interest burden on this debt. I must say that we would overestimate the farsightedness of capitalists by assuming that they would not resort to a budget deficit out of fear of an increase in the government debt. One can prove that with a moderate budget deficit the interest burden on the debt will increase very slowly. We can see this from the following example.

The greatest annual budget deficit due to the recent armaments programme in the USA was more or less 3% of the national income. Let us assume that the budget deficit would be kept constantly at 5% of the national income for 10 years. Then a new government debt would accumulate to the extent of 50% of the national income. With an interest rate of 3% annually, this would come to 1.5% of the national income annually.

One should also not forget that with a high level of employment the price trend on the whole is upward, and thus the 1.5% burden on the national income will generally not be realized. Prices will rise, and the real value of interest payments on the government debt may not increase at all.

Does it follow from the above that the partial financing of armaments with a budget deficit is an instrument for overcoming the basic contradictions of capitalism and even for ensuring its further development? I do not believe this, but I am reluctant to deny it merely because the government debt increases. I believe that there are much more serious obstacles, though of an entirely different nature.

I have in mind the entire organization of the countercyclical intervention in the capitalist system. It would be naïve to assume the existence of a 'general staff' of monopolists which determines economic policy. In spite of tremendous concentration, monopolistic capitalism is a chaotic system, and its salvation does not take place through 'staff' meetings but as a result of conflict between the interests and doctrines of various groups in the capitalist camp.

Experience again shows us that the conflicts between these groups and doctrines are such that the uninterrupted increase in armaments, which would ensure the sustained development of the capitalist system, is impossible. If we observe American policy over a longer time, it becomes obvious that an entirely different mechanism is involved.

Let us note the fact that in nearly all capitalist countries every countercyclical intervention and every increase in government expenditure always take place in the face of very strong opposition from various groups and representatives of various doctrines in the capitalist camp. Even in the case of armaments, such opposition always exists.

Where does this opposition come from? This is a phenomenon which few have studied, and I can only present my hypotheses; no doubt the matter deserves serious examination. Above all, one can see at first glance that this is a doctrinal question. It is clear that in a country where capitalism was based on a constant increase in armaments (with this fact obvious to everyone), the system would not be ideologically strengthened. It is also clear that the ideologists of capitalism unwillingly accept this way of stimulating the business upswing, since then it is impossible to attract ideologically to this system not only the working class, but even the middle class. This explains efforts which aim at presenting armaments as necessary *per se*, and not as necessary for saving the capitalist system. Moreover, apart from doctrines opposing large government expenditures on principle, it is obvious that behind the opposition to armaments there are various group interests.

What groups are opposed to this kind of increase in armaments and to such a solution to the problem of capitalism? It seems—although this is again an unproven hypothesis—that the most important contradiction here follows from differences in the size of monopolies. The largest monopolies can accept 'state capitalism' because they derive the greatest benefits from it. They are the primary recipients of government contracts for armaments, and in this type of capitalism there is a very rapid concentration of capital, with the gradual elimination not only of small enterprises but even of large (though not the largest) ones. That is why large, though not the largest, monopolies are naturally suspicious of a system of large government expenditure. In my opinion, this opposition is what obstructs countercyclical intervention.

Experience teaches us (and I am also completely sure of this with respect to the future) that intervention will never be consistent; it will consist of patching up holes, of attempts to overcome the crisis when it is already acute. This, and not the imaginary problems of inflation and the government debt, is the main obstacle to such intervention.

What I am saying is probably new, and so these political theories may seem just as fantastic to my readers as the theory of inflation seems fantastic to me. For this reason I shall cite certain examples from the American armaments industry. This somewhat precedes the second part of the discussion, but I think that these examples will be useful here. It will turn out that what I have said on this matter is very restrained, but that what happened in reality really goes beyond all fantasy.

I wish to begin with a speech made by R. A. Taft in 1951. This was the first year of the Korean war, and Taft was the 'leading intellectual' of the Republican party (representing major capital).

The strategic nature of American armaments, which he then regarded as indispensable, should, Taft argued, be determined mainly by the need to keep expenditures on the lowest level possible (this was said by a man who was himself closely tied to heavy industry). The only way to achieve this is to accept the doctrine of a nuclear airstrike, since this kind of war is the cheapest. After the election in 1952 of Eisenhower (who was Taft's opponent as candidate for president at the Republican convention), this doctrine was accepted and implemented by the Republican administration. The doctrine of mass retaliation was accepted. In 1954, armaments were in fact reduced by 20% in comparison with 1953, and their structure was changed towards a greater share for the air force and a smaller one for the army. This reduction in armament expenditure led to the business recession in 1954.

Is this not more fantastic than what I said earlier? Monopoly capitalism 'operated' on itself to reduce armaments by 20%, and did this not under pressure from the American masses, nor under pressure from the working class of the entire world, nor under pressure from its allies. Switching over to the cannibalistic doctrine of mass retaliation caused a reduction in the military budget, which led to a recession in 1954 and, in particular, considerably reduced the profits of heavy industry.

It seems to me that conflicting group interests make a planned intervention impossible. However, we must caution here that as soon as a dangerous crisis sets in, when the capitalist system is threatened with a real catastrophe, then those doctrinarians who wanted a nice 'spontaneous' upswing will have to change their position. Also, those 'not the biggest monopolies', which are opposed to large government expenditure, will have to reach an agreement with the 'biggest monopolies' on anti-crisis intervention. This is why I believe that in capitalism some remedy for crisis, in the sense of altogether eliminating it, is out of the question. One can only expect that the measures mentioned above will lessen its severity.

If the general political climate, as at present, is unfavourable to an increase in armament expenditure, there will be an increase in public works of a paramilitary nature. Eventually, at a given level of armaments, taxes will be reduced. Some anti-crisis intervention will lessen the severity of the crisis, however.

How do capitalism's prospects look today in the light of the above? Considering the present economic policy of monopoly capitalism, it seems that this is a system which will not break down of its own accord, which will not face catastrophe, but which will also not develop, remaining a system which bases its existence on patching holes during a crisis only with the help of armaments, a system which can develop only at a very slow rate.[5] This is seen in the fact that a large part of its outlay is devoted to unproductive ends. Obviously, such a system cannot win the competition with the socialist system, which is geared towards the continual development of productive forces and an increase in the standard of living.

I believe that the above analysis sheds some light on the present political situation and the question of peaceful coexistence. Peaceful coexistence is an area for peaceful competition between the two systems. The reduction of armaments in particular, which is one of its main elements, is unquestionably one of the advantages socialism has in competition with monopoly capitalism. The pressure to reduce armaments impedes anti-crisis intervention in capitalism, entangling it still further in its contradictions, and making intervention ever more haphazard and hesitant. In the socialist system, on the other hand, a reduction in the armaments burden allows a more rapid expansion of productive forces and an increase in the living standard. It is precisely because peaceful coexistence, combined with disarmament, gives such tremendous advantages to the socialist system that it is so strongly resisted by the ruling circles of capitalist countries.[6]

II. Analysis of the American Situation, 1950–5

In the previous section we discussed the impact of armaments on the capitalist economy in general. Now we shall apply these theoretical conclusions to an analysis of the economic situation in the USA in 1950–5. Before doing so, I shall briefly summarize certain points of the last section and present them from a somewhat different angle.

I divided the economy into four sectors:

I. investments
II. armaments
III. consumption for workers
IV. consumption for capitalists.

I also assumed that armaments increase, but in the first phase neither the capitalist consumption (sector IV) nor investments (sector I) change. On the basis of this assumption, I then considered the consequences of armaments. Following this, I investigated whether any changes in sectors I and IV take place. It turns out that, with a balanced budget, if investments and capitalist consumption do not change in the first period, they do not change later either.

I further assumed that all the materials which make up the final product are produced in each of these sectors. Hence the value of the final product of each sector will be $V + m$. Changes in V and m in the sectors are shown in Table 53.

As regards investments (sector I), one can write 0 and 0, for at the outset there are no changes there; on the other hand, in the armaments

Table 53. *Schematic Impact of Armaments on Wages and Profits*

Sector	V	m
I	0	0
II	ΔV_2	Δm_2
III	ΔV_3	$\Delta V_2 - p$
IV	0	0
Total	$\Delta V_2 + \Delta V_3$	$\Delta m_2 + \Delta V_2 - p$

sector (II) there was an increase of V and m, i.e. of wages and profits, so I write ΔV_2 and Δm_2 here. Then in sector IV (capitalist consumption), changes in V and m, as in sector I, are 0 and 0. As regards investments and capitalist consumption, I simply assume that they do not change so rapidly, and hence that an increase in armament production has no immediate impact on them.

Now I deal with worker consumption (sector III). In this sector m and V will generally change immediately. We denote the taxes imposed on workers by p and taxes on capitalists, by π. We can easily prove that the increase Δm_3 will be equal to $\Delta V_2 - p$, for an increase Δm in sector III is simply an increase in the surplus production of consumer goods above the needs of workers employed in sector III. This corresponds to an increase in workers' demand $\Delta V_2 - p$, since ΔV_2 is the increase of wages in sector II (this is one change of demand) and p are taxes which must be deducted (this is the second change with respect to sector III). Instead of Δm_3, therefore, I can write $\Delta V_2 - p$.

One can see immediately that the direction of changes in sector III will depend on the difference $\Delta V_2 - p$. If ΔV_2 is greater than p, i.e. if the increase in workers' wages in the armaments sector is greater than the taxes on workers, the surplus value in sector III as well as wages will increase (at any given ratio of surplus value, m, to wages, V). On the other hand, if ΔV_2 is less than p, then output in sector III will decline.

As I have said above, extreme cases will be, on the one hand, when all taxes fall only on the working class and, on the other, if they fall only on capitalists. In the first case (since we have assumed a balanced budget), the taxes on workers are equal to the entire value of the armaments product, i.e. they are greater than ΔV_2. It follows that if all taxes fall on the working class, worker consumption will obviously

decline. As I pointed out above, this fall in consumption will exactly equal the increase in the value of armaments, and there will be no increase in national income.

Since this conclusion may raise some doubts, I shall prove it again. Let us imagine that additional taxes are imposed at the same moment as armaments are increased. The output of the armaments sector will increase by a certain amount, but at the same time the new taxes, which fall exclusively on the working class, will have a negative effect on sector III. Thus the national income does not increase. There is merely a shift from sector III to sector II. When taxes fall exclusively on capitalists, then $\Delta m_3 = \Delta V_2$, i.e. the increase in worker consumption is such that the surplus value in sector III rises by the sum of the wage increases in sector II.

Now I shall prove the assertion I made previously: as long as the budget is balanced, the entire surplus value, after deduction of taxes, will remain constant.

The sum of increases in the surplus value of all sectors in the above balance sheet will be equal to $\Delta m_2 + \Delta V_2 - p$. This will be an increase in total surplus value. From this we must deduct taxes on capitalists, π. After deduction of taxes, therefore, $\Delta m_2 + \Delta V_2 - p - \pi$ will represent surplus value. With a balanced budget this must be equal to zero, for $\Delta m_2 + \Delta V_2$ is the product of sector II, i.e. the value of armaments, and $p + \pi$ is the sum of taxes imposed. As long as the budget is balanced, no increase in profits can take place in any of these cases. And as long as there is no increase in profits, there is also no reason (even after the original processes have been completed) for output in sector I (investments) or output in sector IV (capitalist consumption) to change, since total profits remain on the same level.

Now if we imagine that part of the armaments will be financed by a budget deficit, i.e. that the combined taxes paid by workers and capitalists do not entirely cover armament expenditure, total profits will already increase in the first phase by the sum of the deficit, for $\Delta m_2 + \Delta V_2 - p - \pi$ is equal to the budget deficit. However, since profits initially increase by the sum of the deficit, this will have a secondary impact on investments and capitalist consumption, resulting in a further increase in profits. This will be a typical stimulation of the business upswing, i.e. armaments will have an impact on all 4 sectors. On the other hand, as long as the budget is balanced, sectors I and IV are unaffected by this 'stimulation'.

After these comments, which may be a useful supplement to the previous section, let us examine the situation in the USA in 1950–5.

We must first say a few words about 1950, which we shall take as our point of reference. Armaments plans were announced in 1950, and in the final months of that year there was a small increase in armaments. Was 1950 indeed a crisis year, and did armaments pull the economy out of a crisis? This was not the case. 1950 was a relatively good business year—which does not mean that armaments did not play an interventionary role. In fact, although the level of output and employment was quite high, it was expected that this would not last long. One should mention that in the middle of the year a considerable increase in output was mainly fuelled by the speculative accumulation of inventories and the anticipatory purchases of consumers.

Further, we are interested here in how greatly capital equipment was employed and whether expansion of output was possible within this equipment without serious investments being made. Such expansion was unquestionably possible.

Let me reiterate here that my theoretical analysis is based on the assumption that certain reserves and under-utilization of factors of production exist in the economy. For example, when I speak about increasing the output of sector III, this can take place only if productive reserves exist. Even if $\Delta V_2 - p$ is positive, but there are no productive reserves, an increase in demand will only cause an increase in prices and not a growth of real consumption.

Despite the fact that 1950 was not a crisis year, capital equipment was not fully used and unemployment was about 6% of the total labour force. We should add (as mentioned above) that there was also a considerable speculative increase in inventories. From the middle of 1950 this increase in inventories stopped, and this reduced the utilization of the respective capital equipment. As regards armaments, the production of some elements was able to be increased immediately, but others required considerable investment.

I shall now examine the consequences of armaments. Since I am not making a detailed investigation of business conditions here, I shall limit myself to a study of what happened from 1950 to the first half of 1953, when armaments reached their peak.

First and foremost, what happened in armaments themselves? There was a tremendous increase, which can be seen from the following figures. Real government (and municipal) expenditures increased more than threefold, and this increase can nearly all be attributed to armaments. These new armaments (for there were also armaments before this) amounted in 1953 to 12% of the national income.

What are we most interested in if we wish to apply the theoretical conclusions of our earlier analysis? Let us begin with the consequences of armaments for consumption and investments. Despite the tremendous increase in armaments, consumption also increased. From 1950 to 1951 it stayed on the same level, but then it began to increase. If we compare the first half of 1953 with 1950, it appears that the consumption of goods increased by 6%, and by 8% if services are included. The increase in consumption per head was minimal, since the population also increased considerably. Since consumption increased, the effects of armaments can be qualified as fitting with the case when $\Delta V_2 - p > 0$, i.e. when the increase in wages of workers is greater than the taxes imposed on them.

This is difficult to test statistically, as it is not easy to separate the wages of the military expenditure sector. One can only say that this pattern of development does not fit the model which assumes that taxes on workers are equal to the increase in armaments. If we compare the increase in real expenditure on armaments between 1950 and the first half of 1953 and add to this the additional real expenditure on the expanded armed forces and office personnel, and, on the other hand, if we consider all the taxes which reduce consumption directly (i.e. all taxes except those directly imposed on monopolies), we find in fact that the increase in military expenditure was financed only 60% by taxes that had a direct impact on the consumption of workers and the middle class. Thus the remaining 40% was financed from the budget deficit and from taxes on the profits of monopolies. In any case, we can rule out here what in the first section I called the first variant, i.e. the case where output increases in the armaments sector and falls by the same amount in the consumer goods sector for workers, with no change in the total output. The total national income increased by 15% more or less. What is more, consumption increased, though only by 6%; hence this case corresponds to the variant when ΔV_2 is greater than p.

What happened with investments? Investments in fixed capital remained almost the same. On this basis one might expect that this is the case of a balanced budget, when both profits and investments remain constant. However, as always, reality is more complicated than theoretical models. In fact the budget deficit increased considerably, but, on the other hand, the real value of monopoly profits increased very little, even if we eliminate reliefs in depreciation allowances. Speculative profits, however, increased considerably in 1950. How can this be explained?

From 1950 to 1953 personal savings rose considerably each year. This followed from an increase in the savings of the middle class from after-tax income. The reason for this is not yet entirely clear. Part of it may be that considerable anticipatory purchases had been made in 1950, which stopped by 1953. It is also possible that 1950 belonged also to those post-war years in which consumption was high on account of the deferred demand that built up during the war for certain goods.[7] Obviously, this increase in savings between 1950 and 1953 had the reverse effect of the budget deficit. If a considerable increase in the savings of the middle class had not occurred, total consumption would have been greater, with greater increases in the national income and profits of monopolies. This increase in monopoly profits would have reflected the increase in the budget deficit. Since savings did increase, however, this partially cancelled the impact of the budget deficit.

The second factor working in the same direction was the great increase in inventories in 1950. I mentioned that it was speculative in nature, and that in the first half of 1953 there was a much smaller increase. This fall of investments in inventories also had a softening effect on business in 1953 and also partially cancelled the 'stimulating' impact of the budget deficit. Thus the situation was as follows. The influence of the budget deficit was largely offset by factors not considered in our model. Consequently, the situation was almost as though the budget was balanced. There was an increase in the national income and consumption (though much less in the latter than in the former); investments stayed on the same level, but the profits of monopolies increased, though not very much.

The unchanged volume of investments resulted from a small increase in productive investments and a fall in investments in housing construction. The small increase in productive investments corresponds to the small increase in profits. The fall of housing construction investments can be explained as follows. These investments were rather high in 1950 on account of special credits granted in 1949 (especially for former servicemen). These credits were suspended at the beginning of 1950 and restored in 1952. They might have had some impact in 1953, but this was hampered by a tightening of the credit market. As a result, housing construction in 1953 was considerably

less than in 1950, while productive investments were somewhat higher in conformity with the small increase in profits.

We examined above the consequences of an increase in armaments from 1950 to the middle of 1953, when they reached their peak. Starting from this time, there was a considerable reduction in military expenditure. I have already said a few words about the reasons for this reduction in the first lecture. I shall now repeat what I said, with certain additions, and then analyse the consequences of a reduction in armaments in 1953–4.

During this period armaments were reduced considerably. Real expenditure for armaments was cut by 25%. Total real government expenditure fell by a sum equal to 3% of the national income. How is this significant reduction to be explained? From the standpoint of production capacity, armaments could have been increased still further, despite the fact that investments remained on the same level. This level was quite high and productive capacity, especially in the armaments sector, had expanded considerably.

I have already tried to explain the motives for this reduction in armaments. I know that my explanation may seem strange, but reality is even stranger. I have also indicated the roots of the ideology which ultimately led to the reduction in armaments. I said that in 1951 Senator Taft, who represented the so-called conservatives in the Republican party, made a speech in which he argued for holding increases in budget spending to an absolute minimum and said that he considered a large budget a defeat for the capitalist system. He suggested reducing the budget spending by switching over to armaments for a nuclear air-strike. After the elections of 1952, when the Republicans came to power, this programme was implemented. Military expenditure and taxes were reduced, and in order to make savings in the budget, armament production was carried out under the slogan of 'mass retaliation'. Interestingly enough, the Democrats, who were supported by the trade unions, opposed the reduction in armaments. They argued that such a reduction was unnecessary, since the economic potential of the USA made it possible to continue arms production at an unchanged rate.

Let us now move on to the economic consequences of the reduction in armaments. As I said in the previous section, the very stabilization of armaments, not only their reduction, must set in motion the normal mechanism of a business crisis. As soon as armaments stop at a certain level, the national income and profits also tend to stabilize. However, if capital equipment continues to expand through investments, we have a normal business recession: a high level of investments and expanding capital equipment on the one hand, and national income (and especially profits) on an unchanged level on the other hand. This is a situation which leads to a fall in investments, setting off a crisis.

This was the situation in 1953. From the beginning to the end of the year, armaments were more or less on a constant level, reaching their peak in the middle. The national income also tended to stabilize. At the same time, fixed capital was expanding, inventories were also growing, and this could not be sustained. In the previous period the increase in inventories was accompanied by a rise in the national income, but as soon as the national income stabilized, there was no real basis for their further increase. In fact these inventories, which for some time continued to expand, by the fourth quarter of 1953 turned out to be unnecessary, and then their liquidation began. At the beginning of 1954, productive investments in fixed capital also began to fall, which corresponded to the stabilization of the volume of national income in the previous year. National income and profits stabilized, while investment continually expanded capital equipment. The result was that investment began to fall, and a typical business recession loomed. The downswing gathered even greater momentum on account of the sharp reduction in armaments during the period of national-income stabilization at the end of 1953 and beginning of 1954. One might thus have expected a considerable fall in the national income in 1954. Yet this fall was rather slight (about 3%), and this requires explanation.

First of all, it turns out that in 1954 consumption did not fall, and even rose slightly. Obviously, a fall in consumption was counteracted to some extent by the cut in taxes, especially on income, which accompanied the reduction in armaments. This did not have such a great effect on consumption, however, as to cause its increase instead of its fall. Unemployment benefits also had a certain influence, but this still does not explain the matter. Most probably, during the first year of the fall in employment the unemployed and partially employed began to spend their savings.

The crisis was also mitigated by housing construction, which, in contrast to productive investments, showed an increase. As I said, the credits restored in 1952 might have had a real influence on construction in 1953, but the tightening of the credit market in that year prevented this. Credit loosened up in 1954, and then housing construction showed a real increase.

Though the crisis was mild in 1954, a worsening could have been expected in 1955. In fact, two tendencies appeared which could have caused this. Above all, productive investments in fixed capital had fallen relatively little in 1954, and their major decline could have been expected in 1955. Next, consumption was abnormally high on account of savings spent by the unemployed. These savings had to exhaust themselves quickly. In reality, however, there was not a fall but an increase in the national income in 1955. This was caused by a quite fortuitous event. Toward the end of 1954 the automobile industry produced a new model. This caused an increase in the stocks of cars and, more importantly, a significant rise in their sales. This factor increased consumption as a whole, since this rise in one-off purchases did not take place at the expense of other purchases, but on credit or from savings. As a result, the fall in consumption in relation to income, which could have been expected in 1955, did not occur.

Meanwhile, the liquidation of excessive inventories came to an end. At the same time, completion of the process of armament reduction stabilized production at a lower level in the armaments industry, which previously had been continually contracting. In this way, investments in inventories, which were negative in 1954, reached zero toward the end of that year and the beginning of 1955.

An end to the liquidation of inventories together with the appearance of a new model on the car market led to an increase in the national income and in profits of monopolies. This caused a change in the direction of the curve of productive investments in fixed capital. While these investments were clearly following a downward trend until the first quarter of 1955, they began to increase in the second quarter. In this way, a chance factor caused a very specific boom. We know that a boom caused by a random factor cannot be lasting. If this boom had not spread to investments in fixed capital, it would have ended very quickly, as soon as the additional demand for cars was satisfied. On the other hand, if, as happened then, the boom spread to investments in fixed capital, it could last longer. However, it is hard to see that this would give rise to a long-lasting boom.

A very interesting problem crops up here. Let us say that the boom has ended, and a downswing begins. What then will be the policy of the ruling classes of the USA in the crisis which follows? Although this is only a hypothetical analysis, it may serve as a good example of what I said earlier: that interventions which are theoretically possible encounter enormous political difficulties. Let us imagine that the crisis begins in 1957. We may ask what the nature of the anti-crisis intervention will be. Above all, we can say that nobody will be in any special hurry to undertake such intervention. In fact, over the whole period monopolies have enjoyed high profits, since even during the crisis of 1954 tax reductions enabled them to maintain their profits on the level of 1950–3. This may have the effect of the crisis being underestimated in its initial phase.

What will be the role of armaments in intervention? Fiist of all, armaments will probably not be reduced. After the last conference in Geneva, this does not seem to be an immediate prospect.[8] The very fact that they will not be reduced will be a stabilizing factor. For if armaments remain on a constant level, despite falling tax revenues along with declining national income, employment in the armaments sector will be maintained. This permanent employment will check the fall in consumption from wages of workers employed in this sector.

This is not enough to counteract the crisis, however. It will only make it less severe. What, then, will be the nature of positive intervention? I am quite sure that after some time such intervention will be undertaken, since American imperialism is ideologically based on relatively high employment. If a crisis occurred in the USA, this would enlighten the masses and undermine the entire structure of imperialism. Choosing the type of intervention will cause the ruling class serious difficulties, however. It may be difficult to increase armaments in view of the present international situation, the more so when it is clear that this is done *ad hoc*.

One possibility would be to initiate paramilitary public works, as I do not believe that major public works of an entirely peaceful nature could be undertaken. The latter would mean a return to the Roosevelt era, which the ruling class regards as anti-capitalistic.

There is still the possibility of reducing taxes. This would mean keeping armaments on the same level, despite falling tax revenues. Here, again, the situation is more complicated. It is difficult to imagine that only taxes on lower incomes would be reduced. Reduction of taxes on monopoly profits, the middle class, and the working class would be more likely. In that case, however, taxes would have to be reduced by tremendous sums, since such intervention is very ineffective.[9] If taxes were cut only for the working class, the entire reduction would go on consumption. If they were reduced for the middle class, only part of the cut would be consumed. Finally, a tax cut only on monopolies would have almost no impact on consumption; eventually, it might help investments somewhat, but during a crisis even this is doubtful.

Thus achieving a serious anti-crisis effect would require huge tax cuts, but this would mean a large budget deficit, which would be strongly resisted by opponents of government intervention.[10] Consequently, one can expect that such anti-crisis intervention would be ambiguous: it would not entirely counteract the crisis; it would consist of diverse elements—some public works, some tax cuts—in other words, patching up holes. The ruling class would try measures of various kinds and scales, attempting to keep unemployment down to 10% or 12%.

This analysis shows that the political difficulties of which I spoke earlier are no fantasy. They are a serious obstacle to effective intervention. Despite the theoretical possibility of maintaining high employment through deficit-financed armaments, this will encounter serious difficulties in practice. On the one hand, capitalism will resort to these methods to prevent a catastrophic crisis like the one of 1929–35. On the other hand, capitalism has no programme to ensure a high average rate of utilization of capital equipment and dynamic and continuous economic growth. Consequently, I repeat what I said in the first part about the competition between socialism and capitalism. Even if the economy of capitalist countries does not go through catastrophic crisis (such as in the 1930s), it will be unable to ensure constant high utilization of factors of production, and will develop much more slowly than the economy of the socialist countries.

Economic Problems of Production Automation in Capitalist Countries[1] (*with Adam Szeworski*) (1957)

1. For several years we have been observing an increased rate of technological progress connected with the practical economic application of scientific discoveries of recent decades, especially in physics, chemistry, etc. One of the results of technological progress which is being ever more widely applied in production is automation. The development of automation of production was highlighted in the last 5-year plan in the Soviet Union as one of the main factors in the anticipated increase in output during this period. In the main capitalist countries, especially in the USA, considerable progress has already been made in automation, which has even had a certain impact on the course of the business cycle in recent years.

This development of automation of production is accompanied by a discussion of its social and economic consequences and of prospects for the further development of human society. The main problem addressed in such discussion is what impact automation, through revolutionizing the production of goods and services, will have on social relations as a whole and whether, in this sense, one can really speak of it as a 'second industrial revolution' with all that this implies.

The social and economic consequences of automation depend on the relations of production in which it takes place. In the capitalist system, automation unquestionably leads to an intensification of the contradictions of capitalism, especially by tending to increase unemployment, which cannot be easily offset by shortening the working day. As we shall see, however, this tendency appears only in a later phase. In the short run, the upswing caused by automation investments may even lead to a net increase in employment.

We shall discuss the essence and nature of automation of production as a special form of technological progress, and its historical and economic prerequisites. Then we shall investigate what impact it may have on the capitalist economy, especially on employment over the short and longer term.

2. Automation of production should be examined in close connection with the general course of technological progress, which consisted of the mechanization of production by substituting machines for human labour, and which was initiated by the industrial revolution of the eighteenth century. Thus in this sense automation is a further stage of mechanization, although it differs from it in an essential way.

The mechanization of production consisted of replacing human labour with machines that took over the processing operations which had previously been done by hand. Mechanization does not completely eliminate human effort, leaving to man in every case the functions of servicing machines and controlling their operations and final products.

Human labour, which is still indispensable in a mechanized system of production, is almost completely eliminated by automation of the production process. The essential feature of automation is that the work of the human brain is replaced by a special machine which operates according to a programme of action determined in advance. This machine performs the function of operating the productive machine, and hence guides and controls its work and checks its results. When a larger number of machines are involved in the production process, it also co-ordinates and synchronizes their operations and moves the object of labour through successive stages of the production process. Thus the direct contribution of human labour to automated production is limited to supplying the object of labour with a machine or with a line of machines, and to receiving the finished product (if these operations are not automated too).

Automation of the production process, however, implies the formulation of a specific programme or production instructions for machines controlling the process. This means shifting human labour from the production process proper to the preparation of this process, which involves a basic change in labour qualifications.

Contrary to common opinion, automation of production is not something entirely new, typical only of the last few years. Already in the inter-war period it was being applied in areas of production in which the technological process is uninterrupted and the problems of control relatively simple. This concerns in particular the production of electric energy and the refining of crude oil, where automation of production was used on a wide scale, and some branches of the food and chemical industries. The control and guidance of technological processes in these cases could take place with the electromechanical equipment existing at that time. The great importance which automation is now assuming, therefore, is primarily connected with the wider possibilities of its practical application in the economy, thanks to a number of discoveries and inventions.

An important role in the development of automation was played by the Second World War and armament production in the post-war period, which contributed to laying the technological foundations for the practical application of scientific discoveries, especially in electronics. These discoveries were used primarily for military purposes—radar installations, automated control of anti-aircraft fire, remote-controlled planes and missiles, automatic control systems in the production of military hardware, etc. After further adaptation to the goals of capitalist production; these discoveries are now being applied in non-military production, making possible the ever greater automation of various branches of the production of goods and services. In recent years, automation has made rapid progress in the production of durable consumer goods and machines and in organizational and office work.

From the technical point of view, two basic trends in the automation of production processes must be distinguished: (i) automation of the mass production of uniform products with a long production cycle serviced by highly specialized machines, e.g. the production of pistons, cylinder blocks, and other automobile parts; (ii) automation of the production of diverse products on a small scale with single machines of universal applications.

In the first case, control of the operations of machines and their results does not present great difficulties, on account of the uniform operations which are performed by individual machines. The 'centre of gravity' here lies in the co-ordination and synchronization of the work of machines arranged in a long line and of the transmission equipment between them. Hence automation consists in connecting this whole set of machines with the controlling device, which starts up each machine as soon as the object of labour is fed into it by the transmission equipment, following the completion of operations by the preceding machine. In this way the flow of articles being processed is moved regularly from one machine to the other at specific intervals, during which each machine performs its operations. Automatic control of this process takes place by means of generally uncomplicated electromechanical equipment.

Closely connected with progress in recent years in electronics is the automation of the production of diverse products with the use of universal machines serviced by qualified workers. It consists of installing in individual machines so-called electronic brains, which replace the worker and control the work of the machine. The main feature of the 'electronic brain' is that a small electronic calculating machine is connected by a feedback with the production machine proper. From a magnetic tape the brain reads specific production instructions written in a special code and transmits them to the production machine, starting it up and adjusting it in accordance with the successive operations dictated by the instructions. The feedback brings signals to the brain, informing it about the work of the machine. This makes it possible for the brain to immediately control the machine in accordance with the instructions, preventing any deviations from the norm. Automation in this case makes it possible for the machine to produce an arbitrary number of a particular product by repeating the process contained in the instructions, or to produce various kinds of product according to particular instructions supplied to the electronic brain. The electronic brains installed in individual machines can be linked by feedback with a central electronic brain, which makes possible the automatic control of a larger number of brains, and hence total automation of the entire plant.

Electronic calculating machines can be used in office work because they perform the most complicated arithmetical operations very rapidly,[1] solve various problems in the economic analysis of a company's operations, and prepare technological processes. These features have contributed to the widespread automation of office work, making possible a considerable reduction in the number of workers occupied in mechanical calculations.

3. What economic conditions determine automation in the capitalist firm? The general motive for introducing technological progress, and hence also automation, is obviously to increase profitability by reducing production costs.

As we have said, automation brings a considerable reduction in employment, which reduces labour costs. At the same time,

[1] E.g. the electronic machine 'whirlwind' produced in the Massachusetts Institute of Technology in the USA calculates 200,000 additions or 25,000 multiplications per second.

automation requires increased capital outlay for machines and equipment per employee, which may involve either an increase or a decrease in the costs of capital (depreciation and interest) per unit of output. A number of factors determine the influence of automation on the costs of capital.

Automation is a kind of technological progress which, besides the simple replacement of human labour with the work of machines, brings certain production effects, reducing the costs of capital per unit of output. What is mainly involved here is accelerating the rate of production, i.e. increasing the number of products per unit of time. Next, automation allows more efficient use of capital by extending the 'working day' of machines. In comparison with the system of shift work in normal non-automated production, which (if it is possible at all, legally or according to custom) usually involves a certain increase in labour costs, extension of the working day in automated production does not increase these costs. The elimination of all interruptions in work (to which we shall return later) operates in the same direction.

Finally, the costs of capital per unit of output are also reduced by the simplification and improvement of existing machines and equipment and by reducing the size of plants, since less space is needed for workers and machines.

The flexibility of automated production equipment, i.e. the possibility of adapting it to the changes which the article it processes may undergo on account of changes in demand, also affects the costs of capital per unit of output. As far as this is concerned, there is a basic difference between automation of production with a long cycle, i.e. production based on highly specialized machines, and automation of production based on universal machines. In the first case, any modification whatsoever of the product is impossible, as a rule, without changing at least part of the production equipment. The more frequent the changes in the product, the more often individual pieces of equipment or even all of it must be replaced. The inflexibility of capital equipment in this type of production requires the most rapid depreciation, and thus increases the costs of capital per unit of output. On the other hand, in the case of automation of universal machines, modification of the product only requires new technological instructions for the electronic brains controlling the machines. Thus flexibility is the main feature of these machines. Thanks to this, changes in the product do not increase the amortization costs of capital.

In all cases in which automation reduces the costs of capital per unit of output, it will be profitable for the enterprise. On the other hand, if

automation increases these costs, it will be profitable only if this is at least offset by a reduction in other types of cost per unit of output. This mainly concerns labour costs, which we shall discuss in more detail below. However, costs of materials are also involved to a certain extent.

Costs of materials as a rule increase proportionally to the growth of output. However, since automated production reduces to a minimum the number of defective products that occur in the normal system of production where machines are operated by human labour, automation tends to reduce the costs of materials.

Moving on to labour costs, we should emphasize that automation expresses itself primarily in a considerable reduction of labour directly involved in the production process to the number of workers required for maintenance of the equipment, control of the work of automatic machines, and elimination of breakdowns (which also occur in automated production and are even more dangerous there because they stop production all down the line). Moreover, if automation also extends to office work, it brings a considerable reduction in administrative and office personnel.

On the other hand, automation of production causes an increase in the numbers of technical and laboratory personnel, especially if the product is subject to frequent changes, making it necessary to prepare new instructions for automatic machines. This personnel is obviously more highly qualified than are manual workers, which causes an increase in average wages.

In sum, for automation to reduce labour costs, the effect of reducing the number of employees must exceed the effect of an increase in average wages.

From this it follows that automation which replaces workers employed at machines connected by a transmission belt (based on electromechanical devices) results mainly in savings of labour. In fact, it is very considerable in this case, since the decline in the number of manual workers employed is entirely incommensurate with the increase in the average qualifications of the personnel.[2] On the other hand, with this type of automation one cannot expect a reduction

[2] Among very scanty statistical data on this subject, one can cite as an illustration of this problem the following example concerning automation of the production of cylinder blocks in the Austin Motor Corporation plants in Great Britain. Thanks to automation, the company achieved an increase in production of 20% with unchanged work time, with a simultaneous reduction of labour costs of 81% per unit of time (R. Francis, 'Economic Causes and Effects of Automation', *Marxist Quarterly*, 2, 1956, p. 124).

in costs of capital, owing to the aforementioned inflexibility of equipment, which requires rapid amortization.

The case is similar as regards office equipment. It is clear that in this case costs of capital increase, since they were very low before automation. At the same time, however, there is a tremendous decline in employment, quite incommensurate with the increase in average qualifications.

It is just the opposite for automation of universal machines based on electronic devices. Labour savings are relatively less significant here, because the reduction in workers servicing machines is partly offset by an increase in qualified personnel preparing instructions for electronic brains. The main factor in the reduction of costs is saving of capital. The costs of capital are considerably reduced by accelerating the rate of production, and especially by its uninterruptedness. Interruptions which are unavoidable in ordinary labour process, e.g. for familiarizing a worker with technological instructions, are avoided here. It is also clear that, in contrast to the type of automation discussed previously, elasticity is a typical feature of the automation of universal electronic machines, making rapid depreciation of capital unnecessary.

One should also mention that automation can improve the quality of output, since automatic machines work more precisely than people. Besides reductions in production costs, this increases the competitiveness of the firm.

Summing up these points, one can say that the technical and economic determinants of automation limit its scope, for the time being, to specific applications in industry and to office work. None the less, automation in these areas has a considerable impact on a number of factors that are essential for the economy as a whole, especially for employment and investments, which must lead to certain changes in the economic situation of capitalist countries.

4. Our previous points allow us to identify two phenomena accompanying automation that are very important for the economy as a whole. One of them is the additional volume of investments required for automation of production, the other an increase in labour productivity through automation of production.

Both these factors have an impact on employment. Automation investments per unit of time cause a direct increase in employment, which creates additional demand for consumer goods, resulting in

a further increase in employment. On the other hand, the increase in labour productivity attained through automation reduces employment corresponding to any given level of production as automatic equipment accumulates, i.e. as the sector of automatic production expands. Hence the net effect of automation on employment throughout the economy will depend on the extent to which changes in employment caused by these two factors offset each other.

This problem can be presented most simply in a diagram (see Fig. 40). Line *AB* represents additional employment generated by automation investments. Line *CD* shows increasing unemployment from dismissals due to the spread of automation. The intersection of these lines, *M*, is the point at which additional employment will be entirely offset by the increase in this unemployment. We shall now discuss this diagram in more detail.

We have assumed that additional employment can be presented as a horizontal line, since we presume that automation investments remain on a constant level; moreover, we leave out the increase in labour productivity in this investment sector. Since automation is introduced in stages, these investments stay on a constant level and show a steady demand (in later phases, renovations of automatic equipment installed in previous stages will also be involved).

We have assumed that *CD* is a straight line with a positive slope, since we presume that automation investments, which began at point zero, remain on a constant level. Consequently, the stocks of equipment increase proportionally to time, and hence unemployment caused by automation increases in the same degree. The slope of line

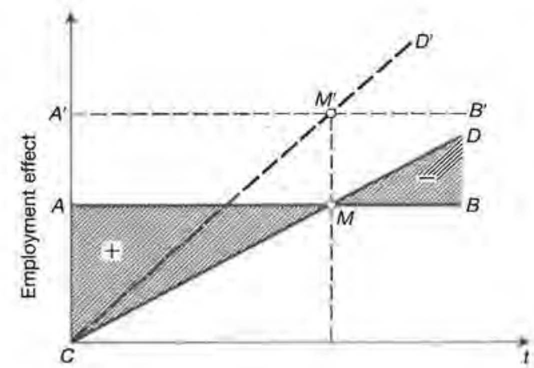

FIG. 40

CD, i.e. the rate of increase in unemployment, will depend on the level of automation investments. We assume that savings of labour inputs per unit of automation investments are constant (we discuss this assumption below). If line AB, i.e. the level of investments, moves upward, the ordinates of line CD increase correspondingly. Thus the point of intersection will have the same abscissa, i.e. it will be reached in the same time. One can see this in the diagram, where line $A'B'$ intersects line CD' at point M', lying perpendicularly above point M.

However, the slope of line CD also depends on the extent of savings of labour inputs through automation investments. The greater the effect of automation in labour savings in comparison with outlays for automation, the steeper the slope of line CD, i.e. the more rapid the increase in unemployment as automation investments accumulate. As a result, the intersection of this line with the line of additional employment is reached more quickly. Obviously, CD will be a straight line only if labour-saving investments remain constant. If they change, CD will be a curve, whose slope will reflect the saving of labour inputs through automation investments at any given period.

In the initial phase of automation, therefore, its net effect on employment (shown in Fig. 40 as a shaded area) will be a considerable increase. In subsequent phases (as automation investments are completed and put into production) this effect will still be positive: there will be some additional employment, though this will decline until it is completely offset by the increase in unemployment resulting from the expansion of automatic production. From the point where the two lines intersect, the net effect of automation will appear as an increasing surplus of additional unemployment over additional employment.

Obviously, the above model is very simple, and serves only for a better understanding of the effect of automation on employment. None the less, it gives us some idea about the present situation in this area. Despite the considerable scope and pace of automation in some capitalist countries, they are still in the initial phase of automation. The positive impact of automation on employment can be observed there for some time, which (as we mentioned in the beginning) has had a certain impact on the course of the business cycle in the last few years.

We should mention, however, that even during a period when automation has a positive impact on employment throughout the economy, a specific type of unemployment may occur. This will be greater concentrations of unemployment in certain branches of the

economy affected by automation, for example, among office workers or among workers in the automobile industry.

5. We have not yet considered another factor which can increase unemployment as a result of automation after a certain time, namely, changes in the distribution of national income in the direction of a shift from wages to profits, which can be, and probably will be, generated by automation.

First of all, the automation of administrative and office work will reduce overhead costs. Since the prices of industrial goods are determined mainly by prime unit costs of production, i.e. by materials and labour costs, a reduction in overheads may not be reflected in price reductions of output: the profit margins covering both profits and overheads will not change, while the latter will be considerably reduced.

Moreover, a considerable shift may take place from labour to materials costs within prime unit costs of production. The impact of automation on the prices of raw materials, especially in agriculture and mining, will probably be minor. Thus, if a given gross profit mark-up on prime unit costs is maintained (this mark-up being largely determined by existing monopoly structures and competition on the market), there will be a shift from wages to profits.

One can illustrate this with the following example. Let us assume that the prime unit costs of production are 100: 70 for costs of materials and 30 for costs of labour. Let the mark-up to meet overheads and profits be 35% of prime unit costs. Then the ratio of overheads and profits to wages will be approximately 1.2:1. If labour costs are reduced by half through automation, i.e. to 15, and costs of materials remain the same, the overhead of 35% of prime costs, now reduced to 85, will be only 30. Hence the ratio of these overheads and profits to wages will be 2:1. Moreover, with the automation of office work, there will be a shift from overheads to profits within the same mark-up, making the ratio of profits to wages increase even more.

The shift from wages to profits in the distribution of national income will reduce the demand for consumer goods, which in turn will have a tendency to increase unemployment still further.

6. It follows that, after a shorter or longer time, automation tends to increase total unemployment. Unemployment will affect certain categories of workers even sooner, as we mentioned earlier. In this situation, trade unions will surely put pressure on capitalists to shorten the working week in order to provide jobs for surplus labour (trade unions will also put pressure on the government to pass laws to solve this problem, a factor which we will discuss below).

Since in the automatic production sector, where the labour force has been reduced to a minimum, the shortening of work time would have almost no quantitative effects in increasing employment, the trade unions will concentrate their pressure on the sector of production not affected by automation. The demands of trade unions for the capitalists of this sector to shorten the working week will be linked with the condition of maintaining existing wage rates; the counteracting of unemployment with this method would otherwise take place at the expense of reduced wages of the employed workers.

For capitalists in the sector of production not affected by automation, this would mean an increase in labour costs per unit of output. Even if these cost increases were passed on to consumers, it would reduce the competitiveness of a given branch of industry. Furthermore, a shortening of the working week would reduce the employment of fixed capital, i.e. would increase capital costs. Counteracting this by introducing shift work (if at all possible technically, legally, or as a custom) would only partially offset the increase in production costs. In these conditions, for capitalists a shortening of the working week would mean a reduction in their profit margin or the need to raise the prices of their products.

Although the normal increase in labour productivity in the non-automated sector will make it easier to shorten the working week to offset the increase in production costs, the demands of trade unions will be opposed by capitalists in this sector. For all of this will take place at a time when production costs and prices are being reduced in the automated sector.

As we see from the above, the direct effect of automation in this period will be a continual intensifying of the class struggle. As unemployment grows, the trade unions will increase their pressure to shorten the working week, meeting ever greater resistance from capitalists.

Consequently, the trade unions might put pressure on the government to limit automation with legislation. Such tendencies have already appeared in capitalist countries, and can be seen in numerous statements of labour leaders in the USA, or in strikes against automation in Great Britain. For the time being, in these cases only unemployment among particular categories of workers is involved, namely, in the automobile industry. If the government accedes to the demands of the trade unions, this will be an artificial inhibition of the development of forces of production.

The second demand which the trade unions will surely make will be for the government to pass a law to shorten the working week, though this may be thwarted by the stiff opposition of capitalists in the non-automated sector of production.

If none of these alternative solutions is implemented, the internal contradictions of capitalism, which at the present time are overcome to a certain extent by government expenditure (armaments, government investments, etc.), would be further intensified.

The Economic Situation in the USA, 1956–1961[1]
(1962)

1. The purpose of this study is not so much a detailed account of the economic situation in the USA in the last few years as an analysis of this period in order to shed light on certain typical features of American capitalism.

As we see from Table 54, two business cycles clearly appear in this period: one between the first quarters of 1956 and of 1959, and another between the first quarter of 1959 and the fourth quarter of 1961.

We briefly discuss these cyclical fluctuations by starting with the first cycle. Economic activity from the first quarter of 1956 to the third quarter of 1957 stayed on a high level, and unemployment, for the USA, was not great, only 5% of the total labour force. Production grew very slowly in this period, however. The real national income in this period of a year and a half increased by only 3%. The living standard, i.e. consumption per head of population, stayed more or less the same (owing to a rather high birth rate).

In the third quarter of 1957 a deep recession began. The real national income fell by nearly 5% by the first quarter of 1958, and unemployment increased to more or less 8% of the total labour force. Consumption per head of population was 2.5% lower than before the recession. Then, from the second quarter of 1958 to the first quarter of 1959, a business upswing raised economic activity to a level somewhat higher than before the recession. The living standard, however, was not much higher than before the recession and unemployment was somewhat greater, 7% of the total labour force in comparison with 5% before the recession.

The course of the second cycle was similar. Until the second quarter of 1960 we observe an increase in the national income at a more rapid pace than in the corresponding period of the previous cycle. On the other hand, unemployment stays on a higher level than before (nearly 7%).

A somewhat less deep recession than in the previous cycle began in the second quarter of 1960. By the first quarter of 1961 national

Table 54. *National Income, Consumption per Head, and Unemployment in the USA, 1956–1961*[a]

Year and quarter	National income[b,c]	Consumption per head[b,d]	Unemployment as % of total labour force
1956, I	100.0	100.0	5.2
1957, III	103.3	101.2	5.4
1958, I	98.2	98.6	8.1
1959, I	106.1	102.4	7.4
1960, II	111.6	105.6	6.5
1961, I	108.6	103.2	8.5
1961, IV	116.8	106.8	7.4

[a] Seasonal fluctuations eliminated.
[b] 1954 prices; quarter I, 1956 = 100.
[c] Including consumer services, but excluding government services; gross of depreciation.
[d] Including consumer services.

Source: *Survey of Current Business.*

income fell by 3%, but unemployment jumped from 6.5% to 8.5%. The living standard declined, as in the previous cycle, by 2.5%. The business upswing that followed raised the national income in the fourth quarter of 1961 to a level somewhat higher than before the recession. Once again, the living standard was not much higher than before the recession, while unemployment was higher.

We can describe the course of the business cycle in this period as follows. During this 6-year period, there were two recessions of short duration. Since they were brief, the fall in the national income was not severe. The difference between the peak point and the bottom was not more than 5%, the corresponding decline in the living standard did not exceed 2.5%, and the increase in unemployment rate was not more than 3% of the total labour force. The relative mildness of the crisis, which was also typical of the recessions in 1949 and 1954, was accompanied by a very slow rate of long-term growth in the national income. During this 6-year period, it increased by 17%, i.e. by only about 2.5% p.a., while the living standard increased by only 1% p.a. The unemployment rate rose from about 5% at the beginning of 1956 to nearly 7.5% at the end of 1961.

In other words, the economic situation of the USA in the last 6 years can be described as long-term stagnation combined with short-lived, not very severe, crises.

We now move on to examine the reasons for this development of the economic situation. We shall first look at the two business cycles separately, and then at development from the beginning to the end of the period.

2. We divide the national income into items shown in Table 55[2] for the period: quarter I, 1956–quarter I, 1959.

This table requires a few explanations. We use here the concept of gross national income, i.e. without deduction of depreciation allowances, since this would be very imprecise. National income here includes consumer services, which it would be hard to estimate separately, but it does not include government services, wherein it

Table 55. *US National Income, 1956–1959*[a]

Components of the national income	Year and quarter			
	1956, I	1957, III	1958, I	1959, I
I. *Private accumulation*				
1. Residential building	16.6	15.2	15.4	19.3
2. Other investments (mainly productive)[b]	40.5	41.5	35.9	34.3
3. Increase in inventories	5.8	2.3	– 4.6	6.2
4. Foreign trade balance[c]	0.9	3.8	0.4	– 2.2
5. Taxes on corporate profits	21.0	18.8	14.5	20.2
6. Budget deficit	– 7.7	– 2.8	7.8	2.3
Total	77.1	78.8	69.4	80.1
II. *Surplus of government revenue over government expenditure on compensations to employees and transfers*	26.3	26.2	21.6	24.6
III. *Personal consumption*	263.2	273.4	268.9	283.8
National income inclusive of consumer services[d]	366.6	378.4	359.9	388.5
of which government expenditure on goods (5 + 6 + II)	39.6	42.2	43.9	47.1

[a] $ billion, at 1954 prices, seasonal fluctuations eliminated.
[b] Private investments; government investments are included in government expenditure.
[c] The foreign-trade balance on the import side does not include foreign government transfers such as 'economic assistance', which is not listed in government expenditure, nor, therefore, in the budget deficit.
[d] Gross of depreciation. Indices of the national income in Table 54 correspond to the absolute figures given here.

Source: *Survey of Current Business.*

differs from the concept of national income used in the socialist countries.

Investments in fixed capital (items 1 and 2), increase in inventories, and foreign-trade balance, i.e. an export surplus, constitute social accumulation. Private accumulation also includes the budget deficit, since the latter is an increase in the indebtedness of the government to private capitalists. We also include in private accumulation taxes on corporate profits as part of private accumulation transferred to the government.

The budget deficit is calculated exclusive of foreign government transfers such as 'economic assistance', since these transfers are not included in the foreign-trade balance on its import side.

Item II, i.e. the surplus of government revenue (exclusive of taxes on corporate profits) over government expenditure on compensation of employees and transfers (i.e. over remuneration of public employees, social services, and interest on the national debt) represents that part of government revenue which finances government purchase of goods. Hence item II, plus the budget deficit (item 6), plus taxes on corporate profits (item 5) together represent the expenditure of the government on goods. One can easily see now that the sum of items I, II, and III is equal to the gross social accumulation, i.e. items 1 + 2 + 3 + 4, government expenditures on goods, i.e. items 5 + 6 + II, and personal consumption III, and hence is equal to the national income.

What is the purpose of this rather complicated breakdown of the national income? It is to separate those of its components which determine changes in its total value. The largest component, consumption, is more or less passive, since it is mainly a function of the level of income. The dynamic elements, on the other hand, are components of private accumulation. For example, if investments are increased, this directly affects the output of goods and, through the income generated in the course of this production, i.e. wages and profits, also affects consumption, which in turn increases the national income. The same can be said for an increase in inventories and an export surplus.

A budget deficit works in the same way; for example, an increase in armaments without a tax increase has the same effect as an increase in investments.

This also concerns item 5, i.e. financing government expenditure by taxes on corporate profits. Taxes imposed to cover an increase in government expenditure do not have an immediate effect on capitalist consumption, which reacts slowly to changes in profits, or even on current investments, which are a result of previous decisions. On the other hand, government expenditure rises, thereby increasing the national income. This increase, and the accompanying rise in gross profits, in turn offset the negative impact of increased taxes on net profits, which in the final analysis remain constant, so that capitalist consumption and investments also do not change in a later period.[1]

On the other hand, if government expenditure on goods is financed by taxes other than on corporate profits, or by a reduction in compensations to government employees or transfers (item II), this is also a more or less neutral change. For consumption declines more or less by the same amount as government expenditure increases, and there is no significant net effect on national income.

Following these introductory remarks, we analyse the cycle from the first quarter of 1956 to the first quarter of 1959, using data in Table 55.

3. From Table 55 we see that, from the first quarter of 1956 to the third quarter of 1957, private accumulation, which is the sum of 'dynamic elements', increased only slightly, with the result that national income also rose only a little. What is interesting is that, even at a high level of business activity, this stagnation was supported to a certain extent by external factors, without which the downswing would have begun before the third quarter of 1957. Indeed, the foreign-trade balance increased in this period, which depended entirely on foreign market conditions. Also, the budget surplus (in Table 55 a deficit with a minus sign) declined by more than taxes on corporate profits.

The downswing began in the third quarter of 1957. Such a downswing after a period of stagnation at a high level of economic activity is typical of the capitalist economy. At the top of the business cycle, investments considerably exceed replacement needs, and hence capital equipment expands. Since national income and profits, according to our assumption, stay at the same level, symptoms of over-production

[1] This argument is based on the assumption that an increase in taxes on corporate profits is not passed on to the consumer through price increases. If this happened, it would reduce demand through an increase in prices equal to the rise in government expenditure. That our assumption is correct, i.e. that taxes on corporate profits are not passed on, is shown by an analysis of American statistical data in the article by A. Szeworski, 'On the Consequences of Taxing Monopoly Profits', *Ekonomista*, 3, 1962 [in Polish].

must appear. In these conditions it is clear that investments must be reduced. Thus the production of capital equipment declines. This is followed by the reduction of inventories, increasing the fall in production and employment (especially if inventories were excessive in comparison with the previous period). The reduction in employment in turn means a shrinking of the wage fund, which has a negative impact on worker consumption and hence on total consumption. As a result, investments decline still further, the reduction of inventories intensifies, and so on.

Such a classical downswing in the business cycle occurred at the end of 1957 and beginning of 1958. From the third quarter of 1957 to the first quarter of 1958, investments declined and the reduction of inventories took place, which was also followed by a certain fall in consumption. One should mention that, in comparison with pre-war crises in the USA, the effects of the fall in investments and the reduction of inventories were softened here by two factors: the payment of unemployment benefits checked the fall in purchasing power and hence in consumption; and government expenditure on goods did not fall in the face of the decline in tax revenues, instead rising slightly.[2] The armaments-swelled US budget greatly slowed the fall in production, since a considerable part of the latter was stabilized, which obviously had a positive effect on the national income, both directly and also through stabilization of the consumption of workers employed in the sector producing for government contracts.

In Table 55 these factors cause a considerable increase in the budget deficit. As a result, private accumulation declined by only 12%, whereas social accumulation (items 1, 2, 3, and 4) declined by 25%.

It is worth mentioning as well that productive investments are positively influenced by the wave of innovations (automation, for example) presently sweeping over the USA (and other capitalist countries). A considerable part of the investments generated by this wave of innovations is quite resistant to the crisis.[3]

National income declined even less than private accumulation. This is a normal feature of business fluctuations, resulting mainly from the fact that, with a fall in income, savings fall much faster than consumption. The accumulation of corporations in particular (undistributed profits) falls much more sharply than dividends.

[2] State and municipal investments increased.

One should say that all the above factors softening the course of the downswing do not signify basic changes in the way the capitalist system operates.

Let us now turn to the upswing that took place in the second half of 1958. What stimulated the increase in production? Above all, the reduction of inventories in the first quarter of 1958 took place at a pace unjustified by the decline in production, and could not be sustained for long at such a rate. So already by the third quarter it had lessened. This alone would not have been enough to sustain a real upswing. Meanwhile, productive investments even declined slightly from the first quarter of 1959 to the first quarter of 1961. Residential building, though, increased on account of government intervention; namely, increased credit for the construction of single-family houses, especially for war veterans (see Table 55).

Finally, fiscal policy played an important role. From Table 55 we see that the budget deficit fell only by the amount of increase in taxes on corporate profits. This means that the increase in other taxes and the decline in the pay-out of unemployment benefits as a result of the upswing were offset by an increase in government expenditure. Besides automatically increasing payments of old-age pensions, this increase was mainly affected by a further rise in state and municipal investments.[3]

Total private accumulation in the first quarter of 1959 rose to a level slightly higher than before the downswing. Its structure changed considerably, though. There were significant increases in residential building, inventories, and the budget deficit, and marked declines in productive investments and the foreign-trade balance. The decline in the latter depended mainly on market conditions for American exports.

Along with private accumulation, national income and consumption reached a somewhat higher level in the first quarter of 1958 than before the recession.

We can summarize as follows:

(i) The recession began in a way typical to the capitalist economy.

(ii) Although the recession was softened by the payment of unemployment benefits, stabilization of government expenditure (comprising a considerable portion of national income), and also a powerful wave of innovations, its course did not differ essentially from the standard course of recession.

(iii) Government intervention, on the other hand, played an important role in the upswing. This intervention was undertaken fairly quickly, although it was contrary to the economic doctrine of the ruling Republican party. Still, it must be noted that this intervention did not go so far as to ensure employment at the level obtaining just before the recession, since unemployment in the first quarter of 1959 was higher than in the third quarter of 1957. Though the level of economic activity was somewhat higher than before, the labour supply and productivity had increased in this time. The living standard also did not rise much above the pre-recession level.

[3] As a result, government expenditure on goods increased by the same amount as the surplus of government revenue (excluding taxes on corporate profits) over government expenditure on compensations to employees and transfers.

4. We now come to a detailed study of the second business cycle, from the first quarter of 1959 to the fourth quarter of 1961. We base ourselves on Table 56, which is constructed in the same way as Table 55.

Although the course of this cycle is similar in many ways to the previous one, there are some important differences. Private accumulation starts to fall even before national income stops increasing. In the second quarter of 1960 it is lower than in the first quarter of 1959, while national income increases during this period by a few percentage points. The main reason for this is a shift in the distribution of the national income from corporate profits to wages. As a result, the share of private accumulation in the national income fell somewhat, and national income, contrary to what usually happens, did not follow this fall.

What is interesting is that, in contrast to the corresponding period of the previous cycle, budget policy here worked to the detriment of private accumulation. The budget deficit was cut considerably on account of a slow-down in the growth of government expenditure on goods, along with a further increase in tax revenues and a reduction in pay-outs of unemployment benefits. Taxes on corporate profits remained the same, however. As a result, private accumulation declined slightly, despite a considerable increase in productive investments and an improvement in the trade balance.

As in the previous cycle, a recession sets in as a result of stagnation at a high level. This especially applies to profits, which, like private accumulation, showed no increase from the first quarter of 1959 to the second quarter of 1960. The recession is exactly like the one in the

Table 56. *US National Income, 1959–1961*[a]

Components of the national income	Year and quarter			
	1959, I	1960, II	1961, I	1961, IV
I. *Private accumulation*				
1. Residential building	19.3	18.1	16.5	19.5
2. Other investments (mainly productive)[b]	34.3	39.3	36.3	39.3
3. Increase in inventories	6.2	4.9	− 3.2	4.7
4. Foreign trade balance[c]	− 2.2	1.0	3.3	2.0
5. Taxes on corporate profits	20.2	20.2	17.0	22.3
6. Budget deficit[c]	2.3	− 4.5	5.5	2.8
Total	80.1	79.0	75.4	90.6
II. *Surplus of government revenue over government expenditure on compensations to employees and transfers*	24.6	30.7	25.7	26.7
III. *Personal consumption*	283.8	299.5	297.0	310.8
National income inclusive of consumer services[d]	388.5	409.2	398.1	428.1
of which government expenditure on goods (5 + 6 + II)	47.1	46.4	48.2	51.8

[a] $ billion, at 1954 prices, seasonal fluctuations eliminated.
[b] Private investments; government investments are included in government expenditure.
[c] The foreign-trade balance on the import side does not include foreign government transfers such as 'economic assistance', which is not listed in government expenditure, nor, therefore, in the budget deficit.
[d] Gross of depreciation. Indices of the national income in Table 54 correspond to the absolute figures given here.

Source: *Survey of Current Business.*

previous cycle. From the second quarter of 1960 to the first quarter of 1961, productive investments fall and inventories are reduced. Due to a slight increase in government expenditures on goods, with falling tax revenues and increased unemployment pay-outs, the budget deficit rises considerably, holding the decline in private accumulation to only 4% (see Table 56).

Here we should mention that a contributing factor was the improvement in the balance of payments (on account of reduced demand for imports), which is more or less normal in times of depression and which did not appear in the previous recession because of non-business factors. With this relatively slight fall in private

accumulation, which represents the sum of dynamic elements of national income, the latter declined only a little.

The upswing that took place between the first and fourth quarters of 1961 was also very similar to the previous cycle. Once again, an important contribution to this was made by an increase in residential building and the reduction of inventories. There was also a certain increase in productive investments in this cycle, however. As regards fiscal policy, it played a greater role than in the previous upswing. In fact, in this case the budget deficit fell much less than the increase in taxes on corporate profits, since greater government expenditure, on goods as well as on remuneration of employees, exceeded the increase in tax revenues from other sources.

This and the increment in investments and inventories caused a considerable increase in private accumulation, followed by a rise in the national income, which reached a higher level than before the recession.

Besides quite small differences between the two cycles, which we indicated above, we should emphasize the different character of the rise in government expenditure on goods, which played an important role in the upswing. From the first quarter of 1958 to the first quarter of 1959 it consisted mainly of an increase in state and municipal investments, while in 1961 there was mainly an increment in armaments expenditure, the pretext for which was the tense international situation. The unsuccessful Cuba expedition and exaggeration of the 'Berlin crisis' helped to stimulate the upswing. Perhaps this was one of the reasons for the risky foreign policy of the USA during this period. The Kennedy administration, which was much more inclined to business intervention than the Eisenhower administration, encountered serious resistance from Congress, however, in which it did not have a majority to support its economic policy. On the contrary, quite paradoxically, Kennedy, who was suspected of being a 'progressive', encountered more opposition in his efforts to stimulate the anaemic American economy than Eisenhower. In these conditions, the bugbear of the 'Communist danger' turned out to be very useful.

5. After this analysis of two business cycles (from the first quarter of 1956 to the first quarter of 1959, and from the first quarter of 1959 to the fourth quarter of 1961), we shall now compare the structure of the national income at the beginning and end of the 6-year period covering these two cycles in order to isolate some more long-term

Table 57. *US National Income, 1956–1961*[a]

Components of the national income	Year and quarter		
	1956, I	1961, IV	1961, IV (1956, I = 100)
I. *Private accumulation*			
1. Residential building	16.6	19.5	—
2. Other investments (mainly productive)	40.5	39.3	—
3. Increase in inventories	5.8	4.7	—
4. Foreign trade balance	0.9	2.0	—
5. Taxes on corporate profits	21.0	22.3	—
6. Budget deficit	−7.7	2.8	—
Total	77.1	90.6	117.1
II. *Surplus of government revenue over government expenditure on compensations to employees and transfers*	26.3	26.7	—
III. *Personal consumption*	263.2	310.8	118.1
National income inclusive of consumer services	366.6	428.1	116.8
of which government expenditure on goods (5 + 6 + II)	39.6	51.8	131.0

[a] $ billion, at 1954 prices, seasonal fluctuations eliminated. For specific definitions, see nn. *b–d* to Tables 55 and 56.

trends. We use the same procedure as before: Table 57 lists components of the national income in the first quarter of 1956 (according to Table 55) and in the fourth quarter of 1961 (according to Table 56).

A glance at Table 57 shows that government intervention played a decisive role, not only in lessening business fluctuations, but also in the long-term growth of the US economy in this period. The entire increment in private accumulation, as we see, came from an increase in two items: residential building and the budget deficit. The latter, in turn, increased by not much more than government expenditure on goods. The rise in tax revenues was largely absorbed by the pay-out of unemployment benefits to a considerably larger army of the unemployed and by an increase in other personal expenses. National income and consumption rose more or less in the same proportion as private accumulation. Government expenditure on goods, on the other hand, increased much more.

As we have said, unemployment increased from 5% to 7.5% of the total labour force (see Table 54) in this 6-year period. This means that

the rate of growth of the national income (2.5% p.a.) was lower than the combined growth rate of the labour force and labour productivity. It turns out that even this slight increase in the national income was due solely to government intervention.

6. Now we shall draw some more general conclusions from the above analysis. We shall do this against the background of four views on contemporary capitalism put forward in economic literature. We begin with two extreme views. One view, advanced in capitalist countries, is that rejuvenated capitalism now shows a tendency towards rapid development with only minor business fluctuations. The second view, which appears, though ever less frequently, in the economic literature of the socialist countries, is that nothing has really changed in the capitalist economy.

Both these extreme views are unfounded. This can be seen from our analysis of the business situation in the USA. The first view is clearly contradicted by the tendency of the economy to go into recession, which would be quite severe without the softening effect of the budget policy. American capitalism also shows a slow rate of long-term growth, and even this modest growth is due in large measure to the increase in government expenditure.

On the other hand, to say that nothing has changed in contemporary capitalism is to close one's eyes to the role of government intervention, which promotes faith in the intensified natural vitality of capitalism. For example, if one compares the course of the present crisis and the crisis of the 1930s, ignoring the difference in the role of the government in the capitalist economy, one can, indeed, become an advocate of the doctrine of rejuvenated capitalism. Then there is nothing to do but to wait patiently for the crisis which, though late in coming, will be even worse than the one of 1929–33.

Two more moderate views coexist in socialist and capitalist countries. The first asserts that *sui generis* planning exists in contemporary capitalism. The second stresses the role of the capitalist government in merely softening recessions and accelerating business upswings.

The difference between the theory of a 'planned capitalism' and the above-mentioned view of its intensified vitality must be emphasized. Whereas the latter is based on the supposedly greater optimism and dynamism of the contemporary capitalist entrepreneur and on his greater sense of civic duty, in the doctrine of planned capitalism we have to do with the hypothesis of economic activity being planned by big capital together with the government. The supporters of this view probably imagine secret conventions of directors of the biggest companies together drawing up an investment plan for a certain period. This is pure fantasy, of course. On the contrary, there is no question, but that productive investments are hardly planned at all in the USA. The government only encourages investment through such measures as 'accelerated depreciation' (i.e. higher depreciation allowances than normal). Moreover, the impact of these incentives is very uncertain.

As regards the course of the business cycle in the 1956–61 period analysed above, there is no trace of a plan here. The fall in productive investments at the end of 1957 and beginning of 1958 was not checked, and the upswing in 1958 was hardly due to planning private investments. The same is true for the next recession, at the end of 1959 and beginning of 1960. One might add that, if there were a long-term plan, in 1956–61 it would have aimed at holding down unemployment and increasing the living standard substantially.

The course of the business cycle in the USA in 1956–61 confirms the view that the capitalist economy still shows a tendency to go into recession, but that a high level of government expenditure during crisis, pay-outs of unemployment benefits, and such measures as easier credit for housing construction soften the course of the recession and accelerate the upswing.

The ruling class not only does not plan economic development, but it does not even decide unanimously on the scope, kind, and timing of intervention. Decisions on these matters result from the collision of interests and doctrines of different groups of capitalists. As a result, anti-crisis intervention, let alone 'planned' capitalism, is not characterized by the consistent actions of the ruling class. No planning was needed, for instance, to reduce unemployment in 1960 to at least the level before the 1957 recession; greater government intervention, for example, increasing municipal, educational, or health investments, would have sufficed.

7. Let us now look at how the present character of American capitalism directly affects three matters of fundamental importance for the international situation: armaments, the competition between two systems, and the domestic political situation in the USA.

'Interventionary capitalism' (described above) unquestionably promotes a high and rising volume of armaments, and hence presents a serious obstacle to universal disarmament. Indeed, let us imagine that

armaments were considerably reduced in the USA. This would cause no difficulties in a planned economy. Quite the opposite—this would make it possible to raise consumption or to increase investments, and hence to increase the rate of economic growth. In the capitalist system, as well, a shift can be made from armaments to consumption by reducing taxes on the broad masses of population equal to the reduction in armaments expenditure. In the present political conditions of the USA, such an idea is almost utopian, however. It would be against the interests of the corporations of the most highly concentrated heavy industry, which exerts a powerful political influence. Next, it is difficult to imagine such a democratic reduction in taxes. In practice, tax relief for the population at large would unquestionably be combined with a reduction of taxes on corporate profits, which would not stimulate consumption.

Perhaps such a reduction of taxes would stimulate growth in investments? This is very doubtful. Capitalist monopolies certainly will not do this immediately, and thus in the first phase the reduction in armaments will not be offset by a rise in investments. Consequently, general output will decline, and another fall in profits of monopolies will follow. In this way, if monopolies do not immediately invest funds received from a reduction in taxes, they will also tend not to increase investments in a later period.[4]

Another way of supporting the level of output and national income despite a reduction in armaments expenditure is to replace them by outlays for public investments or economic assistance for developing countries. At the present time, productive investments undertaken by government are out of the question. The period of progressive New Deal reforms ended long ago. Today big capital, strengthened in its position, will not tolerate public productive investments on a large scale, regarding them as the Trojan horse of socialism ('creeping socialism'). Non-productive investments (hospitals, schools, etc.) remain, therefore, the only other option, but even large investments for these purposes may not offset a considerable reduction in the high level of armaments.

As regards assistance for developing countries, it is quite easy to spend any amount of money on this purpose. Practice shows, however, that the USA is inclined to give assistance on a larger scale mainly to those countries which belong to its camp. This assistance

[4] See the argument on p. 389.

has the aim of consolidating its camp by counteracting revolutionary situations in these countries. However, even in countries within the orbit of the USA, economic assistance is often limited by the policy of leaving the field open for actual or often only potential private investors (e.g. in Latin America). One can imagine, of course, that an international disarmament agreement would provide for automatic investment in developing countries through some international organization of funds saved by disarmament. One must realize, however, what a long way it is from the present policy of the USA to such a rational solution of the essential economic problems of the American economy, on the one hand, and acceleration of the development of underdeveloped countries, on the other.

Thus it appears that, although there are a few economically feasible ways of reducing or stopping armaments in the USA without causing a recession, every one of them presents serious political difficulties that result from this—that it contradicts the interests or doctrines of powerful groups of big capital.

8. We now come to the question of competition between the two systems and prospects for political developments in the USA.

From the above analysis the following profile of American capitalism emerges. This is an economic system which, though having a tendency to go into recession, avoids catastrophic crisis but does not show a high rate of long-run economic growth. The growth of national income and consumption in the period 1956–61 can serve as an example. The living standard (consumption per head of the population) rose but little in this period. Even if we go back to 1950, we see that in the last decade, 1950–60, the living standard increased by only 15%, i.e. an average of 1.5% p.a. There is no doubt that the USA is losing the competition with the socialist countries. Its national income increased in 1950–60 by an average of 3% p.a. In the socialist countries, the long-term growth of national income attained presently and postulated in long-term plans is 7–8% p.a.

As regards the political situation in the USA, in the post-war period it was unquestionably influenced by the favourable economic situation. From 1940 (a year of relatively high pre-war economic activity) to 1950, consumption per head of the population increased by nearly 40%. This rapid increase in the living standard in comparison with the pre-war period, relatively low unemployment in comparison with that period, and the absence of severe crises changed the mentality of the

American masses and made them susceptible to the mass media and propaganda, i.e. press, film, radio, and television, which in the USA are in fact controlled by the ruling class. Not much now remains of the vehement anti-capitalism typical of the masses after the great crisis of the 1930s.

Now, however, there is a new factor which will gradually but persistently work in the opposite direction. The standard of living is now increasing very slowly. We said that since 1950 it has increased by only 1.5% p.a. For the present, this probably does not have a great effect on the masses, since they still tend to compare their situation now with that before the war. However, if, as is likely, the growth rate of the standard of living continues to be low, its jump from the pre-war period to 1950 will be forgotten as time goes on and dissatisfaction will spread, especially among the less affluent groups of the population. Hence the attitude of the American masses towards capitalism will gradually change, intensified still further as the growth rate of the USA lags behind that of the socialist countries. What specific political changes this may bring about, and what effects this will have on international politics, go beyond the scope of this article.[5]

Economic Aspects of West German Rearmament[1]

(1962)

1. After the Second World War the Federal Republic of Germany (FRG) went through the same three stages as did the German Republic following the First World War: (i) a period of economic chaos; (ii) a period of economic stabilization and reconstruction associated with an increased politico-economic significance in the world capitalist system; (iii) a period of militarization coupled with expansionist slogans.

The last phase, which we are witnessing today, shows, however, an important difference from the corresponding period of the 1930s. Hitlerism came to power during a deep economic crisis. Armaments and related government investment, such as road-building, were designed to stimulate production—it was the fascist way out of the crisis. But the Adenauer regime started the process of remilitarization of West Germany during a period of a high level of economic activity, and, as will be seen, its continued favourable course has by no means depended directly on the armament programme. Hence the question arises as to the relation between militarization and the basis for the economic development of the FRG. This article discusses this question and the correspondence between West Germany's economic policy and its military strategy.

Unlike Hitler's, the Adenauer regime bases its military strategy on close collaboration with the whole capitalist camp. The key to the economic role of militarization of the FRG must be also sought in its indirect impact on the economic situation of that entire camp, which in turn influences the economic situation of the FRG.

2. Let us begin with an analysis of the FRG national income and its components in the remilitarization period 1956–60 for the purpose of establishing the source of its continued economic upswing. It will be seen that the driving force of this upswing has not been armaments, but non-productive investment. The relevant data, calculated on the basis of official statistics, are presented in Table 58.

This table is constructed along the same lines as Tables 55 and 56, used for the study of the economic situation in the USA (see pp. 388

Table 58. *National Income in the FRG, 1956–1960 (DM billion, at 1954 prices)*

Components of the national income	1956		1960	1960 (1956 = 100)
I. *Private accumulation*				
1. Non-productive investment[a]	16.5	42.1	55.5	132
2. Productive investment[a]	25.6			
3. Increase of inventories	4.1		5.7	—
4. Foreign balance[b]	6.5		2.6	—
5. Taxes on corporate profits	4.7		6.7	—
6. Current budget deficit[c]	− 17.2		− 22.4	130
Total	40.2		48.1	—
II. *Surplus of government income over administrative outlays and social transfers*	26.1		35.7	—
III. *Consumption of goods and services*	110.5		139.5	126
National income (from consumption services[a])	176.8		223.3	126
Of which government expenditure on goods = (5 + 6 + II)	13.6		20.0	147

[a] Before deducting depreciation.
[b] No allowance is made in imports for government foreign transfers.
[c] Excluding government foreign transfers.

and 394), with some minor modifications. Since government investment is included in the items of unproductive and productive investment, the budget deficit relates only to the current budget. The minus sign before the budget deficit figures means that a budget surplus was in existence throughout the period (in the sense defined above).

As we see, from 1956, when the essential stepping-up of the militarization of the FRG began, to 1960, the national income grew by 26%, or at an approximate rate of 6% p.a. Consumption increased in the same proportion. Government expenditure on goods between these years grew by 47%, which reflects the expansion of the arms programme. But as a result of increased taxation the budget surplus not only failed to decline but even increased more rapidly than the national income (by 30%).

Even if the increase in the budget surplus is considered exclusive of taxes on corporate profits (which, used to finance government outlays, have a stimulating effect on the economic activity)[1] it appears that its growth is parallel to that of the national income from 12.5 billion DM

[1] See p. 389 above.

in 1956 to 15.7 billion in 1960, i.e. by 26%. Since the real foreign balance declined, the increase of private accumulation representing the 'dynamic components' of national income, resulted from the expansion of non-productive and productive investment, and these were the driving force of the economic boom in the period considered. (The higher increase in inventories was of less significance here.)

It is therefore difficult to speak of a direct influence of armament on the economic activity here. This becomes even clearer if we consider that a large part of the increase in armaments was effected by means of imports. For, on analysis of the sources of internal demand, it would be convenient to deduct this part, which obviously does not generate demand, from both government outlays and imports. (Unfortunately, we do not possess accurate data on the subject.) The national income and private accumulation figures would remain unchanged, but the 1960 foreign balance would rise appreciably, and would differ little from the 1956 level; whereas the budget surplus in 1960 would be *pro tanto* greater, and would thus show an even faster growth in relation to 1956.

Before proceeding to analyse the indirect but essential role of militarization in shaping the economic situation of the FRG, it is useful to add a few words on the reasons for the increase in investment. Non-productive investment consists primarily of residential building followed by local and central government investment. Since central and local government policies decisively affect the housing construction programmes, the increase of non-productive investment is a reflection of government investment policies. As concerns productive investments, their increase partly results from the continuous growth of the national income and partly from the modernization wave which has swept over the capitalist countries in recent years (for instance, large-scale automation). An additional incentive to modernization and mechanization in the FRG in the period considered was the shortage of manpower in many branches of industry.

3. Despite the rapid growth, by capitalist standards, of national income, the FRG has had no difficulty in covering its simultaneously increasing imports with expanded exports. On the contrary, if we ignore armament imports, the FRG has maintained its real export surplus at a nearly constant level in the period examined,[2] while as a result of an appreciable improvement in its terms of trade in this

[2] By real export surplus is understood the difference between exports and imports calculated in prices of the base year, which in this case is 1954.

period, the money value of export surplus showed an important increase. Even after deducting from this surplus imports of armaments and government foreign transfers, particularly to West Berlin, its balance of payments still remains favourable, thus making the FRG an international financial power. Indeed, the USA itself recently begged West Germany's help in its currency difficulties (besides arms orders).

It would be wrong to assume that the favourable foreign-trade position enjoyed by the FRG in the given period is due to the growth of its exports to the newly established Common Market. Actually, the balance of trade between the FRG and its Common Market partners has grown worse as a result of its increased arms imports. But even if these imports are disregarded, the increase in the export surplus with those countries would be small, and could not constitute the essential factor in shaping West Germany's balance of payments.

Actually, the expansion of West German exports, which has continued for a number of years, rests on the following factors:

(i) A rather high level of economic activity has prevailed in the capitalist world, one of the most important pillars of which has been the armaments programme of NATO, in particular that of the USA.
(ii) As a result of this lasting prosperity and of the realization of the development programmes of the underdeveloped countries, the demand for machinery as well as chemicals, West Germany's basic export products, showed a high and rising level.
(iii) The export efforts of West Germany's main competitors on the world machinery market were weakened by the absorption of a large part of the respective productive capacities by their armaments.
(iv) In addition, the FRG has a strong competitive position owing to its relatively low production costs, which are a result of high productivity and fairly cheap labour.

In other words, its production structure and costs have facilitated the expansion of West Germany's exports on the world market. And the situation in the latter has been favourable in great measure as a result of the armaments programmes of the capitalist camp. Armaments stimulated the economic activity of the capitalist world on one hand, and they checked to some extent the trade expansion of the main exporters of machinery on the other.

The indirect relation between the militarization of West Germany and its economic development becomes evident here. The increase in the national income requires growing imports. For an economy so much lacking self-sufficiency as that of the FRG, this is of great importance, in particular since the concept of the Common Market, promoted by West Germany, excludes import restrictions. Increasing imports must be covered by the expansion of exports. But the pattern of West German exports is to a great extent dependent on armaments of other capitalist countries. Hence the economic interest of the FRG in maintaining international tension. And one of the most essential elements of the cold war is the militarization of West Germany, which has played such an important role in the conceptions and strategic preparations of the Atlantic alliance. It is easy to see that the relaxation of tension in international relations, leading to disarmament, would deal a heavy blow to the expansion of FRG exports. World capitalist economic activity would then undergo at least a certain weakening, and the 'disarmed' producers of machinery would intensify their export drive. It may be claimed that the decline in armaments production would be compensated for by allocating the corresponding funds to underdeveloped countries for the purchase of machinery, the production of which would utilize the capacity freed from arms production. But even if such a conversion of armament production were fully effected, the underdeveloped countries would then receive machinery from the former arms producers in such quantities that West German exports could not but be seriously hurt. However that may be, one thing is certain: the *surest* basis for West German export expansion has been the cold war.

Some may say: granted that militarization of West Germany stimulates the cold war. The cold war maintains the arms race. Armaments create a favourable position for FRG exports. But since West Germany must in turn arm itself, its export efforts will suffer as well. However, the following must be taken into consideration. (i) The FRG has a much greater heavy-industry production capacity in relation to its national income than is the case in the other capitalist countries, and thus a given percentage of the national income allocated to armaments burdens this capacity to a correspondingly smaller degree. (ii) As already indicated, the FRG covers its growing demand to a considerable extent by foreign-produced arms, for which it assigns part of its foreign-trade surplus achieved through the expansion of its exports.

This kind of coverage of part of its armaments programme burdens the balance of payments, but, as we have seen above, this by no means creates any special difficulties. On the contrary, if West Germany refrained from the import of armaments while maintaining its exports and other imports, this would lead to balance of payments difficulties for its allies and in consequence to economic and political frictions. On the other hand, the imports of arms have the advantage over their production, accompanied by a simultaneous shrinking of exports, in that armaments orders abroad help the FRG to acquire important political and economic influence among the exporters, which in turn facilitates the further expansion of militarization.

The British harboured the cynical dream that the armaments of West Germany would paralyse its exports of machinery, thus enabling them to take over some of the FRG's markets. But, as often happens, this hope proved to be short-lived. The Germans outsmarted the British. True, they improved somewhat Britain's balance of payments; they did so, however, not by slowing down the expansion of their exports and surrendering their markets, but by directing arms orders to Great Britain, obtaining important political concessions in return.

Under these circumstances, there is nothing strange in the fact that even poor old Krupp got tired—though probably for a limited time—of being a world blackguard, and that he now produces ploughs rather than swords.

4. We referred above to the effect of West German militarization on the maintenance of international tension, which is, moreover, the clear goal of its entire foreign policy. It is in this manner that the FRG has also sustained the armaments programmes of the capitalist camp as a whole, which has in turn reacted favourably on its export expansion. We have also pointed out that another important factor of this expansion has been the competitive position of West German exports which rests on relatively cheap labour. Now, militarization is also indirectly instrumental in maintaining this labour cheapness. For the militarization of the FRG is closely linked to its growing chauvinist–revanchist attitude. The Adenauer regime has in this manner achieved a political miracle which is more astonishing than its much-advertised 'economic miracle' by creating in a short time a virtual one-party system. For it is difficult to find today any significant difference between the leading parties in the FRG, particularly between the ruling party and the social democrats. The complete assimilation of the latter most likely has resulted in weakening the militancy of the trade unions. This is of course very helpful in maintaining the relatively low production costs, despite the manpower

Table 59. *Wages, Productivity, Labour Costs, Unemployment, and Cost of Living in the FRG, 1956–1960*

	1952	1956	1960
Money hourly earnings in industry[a] (1952 = 100)	100	124	166
Man-hour productivity in industry[a] (1952 = 100)	100	124	165
Average unit labour costs (ratio of the preceding 2 items)	100	100	101
Unemployment as % of hired manpower	8.4	4.2	1.2
Cost of living (1952 = 100)	100	102	110

[a] Including construction.

shortage in many branches of industry, which facilitates pressure for an increase in money wages exceeding the increase in labour productivity. Table 59 shows that in fact the latter did not occur in the FRG.

Thus, as a result of the identical rise of money hourly earnings and of man-hour productivity, labour costs in 1956–60 (just as in 1952–6) remained at a constant level. This, moreover, occurred under conditions of a decline in unemployment to a very low level, and of a certain increase in the cost of living.

To sum up: militarization is the corner-stone of the FRG policy of inciting international tension abroad and of stifling the class struggle at home. And these two basic political effects, by their economic repercussions—maintaining high armament levels in the other countries of the capitalist camp and facilitating stabilization of production costs at home—clear the way for the expansion of West Germany's exports, which is an integral element of its conception of economic growth.

PART 5

FURTHER DEVELOPMENTS OF THE THEORY OF ECONOMIC DYNAMICS

Observations on the Theory of Growth[1]
(1962)

Introduction

1. The purpose of this paper is to examine the problems raised by Harrod's theory of economic growth. As Harrod himself emphasized, there is an inherent instability in the trend movement which he considers.[1] From this the conclusion is drawn that there will be cyclical fluctuations around the trend line, and that the theory thus provides an explanation both of the economic growth and the business cycle. It has never been proved, however, that the fluctuations started by the instability of the growth do occur around the trend line and not around a horizontal line.

I shall argue that the 'Harrodian' rate of growth is ephemeral in the sense that any deviation from the path determined by it renders the system stationary—i.e. subject to cyclical fluctuations but no trend. In fact, it appears that to any theory of the business cycle of a fairly broad category there corresponds an unstable rate of growth which is devoid of practical significance.

Harrod observes, rightly, that his theory exhibits the basic 'antinomy' of the system; he thinks that 'antinomy' leads to fluctuations around the trend line. I believe that the antinomy of the capitalist economy is in fact more far-reaching: the system cannot break the impasse of fluctuations around a static position unless economic growth is generated by the impact of semi-exogenous factors such as the effect of innovations upon investment. It is only in such a case that cyclical fluctuations do occur around the ascending trend line.

It should be noted that several attempts have been made to lend stability to the Harrodian trend movement by introducing additional specific assumptions. These assumptions appear to me highly artificial and unrealistic. In fact, they obscure the problem which was so acutely posed by Harrod, instead of solving it.

[1] 'Notes on Trade Cycle Theory', *Economic Journal*, June 1951.

2. The argument is divided into three stages. First, a 'business cycle formula' of a fairly general character is devised which covers a number of business cycle theories. Second, the business cycle formula is 'dynamized' so as to apply to a system subject to a tendency to growth. Next, it is shown that the formula arrived at offers two solutions for the rate of growth: one equal to zero and another positive but ephemeral. As a result, it appears that the system is incapable of growth, and merely fluctuates around a static position. Finally, a semi-exogenous factor, namely the impact of innovations upon investment, is introduced in the formula. It then yields two positive solutions for the rate of growth, of which the lower one is stable. As a result, the system is subject to a uniform trend depending on a semi-exogenous factor, and cyclical fluctuations take place around the trend line in accordance with the 'business cycle formula'.

I make the following assumptions. (i) I consider a closed system; (ii) I assume that workers do not save; (iii) I leave aside changes in inventories; (iv) I leave aside government expenditure and revenue; (v) I leave aside the time-lag involved in consumption expenditure.

Assumptions (iii), (iv), and (v) may appear drastic indeed. However, they simplify the argument considerably without affecting the results essentially. While treating the problems in question in my *Theory of Economic Dynamics*,[2] I did not introduce these simplifications, with the result that the argument was considerably complicated, thus obscuring perhaps to some extent the basic idea of my approach.

The Business Cycle Formula

3. We denote by I_t the net investment in fixed capital in a unit period commencing at time t called 'unit period t', and by ΔI_t the change in investment from the beginning to the end of that period. The time-lag between investment decisions and actual investment is adopted as a unit of time. These notions are illustrated by Fig. 41.

MN is the time-curve of net investment. AB is the unit period (it is equal to the time-lag between investment decisions and investment). I_t is equal to the shaded area and ΔI_t to DE. Since AB is equal to one, ΔI_t is the rate of change of investment in the unit period t, shown by the inclination of the chord CD.

[2] Pp. 322–33.

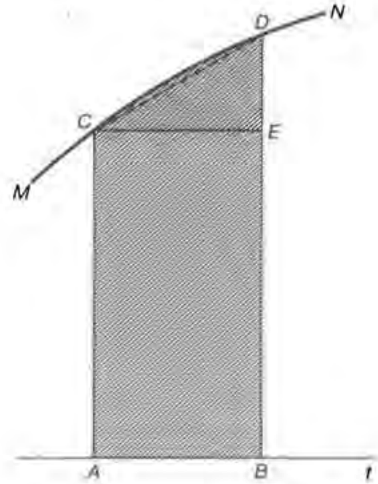

FIG. 41

The formula for the business cycle referred to above is:

$$I_{t+1} = \alpha I_t + \beta \Delta I_t \qquad (1)$$

where $1 > \alpha \geqslant 0$ and $\beta > 0$. Thus the level of investment at time $t+1$ is determined by the level of investment and the rate of change of investment at time t. It will be shown that three business cycle theories may be expressed by means of this equation: (i) my own theory as presented in the *Theory of Economic Dynamics*;[3] (ii) the theory based on the acceleration principle; (iii) a theory that corresponds to Harrod's line of thought as presented in 'Notes on Trade Cycle Theory'.[4]

These three theories differ in their approach to determinants of investment decisions. They all have in common the existence of linear relations between savings S (which are capitalist savings here, since the workers are assumed not to save), profits P, and the national income Y. We thus have the following relations:

$$P = gS + M \qquad (2)$$

and

$$Y = hS + N \qquad (3)$$

[3] Pp. 281–311. [4] Op. cit.

(It should be noted that S, P, and Y are expressed in real terms.) The coefficients g and h are positive. The constants M and N can be assumed positive as well. Capitalist consumption increases in the course of the business cycle proportionally less than profits, and thus the latter increase proportionally less than savings, so that $M > 0$. Moreover, profits increase proportionally more than national income; from this, and from the fact that $M > 0$, it is easy to deduce that in addition $N > 0$.

Since we ignored changes in inventories, I stands for total investment and thus is equal to S.[2] We thus obtain from equations (2) and (3):

$$P = gI + M \tag{4}$$

and

$$Y = hI + N \tag{5}$$

We shall now present briefly the determination of investment decisions per unit of time in each of the theories in question.

4. The approach of my own theory to this problem is as follows.[5] We can assume that at the beginning of the unit period considered

> the firms have pushed their investment plans up to a point where they cease to be profitable, either because of the limited market for the firm's products or because of increasing risk and limitation of the capital market. New investment decisions will thus be made only if, in the period considered, changes in the economic situation take place which extend the boundaries set to investment plans by those factors.[3]

We distinguish two broad categories of such changes: (i) accumulation of capital by firms, which extends the boundary resulting from increasing risk and limitation of the capital market, and (ii) changes in profits and changes in the stock of fixed capital, which determine conjointly the changes in the rate of profit.[4]

Let us denote by D_t the new investment decisions in the unit period t, net of depreciation. Factor (i) may be taken into account by postulating D_t to be an increasing function of accumulation of capital by firms. Assuming that the latter is in turn positively correlated with total net savings S, we can conclude that D_t is an increasing function of S_t.

Factor (ii) may be taken into consideration by postulating that D_t is an increasing function of the change in profits P during the unit period

[5] *Theory of Economic Dynamics*, pp. 281–3 above.

considered; and a decreasing function of the change in the stock of fixed capital, which we denote by K, during that period. D_t is thus an increasing function of ΔP_t and a decreasing function of ΔK_t, where ΔP_t and ΔK_t are the changes in profits and in the stock of capital respectively, from the beginning to the end of the unit period t.

Assuming the above functional relations to be linear, we obtain:

$$D_t = aS_t + b\Delta P_t - c\Delta K_t + d \tag{6}$$

If the system is to be stationary, i.e. not subject to long-run growth, and D as well as S is net of depreciation, d must be equal to zero, and thus we have:

$$D_t = aS_t + b\Delta P_t - c\Delta K_t \tag{7}$$

Taking into account the fact that investment in fixed capital is equal to saving, as we ignored changes in inventories, and that ΔK_t, i.e. the increment in the stock of fixed capital during the unit period considered, is equal to net investment in fixed capital in that period, I_t, we have:

$$D_t = (a - c)I_t + b\Delta P_t \tag{8}$$

Taking, moreover, into consideration that according to equation (4) $\Delta P = g\Delta I$, we obtain

$$D_t = (a - c)I_t + bg\Delta I_t \tag{9}$$

Finally, the time-lag between D and I having been adopted as a unit of time, we have:

$$I_{t+1} = D_t \tag{10}$$

It follows from this and equation (9):

$$I_{t+1} = (a - c)I_t + bg\Delta I_t \tag{11}$$

It is obvious that this equation is identical with the equation

$$I_{t+1} = \alpha I_t + \beta\Delta I_t \tag{1}$$

provided

$$\alpha = (a - c) \quad \text{and} \quad \beta = bg$$

It should be noted that equation (1) yields cyclical fluctuations on condition that $\alpha < 1$. Thus it is necessary to postulate here that $a - c < 1$. It follows from equation (7) that a is the degree to which savings are being reinvested. It is clear that if a does not exceed 1, the condition $a - c < 1$ is certain to be fulfilled. We also assume that $a - c > 0$.

5. In the case of the theory of investment decisions based on the acceleration principle, the argument is very simple. Investment decisions D (net of depreciation) are taken to be determined by the current rate of change in the national income:

$$D_t = e\Delta Y_t \tag{12}$$

Taking into consideration the fact that, according to equation (5), $\Delta Y = h\Delta I$ and that $I_{t+1} = D_t$, we obtain from equation (12):

$$I_{t+1} = eh\Delta I_t \tag{13}$$

This equation is obviously a special case of equation (1) with the following values for the coefficients α and β:

$$\alpha = 0 \quad \text{and} \quad \beta = eh$$

The condition $\alpha < 1$ is obviously fulfilled in this case. It should be noted that the acceleration principle approach has been criticized for two reasons:[6] (i) the acceleration principle relates net investment to the rate of increase in the national income, even though this increase, in the course of the business cycle, is based to a great extent on changes in the degree of utilization of equipment; (ii) formula (13) does not accord with the actual course of the business cycle unless an unrealistically long time-lag between investment decisions and investment is assumed.[7]

6. Finally, Harrod's approach to the problem of the determination of investment decisions may be formulated by paraphrasing in the following way his postulate A of the 'Notes on Trade Cycle Theory'[8] (the paraphrase allows for our dealing at the present stage with a stationary system): 'If investment *ex post* is justified in any period, entrepreneurs will continue to invest at the same rate. If in any period investment *ex post* is less than is justified entrepreneurs will in the next period invest more, and vice versa.' Investment I_t is considered justified if it is equal to $C\Delta Y_t$, where C is the accretion to capital

[6] See e.g. *Theory of Economic Dynamics*, pp. 284–6 above.

[7] The variant developed by Hicks does not suffer from this defect, but this is because he assumed implicitly the time-lag in consumption expenditure to be equal to the investment time-lag, which again is highly unrealistic. [See J. R. Hicks, *A Contribution to the Theory of Trade Cycle*, Oxford, Clarendon Press, 1950, esp. mathematical appendix to ch. 2, pp. 170–4.]

[8] Op. cit., pp. 271–2.

required to support an increase in the national income by a unit (C is thus the so-called 'capital coefficient').

It follows directly that if $I_t = C\Delta Y_t$, investment decisions D_t are equal to investment I_t. If investment is less than justified, i.e. $I_t < C\Delta Y_t$, investment decisions D_t are higher than investment I_t, and conversely.

The determination of D_t may thus be conveniently represented as follows:

$$D_t = I_t + \lambda(C\Delta Y_t - I_t) \tag{14}$$

where λ is a coefficient showing the degree to which investment decisions are 'corrected' for the disproportion between the required and actual current investment. It is plausible to assume that $\lambda \leqslant 1$.[5]

Taking into consideration that $\Delta Y_t = h\Delta I_t$ (equation (5)) and that $D_t = I_{t+1}$, we obtain:

$$I_{t+1} = (1-\lambda)I_t + C\lambda h\Delta I_t \tag{15}$$

This equation also is identical with equation (1) provided

$$\alpha = 1 - \lambda \quad \text{and} \quad \beta = C\lambda h$$

The condition $\alpha < 1$ is obviously fulfilled here. Since we postulated $\lambda \leqslant 1$, the condition $\alpha \geqslant 0$ is fulfilled as well. If $\lambda = 1$, that is, if investment decisions are corrected to the full extent for the disproportion between 'required' and actual current investment, the case considered becomes identical with that of the acceleration principle.

7. It is generally known that the solution of the equation

$$I_{t+1} = \alpha I_t + \beta\Delta I_t \tag{1}$$

represents cyclical fluctuations of I. Since changes in profits and national income are related to investment through equations (4) and (5), the former fluctuate together with investment. We shall not fully analyse the mechanism of the business cycle here.[9] We shall confine ourselves to considering why the position reached at the top of the boom cannot last. Apart from general interest, this problem is relevant to our subsequent argument.[10]

When investment reaches its top level during the boom, the following situation arises. Profits and national income, whose changes are directly related to those of investment, cease to grow as well, but

[9] On this subject see *Theory of Economic Dynamics*, pp. 300–11 above.

[10] See pp. 424–6 below.

capital equipment continues to expand because net investment is positive. The increase in productive capacity is thus not matched by the rise in effective demand. As a result, investment declines, and this in turn causes a fall in profits and national income.

To put this causation of the downswing into proper perspective, it is useful to enquire what would have happened in a similar situation in a socialist economy.[11] Equation (5) would obviously not be valid: the changes in the national income would not be tied to those of investment, but would follow the changes in productive capacity. If investment remained constant while the stock of fixed capital expanded, prices would be reduced or wages raised. In this way the demand for consumer goods would increase in accordance with the expansion of the stock of capital.

Modification of the Basic Relations in an Expanding Economy

8. In an economy subject to long-run growth it will be necessary to introduce certain modifications in equation (1), which was deduced on the assumption of stationary conditions.

The first modification results from the fact that interrelations between savings S, profits P, and the national income Y will be altered somewhat by the existence of the long-run trend. For a stationary economy we have postulated the relations:

$$P = gS + M \tag{2}$$

and

$$Y = hS + N \tag{3}$$

where M and N are positive constants.

However, M and N may be assumed constants only in a stationary economy. In an expanding economy both M and N will tend to rise. It is plausible to assume that M increases with the 'trend value' P' of profits and with the trend value of the stock of capital, K', so that we have:

$$M = mP' + qK' \tag{16}$$

Similarly, we assume that N increases with the 'trend values' of national income Y' and of the stock of capital K', and obtain

$$N = nY' + rK' \tag{17}$$

where m, n, q, and r are positive coefficients.

[11] See *Theory of Economic Dynamics*, pp. 254–5 above.

Thus equations (2) and (3) will now be transformed into

$$P = gS + mP' + qK' \tag{18}$$

and

$$Y = hS + nY' + rK' \tag{19}$$

It is easy to see that the trend values of profits and national income can be expressed in terms of the trend values of savings and the stock of capital. Indeed, for a point of the trend line where the actual values of P, Y, and S coincide with their trend values, we have

$$P' = gS' + mP' + qK'$$

and

$$Y' = hS' + nY' + rK'$$

from which we obtain:

$$P' = \frac{gS' + qK'}{1 - m} \tag{20}$$

and

$$Y' = \frac{hS' + rK'}{1 - n} \tag{21}$$

Substituting these values of P' and Y' into equations (18) and (19) respectively, we obtain finally:

$$P = gS + \frac{mgS' + qK'}{1 - m} \tag{22}$$

and

$$Y = hS + \frac{nhS' + rK'}{1 - n} \tag{23}$$

Frequently a simpler assumption is made about the long-run changes in the constants M and N, namely that they expand proportionally to the trend values of profits and national income respectively. It will be easily found that in such a case the trend values of profits and national income will be proportional to the trend value of savings. (This can be derived from equations (20) and (21) by postulating $q = 0$ and $r = 0$.) Consequently, the constants M and N will be proportional to the trend value of savings S' as well. When applied to a stationary state where $S' = 0$ this leads to perverse results, since we arrive at $M = 0$ or $N = 0$, although we started from an assumption that they are *positive* constants. Thus our more complicated assumptions—that M

is a homogeneous linear function of the trend values of profits and the stock of capital, and that N is such a function of the trend values of national income and the stock of capital—appear to be fully justified. For a stationary state we now obtain, from equations (22) and (23) respectively, for M the value $qK_0/(1-m)$ and for N the value $rK_0/(1-n)$, where K_0 is the constant stock of capital in a given stationary state.

Recalling that, in accordance with our basic assumptions, savings S are equal to investment in fixed capital I, we obtain from equations (20), (21), (22), and (23):

$$P' = \frac{gI' + qK'}{1-m} \tag{24}$$

$$Y' = \frac{hI' + rK'}{1-n} \tag{25}$$

$$P = gI + \frac{mgI' + qK'}{1-m} \tag{26}$$

and

$$Y = hI + \frac{nhI' + rK'}{1-n} \tag{27}$$

9. Let us now substitute the above values of P or Y into the equations corresponding to the three theories considered. For my own theory we obtain from equations (8) and (10):

$$I_{t+1} = (a-c)I_t + bg\Delta I_t + b\frac{mg\Delta I'_t + q\Delta K'_t}{1-m} \tag{28}$$

For the theory based on the acceleration principle we obtain from equation (12):

$$I_{t+1} = eh\Delta I_t + e\frac{nh\Delta I'_t + r\Delta K'_t}{1-n} \tag{29}$$

Finally, for Harrod's theory we derive from equation (15):

$$I_{t+1} = (1-\lambda)I_t + \lambda Ch\Delta I_t + \lambda C\frac{nh\Delta I'_t + r\Delta K'_t}{1-n} \tag{30}$$

Now $\Delta K'_t$, i.e. the increment of the trend value of the stock of capital in the unit period t, is nothing else but the trend value of investment in that period, I'_t. Thus it will be easily seen that all the three equations

may be put into the form:

$$I_{t+1} = \alpha I_t + \beta\Delta I_t + \gamma\Delta I'_t + \delta I'_t \tag{31}$$

where $1 > \alpha \geqslant 0$, $\beta > 0$, $\gamma > 0$, and $\delta > 0$. This equation differs from the business cycle formula by the member $(\gamma\Delta I'_t + \delta I'_t)$ on the right-hand side, which represents the effect of the long-run expansion of the economy through its influence on the change in profits or on the change in the national income.

10. In the case of Harrod's theory, it is necessary to introduce in the business cycle formula yet another alteration in order to take account of the long-run expansion of the economy. In such an economy it is the *relation* of investment I to the long-run stock of fixed capital K' that remains unchanged if investment proves 'justified'. The formula

$$I_{t+1} = I_t + \lambda(C\Delta Y_t - I_t)$$

which represents Harrod's theory in its application to a stationary economy is thus replaced by:

$$\frac{I_{t+1}}{K'_{t+1}} = \frac{I_t + \lambda(C\Delta Y_t - I_t)}{K'_t} \tag{32}$$

This equation, after the substitution of the value for Y_t from equation (27), leads to the formula:

$$\frac{I_{t+1}}{K'_{t+1}} = \frac{\alpha I_t + \beta\Delta I_t + \lambda\Delta I'_t + \delta I'_t}{K'_t} \tag{33}$$

where $\alpha = 1-\lambda$; $\beta = \lambda Ch$; $\gamma = \lambda C\dfrac{hn}{1-n}$; $\delta = \lambda C\dfrac{r}{1-n}$.

Equation (33) may be also written in the form

$$I_{t+1} = \frac{K'_{t+1}}{K'_t}(\alpha I_t + \beta\Delta I_t + \gamma\Delta I'_t + \delta I'_t)$$

Using this equation rather than:

$$I_{t+1} = \alpha I_t + \beta\Delta I_t + \gamma\Delta I'_t + \delta I'_t \tag{31}$$

may be interpreted as taking into consideration in making investment decisions the steady expansion of the economy as reflected in the ratio K'_{t+1}/K'_t. This interpretation makes it reasonable to adopt formula (33) rather than (31), not only in the case of Harrod's theory but in other theories as well.

The Unstable Growth

11. Formula (33) represents the dynamics of the system comprising cyclical fluctuations and the trend. If actual investment moves along the trend line, i.e. $I_t = I'_t$, we obtain:

$$\frac{I'_{t+1}}{K'_{t+1}} = \frac{(\alpha+\delta)I'_t + (\beta+\gamma)\Delta I'_t}{K'_t} \tag{34}$$

which is nothing else but the trend equation. The trend line may be in fact defined as a smooth ascending time-curve satisfying equation (34).

It is easy to show that the system tends to fluctuate around the trend line determined by this equation. But this acquires its proper significance only provided formula (34) does generate a steady process of growth. We shall argue, however, that such is not the case.

12. Let us first transform equation (34) somewhat. We denote the rate of growth of capital equipment by ϕ and the rate of increase of investment by ψ. Thus we have:

$$\frac{I'}{K'} = \phi; \frac{\Delta I'}{I'} = \psi; \frac{\Delta I'}{K'} = \phi\psi$$

We thus may represent the trend formula as follows:

$$\phi_{t+1} = (\alpha+\delta)\phi_t + (\beta+\gamma)\phi_t\psi_t \tag{35}$$

It will be seen that this equation determines the possible rate of uniform growth. Indeed, if the stock of fixed capital K' expands at a constant rate, investment I' will expand at the same rate. We thus have:

$$\phi_{t+1} = \phi_t = \psi_t$$

and we obtain from formula (35) the equation directly determining the constant rate of growth:

$$\phi_t = (\alpha+\delta)\phi_t + (\beta+\gamma)\phi_t^2 \tag{36}$$

This equation yields two solutions

$$\phi = 0; \phi = \frac{1-\alpha-\delta}{\beta+\gamma}$$

Since $\beta > 0$ and $\gamma > 0$, the second solution is positive if $\alpha + \delta < 1$. It has been postulated above that $\alpha < 1$; the condition for $\phi = (1-\alpha-\delta)/(\beta+\gamma)$ being positive is thus more far-reaching.[12]

13. The solution $\phi = 0$ means obviously that the system is not subject to long-run trend, and thus fluctuates around a static position.

[12] It may be shown that in the case of Harrod's theory $(1-\alpha-\delta)/(\beta+\gamma) = s/C$, where s is the trend value of the ratio of savings to the national income, or S'/Y', and C the capital coefficient. Indeed, in this case we have:

$$\alpha = 1-\lambda; \quad \beta = \lambda Ch; \quad \gamma = \lambda C\frac{nh}{1-n}; \quad \delta = \lambda C\frac{r}{1-n}$$

It follows that

$$\phi = \frac{1-\alpha-\delta}{\beta+\gamma} = \frac{1-n}{Ch} - \frac{r}{h} \tag{a}$$

According to equation (21) we have

$$Y' = \frac{hS'}{1-n} + \frac{rK'}{1-n} \tag{21}$$

Dividing both sides by K' and taking into account that $\frac{S'}{K'} = \frac{I'}{K'} = \phi$, we obtain:

$$\frac{Y'}{K'} = \frac{h\phi}{1-n} + \frac{r}{1-n}$$

or

$$\phi = \frac{1-n}{h}\frac{Y'}{K'} - \frac{r}{h}$$

From this equation and equation (a) it follows:

$$\frac{Y'}{K'} = \frac{1}{C}$$

This is as it should be in Harrod's theory, because, if the rate of growth is constant, investment is all the time 'justified'. Substituting now the value CY' for K' in equation (21), we obtain

$$Y' = \frac{hS'}{1-n} + \frac{rCY'}{1-n}$$

It follows that:

$$\frac{S'}{Y'} = \frac{1-n}{h} - \frac{rC}{h}$$

Thus

$$\frac{s}{C} = \frac{S'}{CY'} = \frac{1-n}{Ch} - \frac{r}{h}$$

which is identical with the value of ϕ rendered by equation (a).

The trend value of investment, I', is equal to zero, and thus the trend value of the stock of fixed capital, K', is constant. Consequently the equation

$$\frac{I_{t+1}}{K'_{t+1}} = \frac{\alpha I_t + \beta \Delta I_t + \gamma \Delta I'_t + \delta I'_t}{K'_t} \tag{33}$$

is converted into the business cycle formula

$$I_{t+1} = \alpha I_t + \beta \Delta I_t \tag{1}$$

14. We shall argue that this is the only significant solution, as the rate of growth $\phi = (1 - \alpha - \delta)/(\beta + \gamma)$ appears to be ephemeral. For this purpose we shall examine equation (35)

$$\phi_{t+1} = (\alpha + \delta)\phi_t + (\beta + \gamma)\phi_t\psi_t \tag{35}$$

by means of Fig. 42.

The abscissae represent the rate of growth in the unit period t (i.e. ϕ_t), and the ordinates that in the period $t + 1$ (i.e. ϕ_{t+1}). The curve $0P$ represents the relation between ϕ_{t+1} and ϕ_t, provided that $\phi_t = \psi_t$, i.e. provided that the rate of growth of the stock of capital is

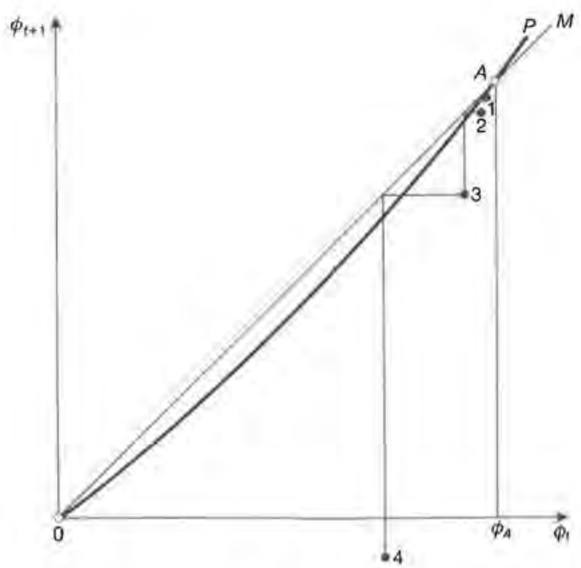

FIG. 42

equal to that of investment. The equation of the curve $0P$ is thus:

$$\phi_{t+1} = (\alpha + \delta)\phi_t + (\beta + \gamma)\phi_t^2$$

i.e. $0P$ is a parabola passing through the zero point.

Let us now draw through the zero point a straight line $0M$ inclined at 45°. Its points of intersection with the curve $0P$, i.e. the zero point and A, determine the feasible rates of uniform growth; for at these points $\phi_{t+1} = \phi_t$, and in addition $\phi_t = \psi_t$ according to the basic characteristic of the curve $0P$. ϕ_0 and ϕ_A are equal, as found above, to 0 and $(1 - \alpha - \delta)/(\beta + \gamma)$ respectively. For the subsequent argument it is essential to note that the parabola $0P$ cuts the straight line $0M$ from below.

Let us now imagine that in the initial period the rate of growth of the stock of capital is ϕ_1, the abscissa of point 1, which is less than the 'equilibrium rate' ϕ_A. Let us, moreover, imagine that the rate of increase of investment in the initial position ψ_1 is equal to ϕ_1.[13] As $\phi_1 = \psi_1$ the rate of growth ϕ_2 in the next period is equal to the ordinate of point 1. (The curve $0P$ represents the relation between ϕ_{t+1} and ϕ_t, provided $\phi_t = \psi_t$.) The ordinate of point 1 is in turn equal to the abscissa of point 2. The rate of growth in the next period ϕ_3 is, however, *not* equal to the ordinate of the curve $0P$ corresponding to the abscissa ϕ_2. In the meantime the rate of growth of investment has fallen below that of the stock of capital, as the decline in ϕ causes an even greater fall in ψ. Thus, as will be seen from the equation,

$$\phi_{t+1} = (\alpha + \delta)\phi_t + (\beta + \gamma)\phi_t\psi_t \tag{35}$$

the rate of growth in the third period ϕ_3 is represented by the ordinate of point 2, which is situated *below* curve $0P$. Similarly, point 3 is below curve $0P$. The sequence of points 1, 2, 3, 4 shows the rapid decline of the rate of growth away from the equilibrium level ϕ_A.

In the fifth period the rate of growth (the ordinate of point 4) becomes negative.[14] It thus appears that a small downward deviation from the equilibrium rate of growth leads to a decline in investment,

[13] Such would be the situation, for instance, if the system was subject to uniform growth, but just before the initial period considered a change in the parameters of equation (35) occurred which raised the 'equilibrium rate of growth' from level ϕ to level ϕ_A.

[14] A few words should be said about how Fig. 42 was drawn. Let us first put equation (35): $\phi_{t+1} = (\alpha + \delta)\phi_t + (\beta + \gamma)\phi_t\psi_t$ into a somewhat different shape. $\phi_t\psi_t$ is nothing but $\frac{I'_t}{K'_t}\frac{\Delta I'_t}{I'_t} = \frac{\Delta I'_t}{K'_t}$. Now $\Delta I'_t = \Delta(K'_t\phi_t)$, and the latter expression may be

which finally falls below the zero level. In this way the system loses the characteristics of an expanding economy. As a result, its dynamics are fully described by means of the business cycle formula

$$I_{t+1} = \alpha I_t + \beta \Delta I_t \tag{1}$$

and it exhibits cyclical fluctuations around a static position. Thus, of the two solutions for the rate of growth, $\phi = 0$ and $\phi = (1 - \alpha - \delta)/(\beta + \gamma)$, only the former is significant, while the latter appears to be ephemeral.

Stable Growth Under the Impact of Semi-exogenous Factors

15. Investment was assumed above to be determined by purely endogenous factors. We shall now take into consideration the impact of such semi-exogenous factors as innovations. The effect of innovations is not exogenous in character in the strict sense, since they are inherent in the normal functioning of the capitalist system. There is no doubt, however, that the influence of changes in profits, national income, the stock of capital equipment, etc. upon the stream of inventions is very complex and subject to long time-lags.

The stream of inventions has an impact on investment similar to the continuous increase in profits in my own theory or the continuous increase in output in other theories considered here. Each new invention, like each increment of profits (or output), makes certain projects *ceteris paribus* more attractive. Thus a stream of inventions causes investment over and above the level which would otherwise obtain.[15]

represented with high degree of approximation by $K'_t \Delta\phi_t + \phi_t \Delta K'_t$. Thus $\Delta I'_t/K'_t = \phi_t^2 + \Delta\phi_t$. Replacing by this the expression $\phi_t \psi_t$ in equation (35), we obtain:

$$\phi_{t+1} = (\alpha + \delta)\phi_t + (\beta + \gamma)(\phi_t^2 + \Delta\phi_t) \tag{35a}$$

Let us now adopt, for the values of the parameters $(\alpha + \delta)$ and $(\beta + \gamma)$, 0.7 and 4 respectively. Equation (35) is then

$$\phi_{t+1} = 0.7\phi_t + 4(\phi_t^2 + \Delta\phi_t)$$

The equation of the curve $0P$, i.e. $\phi_{t+1} = (\alpha + \delta)\phi_t + (\beta + \delta)\phi_t^2$ is in this case

$$\phi_{t+1} = 0.7\,\phi_t + 4\phi_t^2$$

After drawing this curve it was possible to determine on the basis of equation (35a) the sequence of points 1, 2, 3, and 4.

[15] See *Theory of Economic Dynamics*, pp. 334–5 above.

It should be added that innovations need not be identified with changes in technology. We can broaden the concept to include such a phenomenon as the opening up of new sources of raw materials, which induces additional investment in the productive and transportation facilities required.

16. Let us denote the effect of innovations on investment by $\varepsilon K'$, where K' is the long-run level of the stock of fixed capital, and let us call ε the intensity of innovations. This definition is plausible because the effect of a given stream of inventions may be taken to be proportional to the size of the economy, i.e. to the stock of its capital equipment, while the coefficient ε is a characteristic of the stream of inventions as such. It is clear that ε may vary, reflecting a strengthening or weakening of the intensity of innovations.[16] (It should be noted that, in the case of the opening up of new raw-material resources, the intensity of innovations may be taken to be *ceteris paribus* constant when the importance of discoveries varies proportionally to the stock of fixed capital.) We shall argue that, if the intensity of innovations ε is constant, their effect on investment generates a stable uniform growth of the economy; a growth which proved to be impossible when 'induced' investment only was taken into consideration.

We had arrived above at the following general investment formula:

$$\frac{I_{t+1}}{K'_{t+1}} = \frac{\alpha I_t + \beta \Delta I_t + \gamma \Delta I'_t + \delta I'_t}{K'_t} \tag{33}$$

where I' and K' are the trend values of investment and of the stock of fixed capital respectively. If the 'innovation effect' is taken into consideration, we now have

$$\frac{I_{t+1}}{K'_{t+1}} = \frac{\alpha I_t + \beta \Delta I_t + \gamma \Delta I'_t + \delta I'_t + \varepsilon K'_t}{K'_t}$$

or

$$\frac{I_{t+1}}{K'_{t+1}} = \frac{\alpha I_t + \beta \Delta I_t + \gamma \Delta I'_t + \delta I'_t}{K'_t} + \varepsilon \tag{37}$$

If I is assumed to be equal to I', we obtain the trend equation:

$$\frac{I'_{t+1}}{K'_{t+1}} = \frac{(\alpha + \delta) I'_t + (\beta + \gamma) \Delta I'_t}{K'_t} + \varepsilon \tag{38}$$

[16] Ibid., p. 334.

Denoting again $\frac{I'}{K'}$ by ϕ and $\frac{\Delta I'}{I'}$ by ψ, we arrive at:

$$\phi_{t+1} = (\alpha + \delta)\phi_t + (\beta + \gamma)\phi_t\psi_t + \varepsilon \tag{39}$$

The rate of uniform growth consistent with this equation is again obtained by postulating

$$\phi_{t+1} = \phi_t = \psi_t$$

17. We shall determine the possible rates of growth and examine their characteristics by means of a diagram analogous to Fig. 42 (see Fig. 43). The curve *BCP* represents again the relation between ϕ_{t+1} and ϕ_t provided that $\phi_t = \psi_t$. The equation of this curve is consequently:

$$\phi_{t+1} = (\alpha + \delta)\phi_t + (\beta + \gamma)\phi_t^2 + \varepsilon \tag{40}$$

Thus the curve is a parabola cutting the ordinate axis at a distance ε above the zero point. Moreover, let us draw, as in Fig. 42, a straight line $0M$ inclined at 45°. Its points of intersection with the parabola, *B* and *C*, determine the possible rates of uniform growth. Indeed, for all the points of the parabola the condition $\phi_t = \psi_t$ is fulfilled. Moreover, for *B* and *C* the ordinate is equal to the abscissa, i.e. $\phi_{t+1} = \phi_t$. Thus the possible rates of growth appear to be ϕ_C and ϕ_B, which are both positive.[6] This shows that the system cannot be stationary. It should

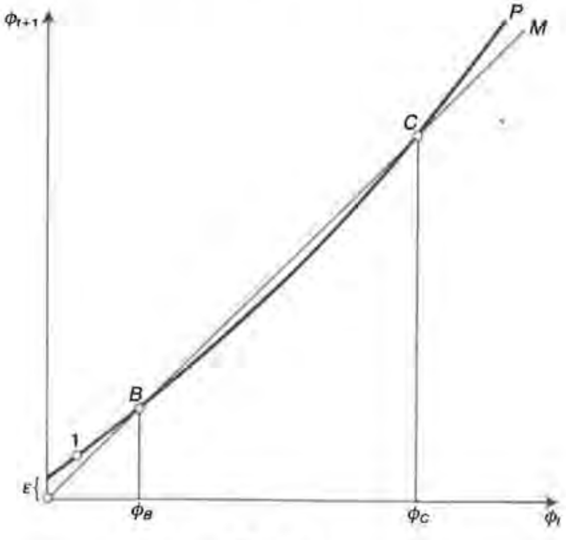

FIG. 43

be noted that the curve *BCP* cuts the straight line $0M$ at point *C* from below. The reverse is true, however, of the point of intersection *B*: at this point the curve cuts $0M$ from above. It will be shown that, while the rate of growth ϕ_C is ephemeral (just like ϕ_A in the case previously considered), the rate ϕ_B represents a stable trend.

18. Let us imagine that in the initial period the rate of growth of the stock of capital is ϕ_1 (the abscissa of point 1), which is less than ϕ_B, and that the rate of increase of investment ψ_1 is equal to ϕ_1.[17] The rate of growth in the next period is represented by the ordinate of point 1 and is in this case *greater* than ϕ_1. Thus the system moves *towards* the equilibrium rate ϕ_B. It follows that a small downward deviation from the equilibrium rate does not result here, as contrasted with the case previously considered, in a disruption of the trend movement. The system continues to fluctuate around the trend line representing the uniform growth at a rate ϕ_B, just as in the previous case it fluctuated around the static position. Point *B* in Fig. 43 is, in fact, the counterpart of the point 0 in Fig. 42.

On the other hand, the rate of growth ϕ_C is of the same character as ϕ_A. A small downward deviation from it will cause the system to move away from this equilibrium rate. As mentioned above, the system *cannot* become stationary, as in the case where $\varepsilon = 0$. If the system gets into a static position it is pushed towards position *B*, i.e. it approaches the state of steady expansion at a rate ϕ_B, or more precisely it starts to fluctuate around such a trend line. Thus it is clear that solution ϕ_C is devoid of practical significance, and that the system tends to expand in the long-run at a rate ϕ_B.[18] It should be noted that this rate is closely related to the intensity of innovations ε.

19. Let us consider now in more detail the fluctuations around the trend line. Let us recall that our general equation for investment is:

$$\frac{I_{t+1}}{K'_{t+1}} = \frac{\alpha I_t + \beta\Delta I_t + \gamma\Delta I'_t + \delta I'_t}{K'_t} + \varepsilon \tag{37}$$

and that the trend equation which represents a uniform growth at a rate ϕ_B is

$$\frac{I'_{t+1}}{K'_{t+1}} = \frac{(\alpha + \delta)I'_t + (\beta + \gamma)\Delta I'_t}{K'_t} + \varepsilon \tag{38}$$

[17] Such a situation will arise e.g. if a change in the parameters of equation (39) has increased the equilibrium rate of growth from ϕ_1 to ϕ_B just before the initial period.

[18] See *Theory of Economic Dynamics*, pp. 330–1 above.

Subtracting the latter from the former we obtain:

$$\frac{I'_{t+1} - I_{t+1}}{K'_{t+1}} = \frac{\alpha(I_t - I'_t) + \beta(\Delta I_t - \Delta I'_t)}{K'_t}$$

or

$$I_{t+1} - I'_{t+1} = \frac{K'_{t+1}}{K'_t}\alpha(I_t - I'_t) + \frac{K'_{t+1}}{K'_t}\beta\Delta(I_t - I'_t) \qquad (41)$$

$I_t - I'_t$ is nothing else but the deviation of the actual investment from its trend value. Moreover, K'_{t+1}/K'_t is a constant here, since the trend is uniform. Thus equation (40) is the business cycle formula for the deviation of investment from the trend, having as coefficients $\frac{K'_{t+1}}{K'_t}\alpha$ and $\frac{K'_{t+1}}{K'_t}\beta$. Thus investment tends to fluctuate around the trend line representing a uniform growth at a rate ϕ_B.

20. It can be concluded that semi-exogenous factors, such as innovations, enable the capitalist system to break the impasse of the stationary state and to expand at a rate dependent on the importance of these factors, e.g. on the intensity of innovations. Around the resulting trend line cyclical fluctuations take place. Whenever the top of the boom is reached a downswing follows, reflecting the inability of the system to expand in the longer run at a higher rate than ϕ_B.

Rate of Growth and Utilization of Equipment

21. It follows that the rate of growth ϕ may be at different levels, depending on the intensity of innovations ε. There arises the problem of how the level of the rate of growth influences the trend value of the degree of utilization of equipment and how as a result the latter is related to ε.

We shall assume here that the ratio of productive capacity to capital is constant. (This, by the way, is implied in Harrod's approach.) In such a case the ratio of the trend values of the national income and the stock of fixed capital, Y'/K', is an indicator of the long-run level of the degree of utilization of equipment. Now according to the equation (25) we have

$$Y' = \frac{hI' + rK'}{1 - n}$$

and dividing both sides by K':

$$\frac{Y'}{K'} = \frac{h}{1-n}\frac{I'}{K'} + \frac{r}{1-n}$$

However, I'/K' is nothing else but the rate of growth ϕ, and thus we obtain:

$$\frac{Y'}{K'} = \frac{h}{1-n}\phi + \frac{r}{1-n} \qquad (42)$$

It follows directly from this equation that if the stock of capital equipment expands at a constant rate ϕ, the degree of utilization is constant as well. Thus the national income grows in the long run at the same rate, ϕ, as capital equipment and investment. This is obviously the direct consequence of our assumption that the trend value of the national income is a linear homogeneous function of the trend values of savings or investment and the stock of capital equipment (cf. equation (21)).

22. It is clear from Fig. 43 that with given parameters α, δ, β, and γ the stable rate of growth ϕ_B is an increasing function of the intensity of innovations ε. From this, and from equation (42), it follows that the degree of utilization of equipment is also an increasing function of the intensity of innovations. Let us discuss this relationship in more detail. We shall examine first the interrelation between ϕ and ε.

When the intensity of innovations ε is equal to zero, the rate of growth ϕ is equal to zero as well, i.e. the economy is stationary. When ε increases the curve *BCP* moves upwards, and so does point *B*, which means that ϕ_B increases as well. However, when ε reaches the critical value ε_{cr} point *B* achieves its highest position B_{cr}, whose abscissa can be denoted by ϕ_{cr} (see Fig. 44). If ε exceeds the level of ε_{cr}, the curve *BCP* no longer cuts the straight line $0M$.

What happens to the economy in such a case? It is clear that the system cannot be subject to a uniform trend, because to any rate ϕ_t there corresponds in the next period a higher rate of growth ϕ_{t+1}. Thus the system will have an inherent tendency for acceleration of the rate of growth and thus for a secular inflationary boom.

The interrelation between the intensity of innovations ε and the rate of growth may be now described by Fig. 45. ε is taken as abscissa and the rates of growth ϕ_C and ϕ_B as ordinates. The curve of the stable rate of growth ϕ_B is drawn as a full line and the curve of the unstable rate of

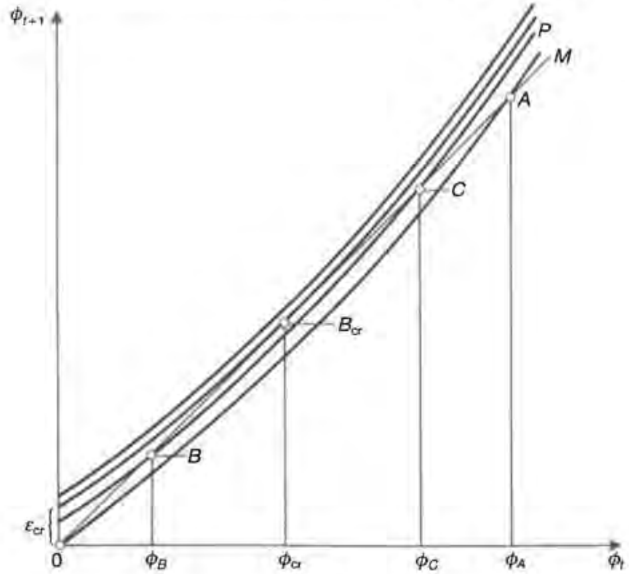

FIG. 44

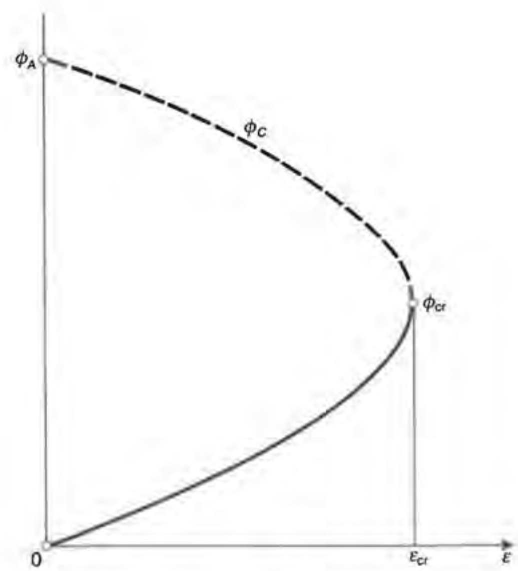

FIG. 45

growth ϕ_C as a dotted line. (Different scales are used for abscissae and ordinates.)

To the critical level of ε there corresponds the highest value of the stable rate of growth ϕ_{cr}. Beyond this level of ϕ, an expansion of the economy at a constant rate is not feasible, and the system tends to develop a secular inflationary boom.

23. As shown in the previous paragraph, the stable rate of growth ϕ is an increasing function of the intensity of innovations ε in the interval (0, ε_{cr}). Thus for this range of ϕ we have:

$$\phi = f(\varepsilon) \tag{43}$$

This function is represented on Fig. 45 by the full line.

Substituting this expression of ϕ into equation (42), we obtain:

$$\frac{Y'}{K'} = \frac{h}{1-n} f(\varepsilon) + \frac{r}{1-n} \tag{44}$$

Thus the degree of utilization is an increasing function of the intensity of innovations when the latter ranges from zero to the critical level ε_{cr}. This relationship is represented by the curve HI on Fig. 46. (Different scales are used for abscissae and ordinates.)

What happens to the degree of utilization when the intensity of innovations exceeds the critical value? As a result of the tendency

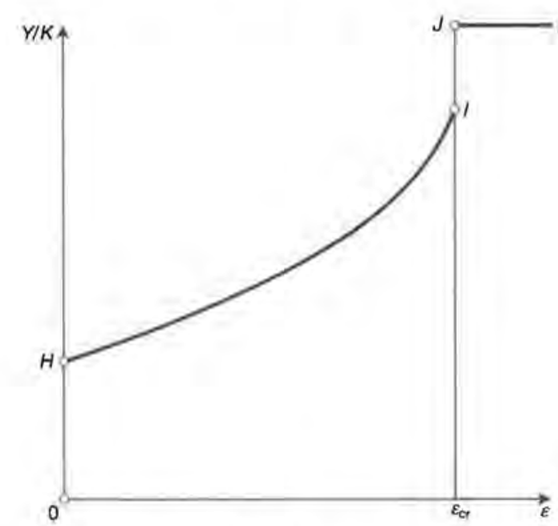

FIG. 46

towards the secular boom, the degree of utilization of equipment achieves after some time, and maintains thereafter, its highest possible level. Thus for the values of the intensity of innovations exceeding ε_{cr} the degree of utilization is represented by a horizontal line JL.

It follows clearly that the semi-exogenous factors play a decisive role in the determination of the degree of utilization of equipment. If the intensity of innovations is relatively low, the long-run utilization of equipment is far from full. If it exceeds a certain level, on the other hand, the tendency towards a secular boom pushes the utilization of equipment up to its highest possible level.

This would provide an explanation for the phenomenon of long-run excess capacity, which to a varying degree makes its appearance in a 'normal' capitalist economy. On the other hand, in the early stages of the development of capitalism, when the intensity of innovations (in the broadest sense) was very high, capital equipment was being used up to capacity.

Trend and the Business Cycle[1]

(1968)

1. Introduction

The contemporary theory of growth of capitalist economies tends to consider the problem of trend and the business cycle in terms of a moving equilibrium rather than adopting an approach similar to that applied in the theory of business cycles. The latter consists of establishing two relations: one based on the impact of the effective demand generated by investment upon profits and the national income; and the other showing the determination of investment decisions by, broadly speaking, the level and the rate of change of economic activity. The first relation does not involve now particularly intricate questions. The second, to my mind, remains the *pièce de résistance* of economics.

I do not see why this approach should be abolished in the face of the problem of long-run growth. In fact, the long-run trend is only a slowly changing component of a chain of short-period situations; it has no independent entity, and the two basic relations mentioned above should be formulated in such a way as to yield the trend-cum-business cycle phenomenon. It is true that the task is incomparably more difficult than in the case of another abstraction, that of the 'pure business cycle' and, as will be seen below, the results of such an enquiry are less 'mechanistic'. This, however, is no excuse for dropping this approach, which seems to me the only key to the realistic analysis of the dynamics of a capitalist economy.

I myself approached this problem in my *Theory of Economic Dynamics*[1] and my 'Observations on the Theory of Growth'[2] in a manner which now I do not consider entirely satisfactory: I started by developing a theory of the 'pure business cycle' in a stationary economy, and I later modified the respective equations to get the trend into the picture. By this separation of short and long-run influences I missed certain repercussions of technical progress which affect the dynamic process as a whole. I shall now try to avoid splitting my argument into these two stages just as much as I shall try to avoid

[1] See pp. 322–37 above. [2] See pp. 411–34 above.

applying the approach of moving equilibrium to the problem of growth.

2. Assumptions

Our simplifying assumptions fall into a few categories. We assume a closed system and leave out government activities, concentrating deliberately on a self-contained *laissez-faire* capitalist economy. We also leave aside worker savings, which are definitely unimportant.

We also make some assumptions for the mere sake of simplicity which *are* unrealistic; however, if the respective factors were taken into account this, while complicating the argument, would not change it basically. We ignore the time-lag in consumer expenditure. This again is realistic with regard to worker consumption but not so with regard to that of capitalists. However, as long as the time-lag between investment decisions and investment is emphasized, disregarding that between profits and capitalist consumption does not distort the analysis.

Similarly, we leave out overhead labour (consisting mainly of salary-earners) and thus assume that all labour receipts are prime costs. This would again distort the changes in the relation between investment and the national income in the course of the trade cycle, were it not for the fact that we distinguish in capitalist consumption a part which does not depend on the current level of profits. This element leads to proportional changes in gross investment in the course of the business cycle being higher than those in profits and the national income. Thus the factor of overhead labour, having similar repercussions, may be disregarded without distorting the familiar pattern of the trade cycle.

Finally, the most drastic simplification is ignoring changes in inventories so that investment is exclusively in fixed capital. Again, such an assumption would not be acceptable if not for the fact that—as will be seen below—our formula for investment decisions includes a member proportional to the increment of profits in the year considered. Since the increase in inventories may be assumed to be proportional to that of the national income which bears in our model a stable relation to profits, this prevents in this case also a distortion of the dynamics of the system.

In short: we do make drastic simplifications to concentrate the attention of the reader on the most essential issues without, however, throwing out the baby along with the bath-water.

3. Investment, Saving, Profits, and National Income

Let us denote gross investment in fixed capital in a given year by I, gross saving by S, capitalist consumption by C_K and gross profits by P (all these magnitudes at constant prices). Since the system is closed, government expenditure and revenue is disregarded, the workers are assumed not to save and increases in inventories are omitted, we have

$$S = I \tag{1}$$

and

$$P = I + C_K. \tag{2}$$

Moreover, we may plausibly postulate, neglecting the time-lag between capitalist consumption and profits, that

$$C_K = \lambda P + A, \tag{3}$$

where λ is a rather small fraction and where A is a certain slowly changing magnitude dependent on past economic and social developments. It may be called a semi-autonomous variable because we shall not try to relate it to any other variables entering our argument, in which therefore it will be considered, at least at the present stage, a slowly changing function of time $A(t)$. From equations (2) and (3) it follows directly

$$P_t = \frac{I_t + A(t)}{1 - \lambda}, \tag{4}$$

or denoting $1/(1 - \lambda)$ by m

$$P_t = m(I_t + A(t)), \tag{4a}$$

where m is greater but not much greater than 1.

Next we shall deal briefly with the relation between profits P and the gross national income Y. We shall consider the ratio P/Y which we denote by q, a parameter which, although in the long run it may be subject to important changes, will be treated in our equations as a constant. The justification of this is as follows.

First, since we leave aside overhead labour, all labour costs are prime costs. But, as I have indicated time and again in my previous work, the relative share of labour prime costs in the national income depends on the mark-ups over the prime costs and the relation between unit wage costs and prices of basic raw materials.[3]

Next, as long as the resources of the economy are far from being fully utilized—and this I believe to be the typical condition of a

[3] See e.g. pp. 225–7 above.

developed capitalist economy—the mark-ups are determined by semi-monopolistic and monopolistic factors which I nicknamed 'degree of monopoly'. It is this term, I think, that facilitated the dismissal of the theory as being 'tautological'. However, in the *Theory of Economic Dynamics* I showed, I believe, that in any case no problem of *tautology* is involved.[4] If the price is not determined by the equilibrium of supply at full utilization of equipment, on the one hand, and demand, on the other—the prices are *fixed* by the firms on the basis of the average prime costs and the average price of the product group in question.[5]

By assuming $q = (P/Y)$ constant, we confine our discussion to the case when the pricing process, and changes in the ratio of unit wage costs to prices of basic raw materials, do not cause a change in q. Of course, the assumption that q is a parameter which under conditions described *may* be constant is incompatible with the approach considering q to be just the instrument of securing—through price flexibility in relation to demand—the full utilization of resources. (Business cycles appear in such an approach as merely 'lapses from full employment' resulting from the imperfection of this instrument.) However, we consider such an approach utterly unrealistic, since a *laissez-faire* capitalist economy used to achieve a more or less full utilization of resources only at the top of a boom, and frequently not even then. Nor did these full-employment booms fill a major part of the cycle.

Thus we shall stick to our assumption and postulate

$$Y = \frac{P}{q}. \tag{5}$$

4. Investment Decisions, I

We shall make an attempt here to attack the problem of determination of investment decisions in a somewhat novel way. But to prepare the ground for it we have first to introduce a concept of that level of investment in a given year at which the new equipment would yield a certain definite gross rate of profit. This 'standard rate of profit' is the reciprocal of the so-called 'pay-off period' during which the capital invested is recovered. Let us denote this rate by π. Let us, moreover, denote by $I(\pi)$ that level of new investment which would 'fetch', under conditions prevailing in the year considered, the rate of profit π. It

[4] See pp. 209–16 above. [5] See pp. 210–14 above.

is clear that the higher, *ceteris paribus*, the level of investment, the lower the rate of profit it fetches. Thus if the rate of profit actually yielded by new equipment is higher than π, then $I(\pi)$ is higher than actual investment I, and vice versa; and obviously $I(\pi) = I$ if these rates are equal.

We shall now try to establish the determinants of $I(\pi)$. If we leave aside for a moment the increase in productivity due to technical progress, $I(\pi)$ may be assumed to be proportional to the increment in 'real' profits from the beginning to the end of the year considered, which we denote by ΔP. Since ample unused productive capacities are postulated to be in existence, new investment will capture only a part of profits $n\Delta P$, where n is a rather small fraction. Thus since $I(\pi)$ is defined as that level of investment which fetches the rate of profit π, we shall have in the case presently discussed $I(\pi) = n\Delta P/\pi$.

Let us now introduce the influence of technical progress. With 'real' gross profits in the year considered, P, and the 'real' gross national income, Y, we obtain for 'real' labour costs $Y - P$. This will be also approximately the level of the labour costs associated with old equipment because the new capacities put to use in the year considered are small in relation to those of the total existing capital equipment. Now during the year considered the 'real' labour costs associated with old equipment will rise as a result of the increase in productivity caused by technical progress, Y and P being expressed in constant prices.

As a consequence of this rise, profits yielded by old equipment will fall. If the price of a product were uniform, the transfer of output would occur merely through some obsolete equipment going out of use, and through the transfer of profits through the reduction of the profit margins for the produce of working old equipment. In fact, however, the market prices of the products are not uniform, and the transfer of profits occurs also in part through the transfer of output of working old equipment to the new one. It follows that profits yielded by old equipment will fall in the year considered by $\alpha(Y - P)$, where α is higher the greater the rate of increase in productivity resulting from technical progress.

Now the loss in profits yielded by old equipment is—given the total profits P—the gain in profits captured by the new plant. In fact, therefore the profits captured by the level of investment $I(\pi)$ will be $n\Delta P + \alpha(Y - P)$ rather than $n\Delta P$, and the corresponding modified formula for $I(\pi)$ is

$$I(\pi) = \frac{n\Delta P + \alpha(Y - P)}{\pi} \tag{6}$$

As a first approximation to the problem of the level of investment fetching a 'standard rate of profit' π, we shall treat n and α as constants. The equation conveys, then, in any case the fact that the level of investment 'capturing' the rate of profit π depends on two basic determinants: the increment in total profits, and the transfer of profits from old to new equipment, resulting from technical progress.

According to equation (5)

$$\alpha(Y - P) = \alpha\left(\frac{P}{q} - P\right) = P\alpha\left(\frac{1}{q} - 1\right) = \delta P \tag{7}$$

where we denote $\alpha[(1/q) - 1]$ by δ.[6] Thus we may write formula (6) in the form

$$I(\pi) = \frac{n\Delta P + \delta P}{\pi} \tag{8}$$

5. Investment Decisions, II

We shall approach the problem of investment decisions in two stages. In this section we shall omit a certain rather complicated factor which, however, is of considerable importance. We shall introduce it in the next section.

We assume that the investment decisions in a given year depend on two sorts of consideration: (i) those concerning the gross entrepreneurial savings (including those out of dividends of the controlling groups of shareholders of joint-stock companies) accruing in this period, and (ii) those concerning the prerequisites for their reinvestment.

The former are tied with the problem of the entrepreneurial capital being the basis of investment because of limited capital markets and the 'increasing risk' involved in making use of it.[7]

The considerations concerning the prerequisites for reinvestment of entrepreneurial savings—i.e. whether the investment decisions taken in a given year are to be equal to entrepreneurial savings, exceed them, or fall short of them—are closely related to the idea of the 'normal rate of profit' π on new investment. We assume that if such investment that would capture in the year considered the rate of profit π is equal to what was the actual investment in this period, i.e. $I(\pi) = I$, the entrepreneurial savings are just being reinvested. If $I(\pi) > I$, more than that is invested, and vice versa. Thus, denoting investment decisions taken in the period considered by D and entrepreneurial savings by E, we may write

$$D = E + r(I(\pi) - I)$$

where r is a coefficient measuring the intensity of the reaction of the entrepreneurs to the difference $I(\pi) - I$.

Substituting in this equation the expression for $I(\pi)$ as given by formula (8), we obtain

$$D = E + r\left(\frac{n\Delta P + \delta P}{\pi} - I\right)$$

We shall assume that gross entrepreneurial savings bear a constant relation to rentier savings (which are much smaller). We thus have

$$E = eS \tag{9}$$

where e is less but not much less than one, and taking into consideration $S = I$ (equation 1), we obtain

$$D = eI + r\left(n\Delta P + \frac{\delta P}{\pi} - I\right)$$

The characteristic feature of this formula for investment decisions D per unit of time, as compared with other approaches to this problem (including my previous work on the subject), is the member δP which accounts explicitly for the stimulus to investment due to higher productivity of labour in the new plant, enabling them to capture profits from old equipment. A very imperfect substitute for allowing for this factor in other theories (including my own) was to carry the argument in terms of net rather than gross investment.

6. Investment Decisions, III

The formula for investment decisions must be still supplemented in order to account for an additional factor. The above argument is

[6] As profits yielded by equipment decline by a fraction δ p.a. as a result of obsolescence, it is in fact the rate of depreciation in the literal sense, because by so much decreases the profit-yielding capacity of capital equipment, and the same may be said about its 'real value' (see s. 10).

[7] See pp. 277–81 above.

based on the idea that entrepreneurs scrutinize how the new investment is 'doing' in terms of profitability, and on this basis form a decision whether just to reinvest their savings, to exceed their level, or to fall short of it: this depends on whether the rate of profit on new actual investment proves to be equal to, higher, or lower than the 'standard rate' π. An important element of how the new investment is doing is the rise in productivity due to technical progress, which causes a transfer of profits from old to new equipment. But there is still another effect of innovations.

In the year considered, new inventions come within the compass of the entrepreneurs. Thus they expect to do better out of their investment than those whose investment materialized in the year considered. In fact, this will not prove true for the investing entrepreneurs as a body: if the increase in productivity is not accelerated, the investment materializing in the next year will not be more profitable on average than that in the present one. Nevertheless, those entrepreneurs who are first to avail themselves of the technical novelties *will* do better than the average.

To account for this additional stimulus to investment which is a direct outcome of innovations, we shall add to the right-hand side of the formula for investment decisions a slowly changing magnitude, depending—similarly to the stable part of capitalist consumption—on past economic, social, and technological developments. This semi-autonomous variable may be considered, at least at the present stage, a slowly changing function of time $B(t)$. We thus have

$$D_t = eI_t + r\left(\frac{n\Delta P_t + \delta P_t}{\pi} - I_t\right) + B(t) \tag{10}$$

7. The Equation of Dynamics of Investment

Denoting the time-lag between investment decisions and actual investment by τ, we have

$$D_t = I_{t+\tau} \tag{11}$$

and thus we may write equation (10) as

$$I_{t+\tau} = (e - r)I_t + \frac{r}{\pi}(n\Delta P_t + \delta P_t) + B(t)$$

We shall now substitute into this equation profits expressed in terms of investment in accordance with formula (4a), i.e. $P_t = m[I_t + A(t)]$.

We obtain

$$I_{t+\tau} = \left(e - r + \frac{r}{\pi}m\delta\right)I_t + \frac{r}{\pi}mn\Delta I_t + \frac{r}{\pi}m\delta A(t) + \frac{r}{\pi}mn\Delta A(t) + B(t) \tag{12}$$

Let us now introduce the notations

$$a = e - r + \frac{r}{\pi}m\delta = e - r\left(1 - m\frac{\delta}{\pi}\right) \tag{13}$$

$$b = \frac{r}{\pi}mn \tag{14}$$

$$F(t) = \frac{r}{\pi}m\delta A(t) + \frac{r}{\pi}mn\Delta A(t) + B(t) = \frac{r}{\pi}m\delta A(t)\left(1 + \frac{n}{\delta}\frac{\Delta A(t)}{A(t)}\right) + B(t) \tag{15}$$

We shall assume $a < 1$, which is plausible in view of the likely values for the parameters involved. First, e being the relative share of entrepreneurial savings in total savings, is less than one. Moreover, $m(\delta/\pi)$ is very likely to be less than one as well. Indeed, m is not much more than one (see section 3). But π is very probably much higher than δ for the following reasons. The 'standard rate of profit' is the reciprocal of the so-called 'pay-off period' during which the entrepreneurs expect 'normally' to recover the capital invested. For the economy as a whole, it may be assumed to be not more than, say, 6–7 years, and thus π may be assumed to be about 15%. Now, according to equation (7), $\delta = \alpha[(1/q) - 1]$, where α is of the order of the annual increase in the 'real' labour costs associated with old equipment and q the relative share of profits in the national income. It is clear that δ can hardly exceed 5%. We thus arrive at the conclusion that $e < 1$ and $r[1 - m(\delta/\pi)] > 0$, from which follows directly $a < 1$.

As to the function $F(t)$ determined by equation (15), it may be assumed to be a slowly changing function of time determined by past economic, social, and technological developments. Indeed, $A(t)$ and $B(t)$ were assumed to be this type of function. Moreover, we interpret the slowly changing function of time as one whose annual increment is a small fraction of its level. We postulate

$$\left|\frac{n}{\delta}\frac{\Delta A(t)}{A(t)}\right|$$

to be small in relation to one (n is a rather small fraction; see section 4). It will be easily seen that then $F(t)$ is a slowly changing function in this sense as well.

We may now write our equation of dynamics of investment in the form

$$I_{t+\tau} = aI_t + b\Delta I_t + F(t) \tag{12a}$$

where a, b, and $F(t)$ are determined by equations (13), (14), and (15); a is assumed to be less than one and $F(t)$ a slowly changing function of time rooted in past developments.

8. Trend and Business Cycle Components of Investment

On certain assumptions about the slowly changing function $F(t)$, equation (12a) has as a particular solution a positive steady function of time y_t. If we subtract from equation (12a) the equation

$$y_{t+\tau} = ay_t + b\Delta y_t + F(t) \tag{16}$$

we obtain

$$I_{t+\tau} - y_{t+\tau} = a(I_t - y_t) + b\Delta(I_t - y_t) \tag{17}$$

The latter equation, however, is known to generate cyclical fluctuations of $I_t - y_t$. (The necessary condition for this is $a < 1$; this is fulfilled according to the argument in section 7.)[8]

The problem of determining y_t is rather intricate. We shall assume $F(t)$ to be such a type of function that equation (16) is satisfied by a y_t steadily but slowly changing (which means that $|(\Delta y_t/y_t)| \leqslant \beta$ where β is a small fraction). Such functions $F(t)$ do exist because the condition is fulfilled for an exponential function $F(t) = ce^{\beta t}$. Indeed, equation (16) is satisfied then by

$$y_t = \frac{e^{\beta t}}{1 - a + e^{\beta t} - 1 - b^{\beta}}$$

where the denominator is positive for a sufficiently small β. The functions of the type mentioned constitute, however, a broader class covering what is, roughly speaking, the nearly exponential functions, i.e. functions differing very little from exponential functions in short periods, although this may not be the case in sufficiently long stretches of time.

[8] See e.g. pp. 288–9 above.

Let us write equation (16) in the form

$$y_{t+\tau} - ay_t - b\Delta y_t = y_{t+\tau} - y_t + (1-a)y_t - b\Delta y_t = F(t)$$

from which follows directly

$$y_t = \frac{F(t)}{1 - a + \dfrac{y_{t+\tau} - y_t - b\Delta y_t}{y_t}}$$

Since y_t is, according to our assumptions, a positive slowly changing function of time, and the time-lag between investment and investment decisions τ is only a few years, we may write

$$\frac{y_{t+\tau} - y_t - b\Delta y_t}{y_t} \leqslant \gamma$$

where γ is also rather small. We thus obtain for the particular solution of equation (12a)

$$y_t = \frac{d_t}{1-a} F(t) \tag{18}$$

where

$$\frac{1}{1 + \dfrac{\gamma}{1-a}} \leqslant d_t \leqslant \frac{1}{1 - \dfrac{\gamma}{1-a}} \tag{19}$$

Let us denote the maximum of $|\Delta F(t)/F(t)|$ by ζ. It follows from condition (19) that the average rate of change of y_t over a period of several years cannot differ much from that of $F(t)$, and thus cannot exceed much in absolute value the maximum rate of change ζ of $F(t)$.

Or, to put it a little differently for a particular case: if $F(t)$ shows an increasing tendency over a period of several years, the average rate of growth of y_t over this period is approximately equal to that of $F(t)$, and thus cannot exceed ζ by much.

We may write now

$$I_t = y_t + (I_t - y_t) \tag{20}$$

where y_t is the trend component (which is not necessarily increasing) while $I_t - y_t$ is the cyclical component corresponding to equation (17).

From formula (4a) we may derive a corresponding equation for profits:

$$P_t = m[I_t + A(t)] = m[y_t + A(t)] + m(I_t - y_t) \tag{21}$$

Obviously $m[y_t + A(t)]$ is the trend component and $m(I_t - y_t)$ the business cycle component of profits.

For the national income we obtain from formula (5)

$$Y_t = \frac{P_t}{q} = \frac{m}{q}[y_t + A(t)] + \frac{m}{q}(I_t - y_t) \qquad (22)$$

9. Discussion of the Trend Component

For the time being, we know of the trend components of investment, profits, and the national income merely that they are positive functions of time which in longer periods exhibit approximately the same average rate of change as $F(t)$. We cannot say in the light of the above argument whether they increase or decline. The latter case is, by the way, by no means absurd: it may in fact happen. We shall now try to outline an economic situation in which there does exist a tendency for an increasing trend.

Imagine that, for a certain, fairly long, initial period of s years, profit, and thus also national income, showed a significant increase after elimination of the cyclical fluctuations. It is a plausible assumption that after this period both the stable part of capitalist consumption $A(t)$ and the immediate impact of innovations upon investment $B(t)$ will tend to grow for a number of years unless there were some changes in social patterns or in the stream of inventions to upset this tendency. This, however, means that $F(t)$ will also show an increase in this period, and that, according to section 8, the trend component of investment y_t, as well as that of profits and the national income, will grow. Thus profits and the national income will exhibit a rising tendency in an s-year period later than the initial one, which will make for a continuation of the rise in $A(t)$ and $B(t)$. In this way the tendency of the economy for growth proves to be self-sustaining.

As said above, the average rate of growth of y_t over a longer period cannot much exceed ζ, the maximum rate of change of $F(t)$. If the maximum rate of change of the stable part of capitalist consumption $A(t)$ does not exceed ζ either, the same is true—according to equations (21) and (22)—of profits and the national income.

So far we have dealt with the problem of the trend of gross investment, profits, and the national income. Is it possible, adopting our approach, to say anything on such subjects as the rate of growth of the stock of fixed capital and the 'trend value' of the degree of utilization of capacity? We shall argue that, for these problems, the degree of monopoly (influencing considerably the relative share of profits in the national income) and the ceiling ζ of the rate of change of the function $F(t)$ are of crucial importance. Before, however, embarking upon this discussion, it is necessary to give a definition of net investment and the stock of fixed capital.

10. Depreciation, the Stock of Fixed Capital and Net Investment

We shall define the rate of depreciation for a capitalist economy in the literal sense of the word. According to section 4, profits yielded by the old equipment diminish by a fraction δ p.a. as a result of technical progress. Thus the profit-yielding capacity of equipment declines by the same fraction. The 'real value' of old equipment may thus be plausibly assumed to decline each year in the proportion $1 - \delta$.[9] Thus the 'trend real value' of the stock of fixed capital K_t may be evaluated as follows:

$$K_t = y_t + y_{t-1}(1-\delta) + y_{t-2}(1-\delta)^2 + \ldots \qquad (23)$$

and the depreciation in year t as δK_t. Thus for the 'trend value' of net investment we have

$$\Delta K_t = y_t - \delta K_t \qquad (24)$$

and for the respective rate of growth of the stock of fixed capital

$$\frac{\Delta K_t}{K_t} = \frac{y_t}{K_t} - \delta \qquad (24a)$$

The approach to the problem of depreciation outlined here is, I think, more realistic than that based on equipment actually scrapped. Equipment may not be scrapped, but, being obsolete, may be of very little practical use, which shows the weakness of the definition in question. What we suggest here is fairly close to the business concept, although, of course, δ need not be assumed equivalent to the conventional rates of depreciation used mainly for the sake of calculating the taxable income.[10]

[9] See n. 6 above.

[10] It is easy to see from equation (16) that, in the case when $F(t)$ is a constant F, the value of y_t will be as well a constant equal to $F/(1-a)$. According to equation (23) the fixed capital K_t will be in such a case $F/(1-a)\delta$ and thus the depreciation δK_t is equal to $F/(1-a)$ or to gross investment. Consequently this will be the case of a stationary economy in which cyclical fluctuations will take place around the depreciation level.

Equation (22) permits us to estimate, on the basis of our assumptions about the function $F(t)$, the lower limit of the stock of capital K_t. Taking into account formula (18), we may write this equation in the form

$$K_t = \frac{1}{1-a}(d_t F(t) + d_{t-1} F(t-1)(I-\delta) + d_{t-2} F(t-2)(I-\delta)^2 \ldots)$$

Since, according to (19),

$$d_t \geqslant \frac{1}{1+\dfrac{\gamma}{1-a}}$$

and $F(t)$ cannot increase at a rate higher than ζ, we have the inequality

$$K_t \geqslant \frac{F(t)}{(1-a)\left(1+\dfrac{\gamma}{1-a}\right)}\left(1+\frac{1-\delta}{1+\zeta}+\left(\frac{1-\delta}{1+\zeta}\right)^2 \ldots\right)$$
$$= \frac{F(t)}{(1-a+\gamma)}\frac{1}{1-\dfrac{1-\delta}{1+\zeta}}$$
$$= \frac{(1+\zeta)F(t)}{(1-a+\gamma)(\zeta+\delta)} > \frac{F(t)}{(1-a+\gamma)(\zeta+\delta)}$$

But from equations (18) and (19) it follows that

$$y_t \leqslant \frac{F(t)}{(1-a)\left(1-\dfrac{\gamma}{1-a}\right)} = \frac{F(t)}{1-a-\gamma}$$

Thus

$$\frac{y_t}{K_t} < (\zeta+\delta)\frac{1-a+\gamma}{1-a-\gamma} \tag{25}$$

and

$$\frac{\Delta K_t}{K_t} = \frac{y_t}{K_t} - \delta < \zeta\frac{1-a+\gamma}{1-a-\gamma} + \delta\frac{2\gamma}{1-a-\gamma} \tag{26}$$

It follows that ζ, the maximum rate of change of $F(t)$, is a very important factor in the determination of the ceiling of the rate of capital accumulation. Since γ is fairly small in relation $1-a$, it will be easily seen that this ceiling is close to ζ.

11. The Long-Run Utilization of Productive Capacity

It follows that it is difficult to give a precise definition of productive capacity. There are elements of existing capital equipment that could produce only at very high costs and are of little practical importance. Leaving aside for a moment the possible variability of the technique of production, we may plausibly assume a rough proportionality between 'practical productive capacity' and the stock of fixed capital K as defined above. Indeed, the obsolete elements are reduced in importance by continuous depreciation of their volume by a fraction δ p.a. Thus the productive capacity would be represented by hK where the coefficient h reflects the average technique of production.

Adopting this definition of productive capacity, we may now discuss the problem of the 'trend degree of utilization of equipment'. The trend component of the national income is, according to equation (22),

$$\frac{m}{q}[y_t + A(t)] \quad \text{or} \quad \frac{m}{q}y_t\left(1+\frac{A(t)}{y_t}\right)$$

Thus the degree of utilization of productive capacity u_t may be represented as

$$u_t = \frac{\dfrac{m}{q}y_t\left(1+\dfrac{A(t)}{y_t}\right)}{hK_t} = \frac{m}{hq}\frac{y_t}{K_t}\left(1+\frac{A(t)}{y_t}\right) \tag{27}$$

Taking into consideration formula (25), setting the ceiling for y_t/K_t, we obtain

$$u_t < \frac{m}{h}\left(1+\frac{A(t)}{y_t}\right)\frac{1-a+\gamma}{1-a-\gamma}\frac{\zeta+\delta}{q} \tag{28}$$

Thus the ceiling of the degree of utilization of equipment will to a great extent depend on the ratio $(\delta+\zeta)/q$, which we shall examine below in more detail.

It is to be recalled that, according to equation (7),

$$\delta = \alpha\left(\frac{1}{q}-1\right)$$

i.e. the higher the relative share of profits in the national income, the lower the impact of the increase in 'real costs' associated with old equipment on the rate of decline of the respective profits δ. It follows directly

$$\frac{\zeta+\delta}{q}=\frac{1}{q}\left[\zeta+\alpha\left(\frac{1}{q}-1\right)\right]$$

Thus the utilization of equipment is considerably affected by the level of q (depending to a great extent on the 'degree of monopoly') and ζ the maximum rate of growth of $F(t)$.[11] This can be easily illustrated by the following examples:

ζ	α	δ	$\frac{\zeta+\delta}{q}$
0.05	0.04	0.45	0.22
0.05	0.04	0.50	0.18
0.04	0.04	0.50	0.16

It is clear that certain combinations of q and ζ will result in a chronic under-utilization of equipment, a frequent phenomenon in developed capitalist economies.

12. Concluding Remarks

It follows that in our approach the rate of growth at a given time is a phenomenon rooted in past economic, social, and technological developments rather than determined fully by the coefficients of our equations as is the case with the business cycle. This is very different from the approach of purely 'mechanistic' theories (based frequently on such fallacious a priori assumptions as a constant degree of long-run utilization of equipment), but seems to me much closer to the realities of the process of development. To my mind, future enquiry into the problems of growth should be directed, not towards doing without such semi-autonomous magnitudes as $A(t)$ and $B(t)$, but rather towards also treating the coefficients used in our equations (m, n, δ, q) as slowly changing variables rooted in the past development of the system.

[11] The level of q and ζ need not affect significantly $A(t)/y_t$ and $(1-a+\gamma/1-a-\gamma)$, which also enter the expression for the ceiling of the degree of utilization determined by formula (28).

The Problem of Effective Demand with Tugan-Baranovsky and Rosa Luxemburg[1]
(1967)

I

In the discussions about the market for the national product in terms of the Marxian schemes of reproduction, the positions taken by Tugan-Baranovsky and Rosa Luxemburg are at opposite poles. Tugan-Baranovsky denies altogether that the problem of markets may constitute an obstacle to the development of capitalism, which thus depends entirely on the increase in productive capacity. Rosa Luxemburg, on the contrary, considers expanded reproduction in a closed capitalist system impossible, attributing all its development to the possibility of selling its wares in the markets external to it, i.e. in the non-capitalist sector of the world economy.

It is most interesting that both authors commit important errors in their arguments and that nevertheless their theories give a correct picture of some essentials of capitalist economy. Tugan-Baranovsky rightly stresses the 'antagonistic character' of the capitalist regime, as a result of which the production of consumer goods is not its final aim and the demand for them is not the motive force of its development. Similarly, although Rosa Luxemburg's theory that the development of capitalism depends solely on the 'external markets' is not correct, these markets are still an important part in the dynamics of capitalism.

The two theories find something like a point of intersection in present-day—especially US—capitalism, where a decisive role is played by a market created by the government for armament production.

II

The theory of Tugan-Baranovsky is in fact very simple: the author maintains that with 'appropriate proportions' of use made of national product the problem of effective demand does not arise. This argument, illustrated numerically by means of Marxian schemes of reproduction, is in fact tantamount to the statement that, at any level of consumption of workers and capitalists, the national product may be sold provided investment is sufficiently large. These are the 'proportions' between consumption and investment, which must be established in order that the total production should be purchased. A distortion of this proportion leads to crises in the course of which the deviation from it is being corrected. Thus the fundamental idea of Tugan rests on an error that what *may* happen is actually happening, because he does not show at all why capitalists in the long run are to invest to the extent which is necessary to contribute to full utilization of productive equipment.

Tugan stresses the point that his theory will be right even in the most adverse conditions of actual curtailment of worker consumption and stability of capitalist consumption. Obviously, on paper even this may be offset by a sufficiently high level of investment. The author, by the way, does not anticipate the criticism that capitalists may be unwilling to use the surplus value by investing so much. Instead he answers a critic of a different type, who would consider absurd investment the purpose of which is production of investment goods rather than that of consumer goods. After having 'fixed' his critic in this way, Tugan gives a perfectly sensible answer.

The capitalist system is not a 'harmonious' regime the purpose of which is the satisfaction of the needs of its citizens, but an 'antagonistic' regime which aims to secure profits for capitalists. As a result, there is nothing absurd in basing the development of the system on expansion of a production of 'coal and steel' which serves merely to develop the production of these commodities. The production of 'coal and steel' is as justified as production of bread if it is profitable. Consumption is the final aim and proof of a 'harmonious' but not of an 'antagonistic' regime.

It is this part of Tugan-Baranovsky's argument that I consider his lasting contribution to the analysis of functioning of capitalism in its various phases. It is worth noticing that the theory of Tugan is, despite his 'optimism', deeply anti-capitalistic: it is just the absurdity of capitalism that makes its development immune to the problem of finding markets for its products.

III

Let us go back, however, to our critique of the theory of Tugan-Baranovsky (which is equivalent to the statement of Rosa Luxemburg on the subject of this theory). Tugan considers the *possible* use of the national product created by full utilization of the productive forces as the actual fact—at least, if we disregard the business cycles. The following problem arises here: the approach is certainly faulty, but it does not follow that Tugan's theory is wrong, merely completely unfounded. Perhaps after all the problem of the markets does not really constitute an obstacle to expanded reproduction of a capitalist economy. In order to give a complete answer to this query, it is necessary to construct a theory of investment decisions such as it would cover all aspects of dynamics of capitalist economy and not only those relevant to the business cycle. This is not the place, however, to develop such a theory, which I always considered to be the central problem of the political economy of capitalism. Here I shall try to show that expanded reproduction—even in conditions much more favourable than were on purpose assumed by Tugan-Baranovsky—is by no means obvious, and that it requires a certain supporting factor, for instance, a factor which would depend on innovations (and thus not necessarily Rosa Luxemburg's 'external markets').

Imagine the process of accumulation of capital, say 4% p.a. Let us assume that at the start capital equipment and labour are fully utilized. Let the depreciation amount to 3% p.a. so that gross investment is equal to 7% of capital. Let us also assume a constant share of gross profits (including depreciation) in the gross national product, and constant proportions in the distribution of gross profits between gross accumulation and capitalist consumption. Thus gross accumulation bears a constant relation to the national income. The process of accumulation consists in the expansion of productive equipment at 4% p.a. due to investment, and since gross accumulation bears a constant relation (7%) to capital, gross accumulation also expands by 4% p.a. Given the constant share of gross accumulation in national income, income would also grow at the rate of 4% p.a. Thus full utilization of equipment continues, and the problem of effective demand does not seem to arise.

All right, but why should capitalists continue to invest at a level of 7% of capital? Simply because the process has been going for some time, this investment has been 'justified', and the capitalists do not anticipate any difficulties in selling their products with reproduction expanding at 4% p.a., and therefore they do not hesitate to continue their game.

Let us, however, consider a case when—for instance, as a result of a change in the social structure of the capitalist class—capitalists are prepared to invest only 6% of the capital p.a. (without changing the relative share of their consumption in gross profits). The problem of effective demand then immediately makes its appearance. The ratio of investment to the stock of capital falls by one-seventh, i.e. by about 14%. There arises thus the problem of over-production: because of the constancy of relation between accumulated and consumed parts of profits, the latter will also fall by 14% in relation to capital; through reduction of employment in investment goods industries and in industries producing consumer goods for capitalists, there will be also a reduction of demand for wage goods and reduction of employment in those industries—until working-class income also falls by 14% in relation to capital, so that the proportion between profits and wages is maintained as assumed. This general situation of over-production in turn adversely affects the investment decisions of capitalists. Now they are not willing to invest even 6% of capital, contributing thus to further deterioration of the situation.

Yes, somebody may say, this is a typical crisis which will be followed by a period of prosperity, and these fluctuations will just occur around the process of expanded reproduction described initially. There is, however, nothing to substantiate this argument. After a breakdown of the moving equilibrium, no trace of the 4% or 3% annual long-run increase was left in the economy. The economy may as well settle to a state of simple reproduction with cyclical fluctuations around it.

IV

We have moved one step forward: we have shown that the development of capitalism which does not encounter the problem of effective demand, even if it is possible, is unstable. However, a process of an unstable equilibrium ceases to exist if it is not supported by some stabilizing force. In relation to our problem it may be said that an expanded reproduction will take place if there exist factors that simply do not permit the system to remain in the state of simple reproduction (or stationary state): the initial state of simple reproduction leads to a level of gross investment exceeding depreciation.

Such a factor may be first and foremost the influence of technological innovations, discovery of new sources of raw materials, and the like, which opens new perspectives to the capitalists. The technical progress appears in this approach not merely as depreciating old plant, which leads to its replacement by new plant; it is also a stimulus for investment over and above that level, resulting from the fact that capitalists investing 'today' think to have an advantage over those having invested 'yesterday' because of technical novelties that have reached them.

The above should not be construed in the sense that such a possibility of expanded reproduction—without 'external markets'—is tantamount to the elimination of the influence of inadequate effective demand. Indeed, the rate of expanded reproduction resulting from this factor is by no means necessarily adequate to secure the full utilization of equipment, or even to keep the degree of this utilization at a constant level. Innovations break the impasse of a simple reproduction only to some extent, and they do not warrant the utilization of resources in Tugan-Baranovsky's sense.

From the last two sections it follows in any case: (i) as a result of the problem of effective demand, expanded reproduction is not a natural and obvious state of the capitalist system; (ii) nevertheless, such reproduction is not necessarily a result of 'external markets'. Thus, although these sections are meant primarily as a criticism of the theory of Tugan-Baranovsky, they constitute at the same time a starting-point for a discussion of the views of Rosa Luxemburg, with which we shall now deal.

V

Rosa Luxemburg considers expanded reproduction in the long run without the existence of 'external markets' to be not only far from obvious but downright impossible. It should be noticed that she argues this point as naïvely as does Tugan-Baranovsky showing the irrelevance of the problem of effective demand for the development of capitalism. In her consideration of the taking of investment decisions by capitalists, she somehow implies that they are being taken by the capitalist class as a whole. And this class is frustrated by the knowledge that there is no final market for the surplus of goods corresponding to accumulation: so why invest?

Now capitalists do many things as a class, but they certainly do not invest as a class. And if that *were* the case, they might do it just in the way prescribed by Tugan-Baranovsky. But despite this error in her argument, it is valuable in being imbued with the spirit of scepticism with regard to the market for the surplus of goods corresponding to the accumulation. Even though following a different line of thought, we also have come to the conclusion that expanded reproduction is by no means a 'natural' phenomenon, and we have tried to find the source of expanded reproduction—which is, though, by no means equivalent to permanent full utilization of equipment—in certain aspects of technical progress.

Rosa Luxemburg, as we have said, sees the possibility of finding the market for surplus goods merely *outside* the world capitalist system. She does not mean here underdeveloped countries only, but also the non-capitalist sectors of developed economies, e.g. peasant agriculture. Only the 'exports' from the capitalist system are the mainspring of development. Hence her pessimistic view of the future of capitalism: by undermining non-capitalist production and gradually pervading the world, capitalism at the same time eliminates the possibility of its further development.

To the quantitative overestimate of the role of 'external markets' Rosa Luxemburg contributes a fundamental mistake, which she perpetrates in the analysis of the impact of these markets on development of capitalism. She considers—in any case in the main current of her argument—that the market for the surplus is created to the extent of *total* exports to the non-capitalist sector, and not only to the extent of the *excess* of exports over imports.

It is easy to show, however, that this approach is erroneous: the imported goods absorb purchasing power just like those home-produced, and thus, to the extent that exports are offset by imports, they do not contribute to the expansion of the markets for national product. Or, to approach it from a different angle, imports, like wages, are costs, and the part of disposal of profits is, alongside capitalist consumption and investment, solely the export surplus. And in order that this should be possible, export of capital is necessary. Only to the extent to which the capitalist system lends to the non-capitalist world (or the latter sells its assets) is it possible to place abroad the surplus of goods unsold at home. Only in this way do the 'external markets' solve the contradictions of the world capitalist system.

Obviously the net 'external markets' also played their role in the development of capitalism, but a much more modest one than would have been the case if really *all* the exports to the non-capitalist world contributed to the absorption of surpluses corresponding to accumulation.

VI

One of the most interesting elements of the theory of Rosa Luxemburg is taking into consideration in her 'external markets', alongside those mentioned above, the market created by government purchases and in particular by armament orders. She consistently, by the way, makes the mistake of treating the *whole* of government expenditure, for instance on armaments, without paying due consideration to its financing, as absorbing the surplus.

If, however, this expenditure is covered by taxes burdening the working class, they have no effect upon the absorption of national product because the new 'armaments markets' are offset by an equal curtailment of worker consumption.[2]

If armaments are financed by the issue of government securities, then the surplus of goods is sold by capitalists in exchange for the money obtained in turn by the government through sale of their bills and bonds to the financial capitalists. The capitalists—taken as a whole—thus grant the government a credit with which to buy their surplus goods. Also, capital is here being 'exported' to the 'foreign market' created by the government (this operation may be transacted through the banking system—the government sells bills to the latter using the amounts obtained to purchase armaments; while in the banking system there is an equal increase in deposits, representing the accumulation corresponding to armament production; as a result, the capitalists grant credits to the government through the medium of the banking system).

Finally, even when the armament expenditure of the government is covered by the tax on profits, it also constitutes a way of absorbing accumulation to this extent, but in a different way from the case of financing this expenditure by internal credits. Imagine that profits accumulated by capitalists as a whole as a result of armament orders are taken away by taxation rather than in exchange for government securities.

The profits do not increase, then, as a result of new armament orders, but the surplus is nevertheless absorbed by its expropriation by the government. The difference from the case considered previously consists in the fact that while there the capitalists granted credits to the government, they pay taxes in the case presently considered.

Thus Rosa Luxemburg rightly saw in the armament orders an 'external market' which can absorb a part of accumulation—but she should have excluded from this type of 'external market' the case where armaments are financed by taxation of the workers.

It should be added still that Rosa Luxemburg does not treat the 'external markets' created by the government as a problem of first-rate importance. Thus, while predicting the general crisis of capitalism caused by the exhaustion of non-capitalist markets, she does not anticipate the possibility of counteracting that crisis by the 'external market' of government purchases.

VII

It follows from what was said at the outset of this paper that the theories both of Tugan-Baranovsky and of Rosa Luxemburg in a sense find their confirmation in contemporary, in particular in American, capitalism. While perpetrating grave mistakes in their arguments, the authors show a striking perspicacity in the evaluation of certain basic elements of late-stage capitalism.

The 'external markets', in the broad sense of Rosa Luxemburg, in the form of armament orders and ancillary expenditure—in so far as they are financed by loans and taxation of capitalists—play today a leading role in the functioning of modern capitalism. It is true that Rosa Luxemburg did not anticipate the enormous role of this type of 'external market' in the absorption of accumulation. But one way or another she maintained that capitalism is saved by 'external markets'. In her time it was no doubt exaggerated, but it has proved right today.

As for Tugan-Baranovsky, contemporary capitalism indeed put into focus his view of the paradoxical and absurd character of 'antagonistic systems' whose main task is not catering to human needs. In his vision of future capitalism, machines were to produce machines for production of machines. But making the high level of employment and worker consumption dependent on production of the means of destruction is even more absurd.

Both, despite slips in their arguments, contributed to the understanding of the perverse world in which we are living.

The Marxian Equations of Reproduction and Modern Economics[1] [1]

(1968)

I

Before we start dealing with the proper subject of this paper, we shall modify somewhat the Marxian division of economy into departments, in order to simplify our argument and to focus on the basic problem of the reproduction schemes.

First, instead of including producer goods in Department 1, we will assume that it covers the total value of gross investment inclusive of the respective raw materials. Thus this department represents the integrated production of all final non-consumer products. (We disregard in our argument, as does Marx—when he deals with reproduction schemes—both foreign trade and government revenue and expenditure.)

Second, we treat likewise the consumer goods, i.e. we include in the department which covers their output the production of respective raw materials from top to bottom. Moreover, fully in the Marxian spirit, we distinguish the following two departments: Department 2, producing consumer goods for capitalists, and Department 3, producing wage goods.

We obtain thus the following *tableau économique* of the national income, where P_1, P_2, P_3 are gross profits (before deduction of depreciation) in the respective departments; W_1, W_2, W_3 are the respective wages; P and W are aggregate profits and wages; and finally I is gross investment, C_k capitalist consumption, C_w worker consumption, and Y gross national income (before deduction of depreciation).

1	2	3	
P_1	P_2	P_3	P
W_1	W_2	W_3	W
I	C_k	C_w	Y

[1] This article was presented as a background paper for the symposium on the influence of Karl Marx on contemporary scientific thought, Paris, 8–10 May 1968, organized under the auspices of UNESCO by the International Social Science Council and the International Council for Philosophy and Humanistic Studies.

II

We shall assume, as Marx does, that workers do not save. Moreover, we shall disregard the problem of possible stockpiling of unsold goods as only a passing phenomenon. It is then easy to arrive at the fundamental Marxian 'equation of exchange' between Departments 1 and 2 on the one hand and Department 3 on the other.

Profits in the latter, P_3, are materialized in the wage goods which are left to the capitalists of that department after payment of wages W_3, which absorb an equal amount of wage goods. Thus the wage goods of the value P_3 are sold to the workers of Departments 1 and 2, that is:

$$P_3 = W_1 + W_2 \tag{1}$$

Marx considers this equation in the context of expanded reproduction proceeding at a given constant rate r. It is easy to see, however, that the equation holds good under *all* circumstances as long as there is no stockpiling of unsold goods, as mentioned above.

Considered in this general context, equation (1) leads to a proposition that—given the distribution of income between profits and wages in the three departments—investment I and capitalist consumption C_k determine profits and the national income. Indeed, let us add $P_1 + P_2$ to both sides of equation (1). We obtain:

$$P_1 + P_2 + P_3 = P_1 + W_1 + P_2 + W_2$$

Hence:

$$P = I + C_k \tag{2}$$

Moreover, if we denote W_1/I, W_2/C_k, W_3/C_w by w_1, w_2, w_3 respectively, we obtain from equation (1):

$$(1 - w_3)C_w = w_1 I + w_2 C_k$$

Consequently, we have for the consumption of wage goods:

$$C_w = \frac{w_1 I + w_2 C_k}{1 - w_3} \tag{3}$$

and for the national income:

$$Y = I + C_k + C_w = I + C_k + \frac{w_1 I + w_2 C_k}{1 - w_3} \tag{4}$$

Thus the national income (or product) Y which can be sold and the profits P which can be realized are determined in all circumstances

(and not only in a state of uniformly expanding reproduction) by the level of investment I and capitalist consumption C_k (given the distribution of income between wages and profits). A question may be raised as to why equations (2) and (4) must be interpreted in this way and not the other way around, i.e. that investment and capitalist consumption are determined by profits and national income. The answer to this crucial query is as follows.

Investment and capitalist consumption in the short period considered are the outcome of decisions taken in the past, and thus should be considered as given. With regard to investment, this follows directly from the time-lag dependent on the period of construction. But changes in capitalist consumption also follow those in profits with some delay. Now, sales and profits in a given period cannot be a direct outcome of past decisions: the capitalists can decide how much they will invest and consume next year, but they cannot decide how much they shall sell and profit. The independent variables in a given period are investment and capitalist consumption. It is these magnitudes that, through equations (2) and (4), determine the levels of national income and profits which can be realized.

III

The decisions of capitalists with regard to their investment and consumption are made in 'real' rather than in money terms: that is, I and C_k should be calculated in stable prices. If w_1, w_2, w_3 are constant and money wage rates in all three departments change in the same proportion, the same is true of prices of the produce of these departments. Moreover, as is easy to see, equations (2) and (3) will hold also in 'real' terms. Any increase in 'real' investment or capitalist consumption results, under these circumstances, in an increase in output of Department 3, C_w, to provide for a surplus of this department, P_3, sufficient to meet the demand generated by the higher wage bills in Departments 1 and 2, i.e. $W_1 + W_2$.

However, such repercussions of an increase in I or C_k are obviously possible only if there exist unused capacities in Department 3. Imagine that such is not the case. Then C_w is fixed in real terms, i.e., is equal to a constant B. In this case the increase in money value of $W_1 + W_2$ will cause a rise in prices rather than in production of wage goods. The result will be that the 'real' value of W_1, W_2, and W_3 will be reduced as compared with the levels which would be achieved if unused capacities existed in Department 3. Consequently $w_1 = W_1/I$, $w_2 = W_2/C_k$, $w_3 = W_3/C_w = W_3/B$, where all magnitudes involved are now to be interpreted in 'real' terms, will decline in the proportion reciprocal to the increase in the prices of wage goods. Equation (3) can now be written:

$$\frac{w_1 I + w_2 C_k}{I - w_3} = B$$

When I and/or C_k increase,[2] w_1, w_2, and w_3 decline in such a proportion as to render the left-hand side of the equation equal to B.[2]

Sections II and III represent in fact the gist of the modern theory of effective demand. As will be seen, this theory may be derived in full from the Marxian equation (1) representing the exchange between Departments 1 and 2 on the one hand and Department 3 on the other, if this equation is considered in the general context rather than in that of uniformly expanding reproduction.

IV

Let us now turn to the significance of equations (2) and (4) just in the latter context, i.e. in the process of a uniform accumulation of capital. Let us denote the 'real' stock of capital by K, the rate of net accumulation by r, and the rate of depreciation by δ. In this case we may write the 'equation of accumulation', recalling that I is investment *gross* of depreciation, in the form:

$$I = (r + \delta)K \tag{5}$$

Since we are considering the long-run process of growth, let us postulate that capitalist consumption C_k is proportional to profits P. Since, according to formula (2), the latter are equal to $I + C_k$, it follows that C_k bears a constant relationship to I. We thus have:

$$C_k = mI$$

In consequence we may write equation (4) in the form:

$$Y = (1 + m)I + \frac{I(w_1 + mw_2)}{1 - w_3} = I\left(1 + m + \frac{w_1 + mw_2}{1 - w_3}\right) \tag{6}$$

[2] In a socialist economy, prices of consumer goods are *always* fixed relative to wages in such a way as to secure a full utilization of the productive capacity B, i.e., the equation $w_1 I/(1 - w_3) = B$ is permanently fulfilled (C_k obviously equals 0 in this case).

and substituting in it for I its value from equation (5) we obtain:

$$Y = K(r + \delta)\left(1 + m + \frac{w_1 + mw_2}{1 - w_3}\right) \tag{7}$$

The national income Y thus bears a constant relationship to the stock of capital K (provided that w_1, w_2, w_3 do not change).[3] With a given relationship of productive capacity to the stock of capital, the degree of utilization of equipment is constant. Thus if capital equipment is satisfactorily utilized in the initial position, this state of affairs is maintained in the course of expanded reproduction and the problem of effective demand does not arise.

It is this approach that is inherent in many contemporary theories of economic growth. In particular, if we differentiate equation (7) we obtain:

$$\frac{dY}{dK} = \frac{Y}{K} = r\frac{Y}{rK}$$

Now, with a constant satisfactory utilization of equipment, dK/dY is the so-called capital–output ratio, which we denote by R. Moreover, rK is the *net* investment, and thus rK/Y is the relative share of accumulation in the national income, which we shall denote by a. We thus have:

$$\frac{1}{R} = \frac{r}{a}$$

or

$$r = \frac{a}{R}$$

which is the basic formula of the Harrod–Domar theory (in which, however, coefficient a represents the 'propensity to save of the population', rather than the ratio of net accumulation out of profits to the national income, which depends on its distribution between capitalists and workers).

In fact, many of the contemporary theories of growth are simply variations on the theme of Marxian schemes of expanded reproduction which are represented here by the following equations:

$$W_1 + W_2 = P_3 \tag{1}$$

$$I = (r + \delta)K \tag{5}$$

[3] If the productive capacities of all 3 departments expand at the same rate, the shortage of wage goods discussed in the preceding section will not enter the picture.

V

The repercussions of changes in investment and capitalist consumption described in section II do not, I believe, raise any major misgivings. In contrast to this, the moving equilibrium described in section III depends on the very far-reaching assumption that capitalists are willing to engage in investment which increases their capital at a constant rate r per annum. What happens, however, if, having become more cautious (perhaps under the influence of a change in the social structure of their class), they decide to reduce investment from $(r + \delta)K$ to $(r' + \delta)K$ where $r' < r$?

It follows directly from formula (7) that Y/K, and thus the degree of utilization of equipment, declines in the proportion $(r' + \delta)/(r + \delta)$ as a result of the decline of effective demand. It is clear that in this situation the 'cautious' capitalists will no longer be agreeable to a lower rate of accumulation r', but will reduce it further to $r'' < r'$, and this will in turn affect correspondingly the degree of utilization of equipment.

Some economists tend to consider this phenomenon as a downswing phase of the business cycle which takes place around the initial path of growth. However, such a proposition is not well founded: there is no reason why, having left the initial unstable path, investment must fluctuate around it rather than around the depreciation level δK. Or to put it in Marxian terms: why cannot a capitalist system, once it has deviated downwards from the path of expanded reproduction, find itself in a position of long-run simple reproduction?

In fact, we are absolutely in the dark concerning what will actually happen in such a situation as long as we have not solved the problem of determinants of investment decisions. Marx did not develop such a theory, but neither has this been accomplished in modern economics. Some attempts have been made in the development of the theory of cyclical fluctuations. However, the problems of the determination of investment decisions involving the elements associated with the long-run trend are much more difficult than in the case of the 'pure business cycle' (i.e. in a system which in the long run is subject to simple reproduction). I myself tried to do something along these lines but I consider my work in this field to be definitely of a pioneer nature.[4] One thing, however, is clear to me: the long-run growth of the national income involving satisfactory utilization of equipment in a capitalist economy is far from obvious.

[4] A new paper of mine on the subject appeared in the June issue of the *Economic Journal*.

VI

That Marx was deeply conscious of the impact of effective demand upon the dynamics of the capitalist system follows clearly from this passage of the third volume of *Capital*: 'The conditions of direct exploitation and those of the realization of surplus-value are not identical. They are separated not only by time and space but logically as well. The former are limited merely by the productive capacity of the society, the latter by the proportions of various branches of production and by consumer power of the society.' However, he did not systematically scrutinize the process described by his reproduction schemes from the point of view of the contradictions inherent in capitalism as a result of the problem of effective demand.

It was one of his most prominent followers, Rosa Luxemburg, who expressed very definite and even extreme views on the subject: she rejected altogether the possibility of long-run expanded reproduction if no 'external markets' existed. By 'external markets' she understood those outside the world capitalist system, consisting not only of underdeveloped countries but also of the non-capitalist sectors of developed capitalist economies, for instance, peasant agriculture as well as government purchases.

Her argument suffers from the fact that she considers investment decisions as being made by the capitalist class as a whole, and this class is frustrated by the knowledge that finally there is no market for the economic surplus. However, her scepticism as to the possibility of long-run expanded reproduction is valuable because the self-propelled growth of capitalist economy cannot, indeed, be taken for granted. If this economy expands at all without the assistance of 'external markets', this, to my mind, is due to certain aspects of technical progress which, however, do not necessarily assure a satisfactory long-run utilization of equipment.

Nor should the significance of 'external markets' in the development of capitalism be disregarded. In particular, in present-day capitalism the 'external markets' in the form of government expenditure, especially on armaments, play an important role in the functioning of capitalist economies. This expenditure, to the extent that it is financed by loans, or even by taxation of capitalists, contributes to the solution of the problem of effective demand because its effect is not offset by the decline in investment and consumption. (The latter would be the case if this expenditure were financed by indirect or direct taxation of workers.) Thus today the 'external markets' in this particular form are of even greater significance for expanded reproduction than at the time when Rosa Luxemburg propounded her theory.

The high degree of utilization of resources resulting in fact from these government-made 'external markets' has a paradoxical impact upon Western economic theory. It creates an atmosphere favourable to the construction of models for the growth of *laissez-faire* capitalist economies unperturbed by the long-run problem of effective demand.

Observations on the 'Crucial Reform'[1]
(*with Tadeusz Kowalik*)
(1971)

1. The problem of reform in capitalism is most often posed in socialist literature as the problem of reconciling the struggle for reform with the revolutionary struggle—that is, the struggle to change the social system altogether—and of conducting the fight for immediate and partial goals so that it will strengthen, not weaken, the revolutionary potential of mass movements.

We take up here an extreme form of this problem which does not seem to have been adequately studied. Let us imagine that the strong pressure of the masses leads to such a radical reform of the system, in spite of the opposition of the ruling class, that, without abolishing existing relations of production, a new valve is opened for the development of forces of production. There will then be a paradoxical situation: a 'crucial reform' imposed on the ruling class may stabilize the system, temporarily at least. As we argue below, we have to do with just such a situation in contemporary capitalism.

2. We should say at the outset that the problem examined here has little in common with Edward Bernstein's reformism. The author of *Evolutionary Socialism*,[1] basing himself on a one-sided interpretation of certain new economic and social phenomena, argued that spontaneous economic development and gradual social reforms would change mature capitalist societies into socialist ones. The party was to have the courage to admit openly that it is a party of social reforms and not a revolutionary party.

From the economic point of view, Bernstein committed two cardinal mistakes. Most importantly, he did not perceive the contradiction between production and realization in capitalism, reducing crises of over-production to disproportions in the development of particular branches of production. That is why he believed that cartels and

[1] E. Bernstein, *Evolutionary Socialism: A Criticism and Affirmation*, New York, Heubsch, 1909.

trusts, as well as credit institutions, eliminate the anarchy of production on the social scale. Secondly, Bernstein drew too far-reaching conclusions from the limiting influence on capitalist profits exerted by trade unions and consumer co-operatives. He not only negated the theory of 'absolute impoverishment' then encountered in socialist literature (where he was unquestionably right), but he also argued that profits, under the pressure of the aforementioned organizations, are gradually transformed into managerial salaries. This shows that he did not understand two basic problems of the capitalist economy: (i) the reduction of profits to managerial salaries by raising money wages is highly improbable (considering the impact of such an increase on prices); (ii) the disappearance of 'pure' profits would lead to economic stagnation, since undistributed corporate profits are one of the main incentives for investment decisions.

3. The view of two of Bernstein's adversaries, Rudolf Hilferding and Rosa Luxemburg, deserve careful attention from the point of view of the problem raised here.

It might appear that Hilferding's views are not so different from Bernstein's. Hilferding also attributed crises to the disproportional development of individual branches of production. He allowed the possibility of eliminating crises by 'organizing' capitalism. From this point on, however, there are essential differences between Bernstein's views and those of his critic. The author of *Finance Capital* argued that 'planned production and anarchic production are not quantitative opposites, such that by tacking on more and more 'planning' conscious organization will emerge out of anarchy. . . . to expect the abolition of crises from individual cartels simply shows a lack of insight into the causes of crises and the structure of the capitalist system.'[2] Anarchy and economic crises could be eliminated only by a 'general cartel', in which production would be consciously controlled by a central institution and prices would be only a formal instrument for distributing the total product.

Moreover, Hilferding believed that the shift from scattered cartels and trusts to a general cartel would be a transformation that 'can only take place suddenly, by subordinating the whole production to conscious control'.[3] Perhaps for the first time in the history of doctrines,

[2] R. Hilferding, *Finance Capital: A Study of the Latest Phase of Capitalist Development*, London, Routledge & Kegan Paul, 1985, pp. 296–7.
[3] Ibid.

we see in this not fully explained view a similar idea to the concept developed here of the 'crucial reform', although we do not know whether in Hilferding's opinion, indirectly at least, the pressure of the masses would play any role.

Developing his vision of a 'general cartel', Hilferding emphasized that he did not believe in the stability of the system corresponding to this vision. Although a 'general cartel' would resolve the basic economic contradictions of capitalism, he thought that such a system would have to collapse for social and political reasons, 'because it would inevitably come to grief on the conflict of interests which it would intensify to an extreme point'.[4] Unfortunately, Hilferding also left this open as a general statement, making it difficult to judge on its merits. On the other hand, what is interesting, and documented, is his analysis of international contradictions between imperialist powers and tendencies leading to military conflicts between national 'general cartels'. Hilferding saw prospects for a socialist revolution in these international conflicts, given sharp class antagonisms existing within these cartels.

We find a certain anticipation of Hilferding's vision of a general cartel much earlier in the works of the Polish sociologist Ludwik Krzywicki,[5] who noticed strong tendencies toward 'industrial feudalism'. This was the vision of a 'nation-estate'—a kind of feudal estate embracing the whole country—with a hierarchical social structure governed by a financial oligarchy. Krzywicki linked this vision with the simultaneous mass conformization of society, including the working class, which would derive certain material benefits from this 'estate'. That is why he attributed considerable stability to the system of industrial feudalism, apparently even seeing it as a threat to the eventual socialist alternative.

4. The views of Rosa Luxemburg differ essentially from those of Hilferding. For her, the basic contradiction of capitalism is not disproportion of development of individual branches of industry but the separation between production and market. In her analysis of the divergence between the development of forces of production and relations of production, the main problem is that of realization of the

[4] Ibid.
[5] L. Krzywicki, *Idea and Practice: Collected Articles, 1883–1892*, Warsaw, PWN, 1957 (in Polish).

accumulated surpluses.[6] Taking an extreme position, she believed that an indispensable condition for the realization of surpluses is the existence of outlets outside the capitalist system. This factor, until it exhausts itself when the entire world is capitalistic, would allow further development within the capitalist system. Although this view is exaggerated, highlighting the role of external markets in the development of capitalism is very important, and also for the problem examined here. A logical consequence of this approach to the contradiction of capitalism was Luxemburg's correct conclusion that the development of new organizational forms of capitalism (cartels and trusts) would not reduce the discrepancy between output potential and sales possibilities but might even intensify it.[7]

So there is no convergence so far here of these views with Hilferding's idea. Yet there is an element in Luxemburg's economic theory not stressed by her, which, as we shall see, in a certain sense is parallel to Hilferding's theory. Luxemburg understood by 'non-capitalist markets' also the market of government purchases, especially orders for armaments.[8] Today we know that, if the financing of armaments does not reduce worker consumption (i.e. through loans or taxes on capitalists), they contribute to realization of accumulated profits. (In the first instance profits are realized through sales of surplus goods appropriated by capitalists based on government indebtedness to them; in the second instance, these 'additional' profits are siphoned off through taxes.)

Notwithstanding all the differences of approach between Hilferding and Luxemburg, their ideas are similar on this point. If applied on a sufficiently large scale, these government purchases, at least in principle, can overcome the discrepancy between production potential and the capacity of markets. The systematic application of this measure, however, would lead to the formation of a system of concerns and trusts in which there would be a high rate of employment of capital equipment and labour. The system of government interventionism

[6] See R. Luxemburg, *The Accumulation of Capital*, London, Routledge & Kegan Paul, 1971.

[7] Luxemburg developed this thesis in a booklet directed against Bernstein's doctrine, 'Social Reform or Revolution?', in Dick Howard (ed.), *Selected Political Writings of Rosa Luxemburg*, New York and London, Monthly Review Press, 1971.

[8] Ch. 32 of *The Accumulation of Capital* is entitled: 'Militarism as a Province of Accumulation'.

would replace, in this field, the institution of central planning implied in the concept of a 'general cartel'.

Like Hilferding, Rosa Luxemburg closely linked the prospects of a socialist revolution (or rather, revolutions) with the anticipated round of imperialist wars. With the contraction of the non-capitalist environment, there will be increased rivalry for markets where goods corresponding to the unrealized accumulation can be sold, which will represent the ever-present seeds of military conflict. Armaments that help to realize the surplus also contribute to wars. The latter eventually lead to a revolutionary overthrow of the capitalist system. The connection of the socialist revolution with imperialist wars is also the quintessence of Lenin's strategy and theory of revolution.

5. These ideas on the evolution of the capitalist system and the prospects of its eventual collapse appeared before 1914, when, as someone wittily observed, the nineteenth century finally ended. The half-century which separates us from the outbreak of the Second World War has not fully confirmed any of the predictions and hypotheses presented in sections 3 and 4. In the social and economic history of this epoch, however, we find many events and trends that are a partial confirmation of each of these predictions.

The Second World War broke out against the background of the fight over markets, over a new division of the world. National economies, working for war needs, especially in Germany, were subjected to certain controls. Outside the sector working directly for war needs, however, there was no central planning of production on a wider scale. Such planning and central organization appeared most strongly in far-reaching, meticulous rationing of basic consumer goods.

A series of mass revolutionary uprisings broke out in 1917. Only the Russian Revolution, which took place in a backward country with an unsolved agrarian question and serious national liberation conflicts, was successful. The developed industrial countries retained the unreformed system of monopoly capitalism. Except for the 8-hour working day and various kinds of social insurance gained by the working class in many countries, capitalism during the 1920s operated in more or less the same way as before the war.

The turning point was the crisis of 1929–33, which shook the foundations of the capitalist system. Its failures contrasted with the progress of the economy of the USSR, which at that time was developing very rapidly. The period of 'crucial' reform of capitalism began, especially in the two leading capitalist countries which had been most strongly affected by the crisis, Germany and the USA. With initially fairly strong opposition from the *grande bourgeoisie*, capitalist governments set about protecting the foundations of their system from the threat of mass unemployment. What is quite typical, though, is that this programme of improving the capitalist economy consisted, not in its planned control, but in government intervention to fill the gap of insufficient demand and to organize additional employment. In Nazi Germany the stimulation of the business upswing was military in nature from the very outset.

One can say that during the Second World War the economies of the European capitalist countries largely took the form of centrally controlled capitalism. The total nature of the war, resulting mainly from the military technique of that time, was the major reason for this. Following the end of the war and a short period of reconversion, however, central control of the capitalist economy weakened considerably. What crystallized instead was a capitalist system of large corporations with supplementary markets guaranteed by government purchases, mainly of armaments, which allowed the realization of accumulated profits. The share of government expenditure in the total demand for goods and services increased considerably in comparison with the inter-war period. Besides this, in some European capitalist countries the government influenced the economy through nationalized industry. In some of these countries government interference has increased in the branch and regional structure of production through subsidies, tax differentiation, and credit policy.

The Second World War accelerated the 'crucial' reform process. Government intervention in the expansion of markets became an institution, making it possible to limit unemployment to a few per cent, and hence in practice to accept something similar to the 'right to work' slogan advanced by the revolution of 1848 (in some leading capitalist countries there was even legislation to this effect). This state of affairs (along with a considerable expansion of social security) led to a certain transformation of the working class, which on the whole became radically reformist in its attitude toward capitalism. Preserving high employment rates in the leading capitalist countries generally gives the workers a satisfactory level of real income. With high and steady employment, real wages, at least over the long term,

rise along with increases in labour productivity, unless a fall in their share in the national income offsets this. As a result, anti-capitalist attitudes have weakened considerably.[9]

In some countries, workers who have become conformist have even ceased to fight for a reduction in armaments (since they are aware that a high level of employment depends on armament production). On the other hand, at least after a certain period of 'neo-capitalism', workers have become very sensitive to adhering to the 'rules of the game' mentioned above (along with the question of their share in the national income). If for any reason these rules are violated, therefore, reactions are sometimes very sharp, also expressing suppressed class hatred.

Contemporary capitalism is often called 'controlled'. Even the development of central planning in capitalism is sometimes mentioned. This seems erroneous. The fact that the country is actually governed by a conglomerate of great consortia, and that such governments ensure relatively high employment of capital equipment and labour, hardly means (as follows from our argument) central planning. Government intervention through budget manipulation (government purchases and tax policy) can be diverse, with its pattern over time determined by the desire at least temporarily to weaken the position of the working class by some inconsiderable unemployment, and the directions of this intervention being determined mainly by the fight between various groups of capitalists. As a rule, however, government actions are supplementary, filling in gaps of insufficient demand or organizing additional areas for the realization of accumulated profits. In the centrally planned socialist system, on the other hand, assuring adequate purchasing power is an integral part of the plan. After the decision on the distribution of national income between investments and consumption is reached in the plan, a ratio of consumer goods prices to wages is established such as to create demand for these goods equal to their planned supply.

Hilferding's general cartel would also operate in a fundamentally different way from government intervention. Methods corresponding to Luxemburg's theory of 'additional' markets give results similar to Hilferding's in the use of resources, however, especially in the level of employment. As regards a 'general cartel', we should stress that in the USA a huge military–industrial complex has emerged which, now

[9] See Kalecki, 'Political Aspects of Full Employment', *Collected Works*, vol. i.

together with the exploration of space, has a great influence on social and economic relations as a whole, and thus shows some resemblance to Hilferding's concept.

6. After the Second World War, a group of developing countries has also appeared which in their industrialization benefit from the experience of the socialist countries. These countries can in no way be regarded as socialist, though they willingly call themselves such. These are former colonies which gained their independence as a result of the last World War and base their development on a so-called mixed economy. In these countries, the government often plays an important role in heavy industry, transport, and banks, and especially in new productive investments. The agrarian reforms carried out here were, as a rule, more radical in their initial assumptions than in their execution. They are 'intermediate regimes', whose core is the government sector, with its social base being the lower middle class and rich peasantry.[10] Besides this, there are also groups antagonistic to this system: on the one hand, remnants of feudalism, foreign capital, larger local private capital and, on the other, smallholders and landless peasants, small craftsmen, workers employed in small shops, and numerous groups of the suburban population without permanent employment. Although these countries formulate bold development plans, the execution is usually far short of the goals. One can generally say that these countries have also passed through a 'crucial reform', although it took different forms, and although there is considerably less stability than in the 'neo-capitalist' countries.

7. Another result of the Second World War was the spread of the socialist system to many new countries, but here again these countries, as a rule, were not industrialized. The most important result of this war from the stand-point of the international situation was the emergence of two superpowers: one in the camp of countries of developed capitalism, the other in the socialist camp. The Western countries are militarily dependent on the USA. Mutual relations between the 'neo-capitalist' countries are determined mainly by the antagonism between them and the countries of the socialist bloc. Considering also the strong economic ties (the existence of multinational corporations, especially American, and the European Common Market), military conflicts within the capitalist system today are highly improbable. This would be just as dangerous for the capitalist system as an eventual repetition of the great depression. Armaments in the 'neo-capitalist' countries are being stockpiled mainly for a conflict with the USSR and the other socialist countries. With the ever-growing awareness that an 'inter-camp' war would result in the use of non-conventional weapons and hence in mutual self-destruction, armaments here are a demonstration of power. Space flights for the most part are of the same nature. Their aim is to demonstrate technological and military efficiency.

[10] See 'Intermediate Regimes', in Kalecki, *Essays on Developing Economies*, Hassocks, England, Harvester, 1976, ch. 4, and *Collected Works*, vol. v.

This state of affairs found theoretical expression in the doctrine of peaceful coexistence put forward by the socialist countries. This doctrine rests on two pillars: certain social revolts which the 'neo-capitalist' countries are experiencing do not constitute a threat to their existence now or in the near future; and a thermonuclear 'inter-camp' war would result in mutual self-destruction.

Indeed, the experience of many years shows that wars are now being waged in connection with the affairs of the so-called third world. The most typical is the American punitive expedition to Vietnam, with the aim of gaining spheres of influence in the Far East or, perhaps, even more importantly, of providing an example that would deter peasant uprisings (simultaneously this expedition was also a result of the struggle among various groups of American capital over the direction of intervention in the business cycle, which we mentioned earlier). Wars of this type cannot cause revolutions in these countries, since they are not total.

The conclusion must be that the theory of socialist revolution developing as a result of imperialistic wars is today, for the most part, a historical relic (except for countries of the third world). Karl Kautsky's well-known hypothesis of the 'ultra-imperialistic' co-operation of capitalist countries,[11] which in its time was utopian and pacifistic, is now closer to reality on this (and only on this) point than the ideas of Rudolf Hilferding and Rosa Luxemburg opposed to this hypothesis.

8. This article is more an attempt to understand the present situation (and its possible development in the near future) than a desire to make

[11] K. Kautsky, 'Der Imperialismus', *Die Neue Zeit*, 2, 1914; for an English translation of extracts from this article, see P. Goode (ed.), *Karl Kautsky: Selected Political Writings*, London, Macmillan, 1983, esp. p. 88.

a long-term prognosis. The relative stability of reformed capitalism depends on a high degree of social conformity. One can express the cautious opinion that recent student movements seem to be an omen of the declining ability of the bourgeois power apparatus to manipulate new generations entering the historical scene. This phenomenon is all the more serious since, with the rapid progress in science and technology, intellectuals are beginning to play an ever greater role as a social group. For the time being, student movements in some cases have contributed to intensified protests of the working class against violating the 'rules of the game', of which we spoke earlier, and to widening the appeal of slogans calling for mass dissent.

EDITORIAL NOTES AND ANNEXES

PART 1
Factors in the Distribution of National Income

The Determinants of Distribution of the National Income

[1]

First published in *Econometrica*, 6/2, 1938, pp. 97–112. A revised version appeared as ch. 1 of Kalecki's *Essays in the Theory of Economic Fluctuations* (see *Collected Works*, vol. i; for subsequent reprints and translations of this revised version, see ibid., pp. 436–7). We are grateful to the publishers of *Econometrica* for permission to reproduce this article.

Kalecki's theory of income distribution is one of the most debated parts of his legacy. Various aspects of this theory have been discussed, criticized, and empirically tested in dozens of articles and many books. Next to his theory of the business cycle and economic dynamics, the distribution of the national income was a constant subject of Kalecki's studies on the capitalist economy. Pt. 1 of this volume contains his studies on this subject, with two exceptions: one is the version presented in his *Studies in Economic Dynamics*, which is included in pt. 2 of this volume; the other is his *Theory of Economic Dynamics*, a book which constitutes pt. 3 of this volume. The editorial comments on the evolution of Kalecki's views and on discussions of his theory, which follow below, cover these two versions of his theory, however.

Kalecki's theory of national income distribution is an integral part of his theory of capitalist reproduction. He began his studies with problems of the business cycle. The dynamics of the capitalist economy and its cyclical fluctuations was always a major subject of these studies. This starting-point defined the range and content of his theory of income distribution, and the lines of his enquiry.

Kalecki considered cyclical fluctuations in the whole economy to be generated by fluctuations in activity of private industrial enterprises. For the statistical testing of his theoretical hypotheses he used data for the economy as a whole, assuming that there was a close correlation between them and the corresponding indicators for the private sector. In his investigations of the determinants of business fluctuations, he separated from the income of the private sector wages—changes in which could cause no cyclical fluctuations in output and employment but were merely their consequence (for 'workers spend what they earn')—and profits—changes in which were the source of the cycle (for capitalists 'earn what they spend', and their investment expenditure is subject to an 'automatic' business cycle). Thus from the early 1930s Kalecki focused on examining fluctuations in the relative shares of wages and profits in the income (of the private sector) caused by cyclical fluctuations in output and employment on the one hand, and on the impact of autonomous changes in wages and profits in the course of the business cycle on the other hand.

In his early studies of the theory of the business cycle, Kalecki used a model of a free-competition economy, in which the curves of short-period marginal costs of individual firms are rising. (None the less, from the very outset Kalecki consistently rejected the assumption of full employment of factors of production in the course of the business cycle, which undermined the allocative functions of the free-competition mechanism. He also pointed out that introducing the cartelized sector into his model did not change his main conclusions on the determinants and the mechanism of the 'automatic' business cycle; see his *Essay on the Business Cycle Theory*, in *Collected Works*, vol. i.) Following these assumptions, he argued that, when output and employment rise, the relation of prices to wages also increases; therefore, during the upswing real wages—in contrast to the total wage bill—fall, and the reverse is true with a fall in employment during the depression. This viewpoint, already implied in Kalecki's *Essay on the Business Cycle Theory*, was similar to Keynes's view on induced changes of the share of wages in national income in the course of the business cycle (see *The Collected Writings of John Maynard Keynes*, vol. vii, *The General Theory*, London, Macmillan, 1973, pp. 10 ff.), and with the assertion from neo-classical economics (though the latter was deduced from entirely different assumptions) that, for any given technique of production and labour intensity, every increase in employment reduces the marginal productivity of labour, and hence also the real wage rate.

In Kalecki's theory, autonomous changes in profits and, in the final analysis, in investment outlay were the mainspring of the business cycle. As regards the influence of changes in money wages on the course of the business cycle, Kalecki had already, in 1932–3, rejected the thesis of orthodox economics that a reduction in money wages automatically increases proportionally the outlays of capitalists for their consumption and investment and, hence, their profits (see 'Reduction of Wages during Crisis' and *Essay on the Business Cycle Theory*, in *Collected Works*, vol. i).

This assertion concerning the influence of changes in money wages on the course of the business cycle under free competition differed little from theses put forward in Keynes's *General Theory*. In fact, Kalecki, limiting himself to the study of a closed economy, called this assertion the 'Keynesian theory of wages' (see 'The Lesson of the Blum Experiment', and ch. 3 of *Essays in the Theory of Economic Fluctuations*, in *Collected Works*, vol. i). The difference between Kalecki's and Keynes's positions boils down to the fact that Keynes allowed for the possibility of a positive influence of wage reductions on the volume of investments, i.e., when it is anticipated that money wages will rise

in the future; for then a reduction in money wages increases the marginal productivity of capital (see Keynes, *General Theory*, p. 263, and the correspondence between Kalecki and Keynes on Kalecki's 'A Theory of the Business Cycle', in Kalecki, *Collected Works*, vol. i, pp. 524–5).

Until 1938 Kalecki did not deal explicitly with the determinants of real wages, accepting their relative share in the income of the private sector as given. Under this assumption, fluctuations of investments determined not only cyclical changes in profits (which were a function of investment outlay) but also the entire income of the private sector. At the same time, Kalecki's assertion that 'workers spend what they earn' was consistent with the Marxian subsistence theory of wages, which permits no net savings out of wages over the long period. Finally, Kalecki's proposition that changes in money wages do not affect the business cycle shows that he did not apply the assumption of free competition to the labour market; for him, real wages were not determined by the supply of labour and the demand for it.

> The immediate impulse for the formulation of the degree of monopoly theory of income distribution seems to have been the need to find analytical tools which would make it possible to investigate cyclical and secular changes in wages and profits as components of national income, and their relative shares, under oligopoly competition. (J. Osiatyński, 'Michał Kalecki's Theory of Income Distribution', *Oeconomica Polona*, 3, 1979, p. 339.)

Kalecki was aware, however, that the assumption of free competition made his theory of the business cycle only a first approximation of reality. The next step required the rejection of this assumption and verification of his conclusions under conditions of oligopoly competition.

This instrumental approach to the theory of national income distribution explains the focus of his theory on the relative share of the wages of *manual* workers in the value added of the *private* sector on the one hand (outlays from wages of manual workers do not generate business fluctuations) and the share of total profits and salaries (changes in which cause business fluctuations) on the other hand. This also explains why the main point of reference of his theory of income distribution was changes of relative shares during the course of the cycle and in the long run. 'The relative share of *manual* labour in the national income is more suitable for theoretical analysis', he wrote in the opening paragraph of his first paper on the distribution of national income, without specifying the subject-matter of this analysis; what he must have had in mind, however, was the 'theoretical analysis' of business fluctuations.

Kalecki put forward his degree of monopoly theory of income distribution for the first time in 1938. Before discussing the most important polemics on this theory and its evolution, we will briefly mention the views predominant in the 1930s on factors of national income distribution and the main contemporary lines of enquiry which influenced Kalecki's theory.

According to neo-classical theory, the real wage rate is determined by the marginal productivity of labour, just as the return on every other factor is determined by its marginal productivity. This assertion is based on the assumptions of perfect competition, perfect substitution between factors of production, etc., and is meant to hold for positions of full-employment equilibrium.

In 1925, Piero Sraffa questioned the determination of prices through the mechanism of perfectly competitive markets, and the theory of income distribution on the basis of the marginal productivity of factors of production ('The Laws of Return under Competitive Conditions', *Economic Journal*, 36/4, 1926; its Italian version had appeared a year earlier). He argued that, over a considerable range of the variability of output, changes in the ratio of actual output to full capacity output did not lead to changes in the ratio of prices to costs.

In 1933 Joan Robinson (*The Economics of Imperfect Competition*, London, Macmillan) and E. H. Chamberlin (*The Theory of Monopolistic Competition*, Cambridge, Mass., Harvard Univ. Press) published major works on imperfect competition that put the problem of monopolistic competition at the centre of interest for economics. These studies, however, presented no alternative theory of income distribution to the neo-classical one (for a discussion of some of their shortcomings from the viewpoint of Kalecki's theory, and a selected bibliography of the subject, see P. Kriesler, *Kalecki's Microanalysis: The Development of Kalecki's Analysis of Pricing and Distribution*, Cambridge, CUP, 1987, pp. 10–11). Following the studies by Robinson and Chamberlin, Kalecki assumed that there can exist more than one price for the same product, on the same market, at the same time (see also Annex 1 below).

In 1936 J. M. Keynes questioned the automatic equalization of money wages with the marginal productivity of labour. He failed, however, to examine the consequences of his general theory of employment for the neo-classical theory of income distribution; nor did he develop (either in the *General Theory* or in later publications) a theory of distribution between wages and profits which would logically follow from his theory of employment.

Finally, let us mention A. P. Lerner's concept of monopoly power, to which Kalecki referred in the first formulations of his theory. In 1934 Lerner tried to find a measure of monopoly power ('The Concept of Monopoly and the Measurement of Monopoly Power', *Review of Economic Studies*, 1/3, 1933–4). According to neo-classical economics, under perfect competition the 'national dividend' (A. C. Pigou's term) reaches its maximum when capital equipment is used up to the level at which marginal costs become equal to price. In monopolistic conditions, the spread between price and marginal cost does not lead to an allocation of factors of production which maximizes the social dividend. Lerner wanted to find the deviation from that optimum

allocation of resources, i.e. to find the measure of losses due to the existence of monopolies. In his approach, this measure was the ratio of the difference between price and marginal cost to price. This index showed the difference between the standard of social optimum (i.e. a position of equilibrium under perfect competition) and the actual position. Since this difference resulted from the operation of monopolistic factors, Lerner called his index the 'degree of monopoly power'. Under perfect competition the price equals the marginal cost, and the degree of monopoly power is therefore zero (for a discussion of Lerner's concept, see Kriesler, *Kalecki's Microanalysis*, ch. 3).

The studies of Sraffa, Joan Robinson, Chamberlin, and Lerner were pioneering work, and had only a limited impact on the economic theory of the time, which was dominated by free-competition models of the capitalist economy. Some attention was also given to the 'pure-monopoly' model of A. Cournot and to his concept of the 'monopoly price'. Between models of the free-competition economy on the one hand and models of the 'pure monopoly' on the other lay the 'no man's land' of a theory of income distribution under oligopoly competition.

Rejecting, in 1938, the model of free competition as a tool for the analysis of the capitalist economy, Kalecki attempted to construct a theory of income distribution and price determination that would fit the conditions of the oligopolistic economy. His early publications on income distribution theory show that, in his concept of monopoly elements as obstacles to entry, he was following the fundamental criticism of the Marshallian theory of competition contained in Sraffa's 1926 article, and that he was already in 1938 working within an analytical framework which was basically different from Joan Robinson's *Economics of Imperfect Competition* (see P. Sylos-Labini, 'Sraffa's Critique of the Marshallian Theory of Prices', *Political Economy*, 2, 1986, pp. 61–2). This, and Joan Robinson's review of Kalecki's *Selected Essays on the Dynamics of the Capitalist Economy, 1933–1970* (Cambridge, CUP, 1971) make some researchers believe that

> from this first meeting Robinson saw that Kalecki might be doing what apparently nor Kahn, nor Keynes, nor Sraffa were keen to do, and what she felt unable to do, i.e. to build the theory of effective demand on more 'realistic' grounds that those of the Marshall–Pigou apparatus. (M. C. Marcuzzo's contribution to the conference on 'Kalecki's Relevance Today', Perugia, 22–4 April 1986, mimeo.)

Even before Kalecki left Poland in 1935, in numerous discussions at the Institute for the Study of Business Cycles and Prices he had argued that in many firms the unit prime cost was in fact fairly constant over a considerable range of output changes. He attempted to test this proposition in his empirical studies on the operation of cartels in Poland. In 1935, Kalecki and Landau published a paper on fluctuations in prices, costs, and industrial output in Poland, from 1928 to 1934. The authors pointed out that 'it would be incorrect to perceive any direct link between the direction of cost changes and the direction of changes in output' (M. Kalecki and L. Landau, 'Changes in Price–Cost Relations and Fluctuations in Industrial Production in Poland', in Kalecki, *Collected Works*, vol. vi; at the same time they admitted that 'the level of prices and costs in general shows a tendency to rise and fall together with output').

During his stay at Cambridge, Kalecki actively participated in Sraffa's seminar, where the nature of short-period cost curves of firms was much discussed (see also pp. 522–4 below). Sraffa's observation on the lack of changes in the ratio of prices to costs with changes in output below full employment of capital confirmed Kalecki's tentative ideas on this matter. Thus, from 1938 Kalecki assumed that the marginal cost was approximately constant below capacity output (on other influences of Sraffa on Kalecki, see C. Sardoni, 'Some ties of Kalecki to the 1926 "Sraffian Manifesto"', *Journal of Post Keynesian Economics*, 6/3, 1984).

From Lerner Kalecki took the concept of 'degree of monopoly'. However, while Lerner concentrated on the allocative aspect of imperfect condition, Kalecki paid little attention to the problems of allocating factors of production in this sense. Rather, he used the concept of the degree of monopoly in an analysis of factors determining the distribution of national income.

The scope and fever of the discussion that broke out after the publication of his theory may have surprised Kalecki. Though Keynes wrote that Kalecki's article of 1938 was 'brilliant' and that his tools of analysis 'may prove to be an important piece of pioneer work' ('Relative Movements of Real Wages and Output', *Economic Journal*, 49/1, 1939, p. 49), the reception of Kalecki's ideas was in general critical. Leaving aside some shortcomings in Kalecki's approach, this criticism may be partly attributed to the fact that, in rejecting the concept of perfect competition and the assumptions on which it was based, Kalecki struck at the very foundations of neo-classical economics. Another target of criticism was insufficient consistency in his rejecting the assumptions of neo-classical economics (e.g. in preserving the dependence of the degree of monopoly on the elasticity of demand for the product of the firm); still another criticism was that Kalecki took up the question of determinants of prices and income distribution under oligopoly competition, i.e. in a field in which neither the neo-classical theory nor the theory of 'pure monopoly' had much to say.

This discussion, which continues incessantly from 1939, took place around Kalecki rather than with his participation. With few exceptions, he did not enter into direct polemics, though he did listen carefully, taking some criticism into account when elaborating subsequent versions of his theory. Below we give an account of some of the more important views in the debate and of Kalecki's reactions to them. This account is divided into four parts. We concentrate first on polemics on the assumptions and the internal coherence of his theory. Next we discuss some critical opinions on Kalecki's use of his theory to explain the actual cyclical and long-run changes of the relative shares of wages and profits in the national income. Then we deal with more recent debates and developments of Kalecki's theory. A summary of some of its more general appraisals will be given at the end of this note.

Early polemics on the degree of monopoly theory of income distribution

The very application of the concept of the degree of monopoly to the study of distribution of the national income gave rise to criticism. J. T. Dunlop pointed out the following limitations to the possibility of using this concept for macro-economic studies (see his 'Price Flexibility and the "Degree of Monopoly"', *Quarterly Journal of Economics*, 53, Aug. 1939, pp. 522–33): 1. Its analytical framework makes it applicable to a single firm and only over a very short period (though he agreed with Kalecki's procedure of branch aggregation). 2. In the interpretation of the gap between price and marginal cost we have to know whether every change in this gap is an effect of the enterprise's movement from one position of equilibrium to another, or the effect of a movement towards equilibrium (for the concept taken from Lerner is tied to a position of equilibrium under perfect competition). 3. The measure of the gap between price and marginal cost and its changes is not necessarily linked with profit and its changes (for the latter depend on the gap between average receipts and average cost). 4. This measure tells us nothing about the degree of utilization of production factors in a given firm or an industry.

Despite these reservations, Dunlop did not question the very idea of applying the concept of degree of monopoly to investigate the distribution of the national income, and used it himself to study selected branches of US industry in 1928–35. His findings show that 'the gap between average prime costs and price tended to increase during periods of depression and decrease during the prosperity phase of the cycle. The tendency is almost without exceptions' (ibid. 530–2). In his opinion, these findings confirm Kalecki's assertions on changes in the degree of monopoly during the business cycle and the distribution of income between wages and profits.

A more severe criticism of the application of the concept of the degree of monopoly to the study of national income distribution was made by P. T. Bauer ('A Note on Monopoly', *Economica*, 8/30, 1941, pp. 194–202) and R. H. Whitman ('A Note on the Concept of "Degree of Monopoly"', *Economic Journal*, 51/2–3, 1941, pp. 261–9). Both critics observe that, because of the way the degree of monopoly is defined, in Kalecki's theory all changes of relative shares in output are identical with changes in the degree of monopoly, which makes the theory tautological (a similar opinion was expressed by Dunlop in *Wage Determination under Trade Unions*, New York, Macmillan, 1944, p. 187 n.). They also point out that changes in the degree of monopoly or, in their opinion, changes of relative shares can result from such factors as changes in the capital intensity of output, which can even go in an opposite direction from changes in the competitive structure of the market. Kalecki's response to Whitman's charges is given in Annex 1 below.

ANNEX 1

Mr Whitman on the Concept of 'Degree of Monopoly': A Comment[1]

M. KALECKI

1. In a note published in the *Economic Journal*[1] Mr Whitman criticizes severely my application of the concept of degree of monopoly to the theory of distribution of the product of industry. 'It is hoped', he says at the end of the paper, 'that this note may have cleared away some of the errors which have plagued a discussion of the problem.' This hope seems to me not altogether justified.

Mr Whitman starts with a short and quite correct exposition of my theory.[2] This is based on the assumption that the marginal cost M is approximately equal to the average prime cost C over the relevant range of output.[3] I then call $(P - M)/P = (P - C)/P$ the degree of monopoly. This is determined by conditions of imperfect competition and oligopoly. (In the case of pure imperfect competition it is the reciprocal of the elasticity of demand for the firm's product.) Thus these factors determine the margin of overheads plus profits in relation to price, and, given the ratio of wage and raw-material cost, the sum of which is C, also the distribution of value added (i.e. net output)

[1] First published in *Economic Journal*, 52/1, 1942, pp. 121–7. The publisher's permission to reprint this article is gratefully acknowledged.

1 51/2-3, 1941.

2 As presented in my *Essays in the Theory of Economic Fluctuations*, pp. 13–41. [See *Collected Works*, vol. i, pp. 235–52.]

3 This assumption is meant, of course, only as a first approximation. It is based on the following hypotheses, which seem to represent more or less truly the prevailing conditions: (i) The marginal cost curve is usually horizontal over the relevant range of output (confirmed by recent investigations, as, e.g., those of Professor J. Dean). [See *Econometrica*, 8/2, 1940, p. 188.] (ii) The main components of marginal costs are wages and cost of materials. (iii) The cost of overhead manual labour and materials makes usually only a very small proportion of the total cost of these items, over the relevant range of output.

between overheads and profits on the one hand and wages on the other. We may treat the problem of distribution of the product of an industry as a whole in the same way if by P we mean the weighted average price and by C the weighted average of average prime costs. The distribution of the value added by industry between factors of production will be determined, on my assumptions, both in the short period and in the long run by the 'average' degree of monopoly $(P - C)/P$ and the ratio of wage bill to raw-material bill.

2. To show the unreasonableness of this theory, Mr Whitman examines the behaviour of my measure of degree of monopoly in two industries, A, in which the capital is twice the annual sales, and B, in which the capital is half the annual sales. He grants my assumption that in both industries there is a condition of imperfect competition and that marginal costs are equal to average prime costs. He further assumes that both industries are in equilibrium, and that they earn the same 'normal' rate of profit of 6% on capital. He then finds that the ratio of overheads plus profits to price—i.e. $(P - C)/P$—is much higher in industry A than in industry B, irrespective of the conditions of market imperfection in both industries. 'If the industry B had the same "degree of monopoly power" as industry A, it would earn over 50 per cent on capital. This indicates the absurdity of Mr Kalecki's conclusion.' No, it indicates only that Mr Whitman does not understand the problem. If the degree of monopoly is the same in both industries, industry B will certainly earn a much higher rate of profit. This will attract new entries into industry B, and its capital will rise in relation to sales (which means that the utilization of equipment will fall). And this will go on up to the point where the rate of profit in industry B falls to the 'normal' rate of 6%.[4] The solution of Mr Whitman's puzzle is simply that the proportions of sales to capital assumed by him in A and B are incompatible with long-run equilibrium if the degree of monopoly in both industries is the same.

After having in the above way 'disposed of the "degree of monopoly power" as a determinant in the long-run distribution of national

4 There will, of course, appear in industry B a large 'surplus capacity'. It may be asked how it is possible for this state to prevail in the long run without inducing firms to curtail their plants. The answer is that large-scale economies will prevent firms from reducing their plant below a certain limit: imperfect competition must cause equipment to be utilized in long-run equilibrium below the optimum point. See e.g. R. F. Harrod, 'Doctrines of Imperfect Competition', *Quarterly Journal of Economics*, May 1934.

income', Mr Whitman continues: 'As between two periods of time for the entire economy, as well as between two industries, the gross profit as a ratio of business income is the resultant of many forces of which the degree of imperfection of the market is only one, and probably one of the least important.' $(P - C)/P$, on the assumption of marginal cost = average prime cost and of pure imperfect competition, is the reciprocal of the elasticity of demand for the firm's product; how thus can the degree of market imperfection be one of its least important determinants? To put it mildly, Mr Whitman seems not to have thought over carefully this part of his note.[5,[2]]

3. When we consider the same industry in various periods, there arise (as Mr Whitman points out in the sentence quoted above) the same problems as to profits plus overheads margin in relation to price as when various industries are compared. If the capital intensity of an industry increases in time—i.e. if the ratio of maximum output capacity to capital falls and the degree of monopoly remains constant—then the utilization of equipment must rise to secure the same rate of profit;[6] whereas if it does not rise sufficiently, the rate of profit falls. A good example of the latter situation is provided by the development of US manufacturing industry in the period 1899–1923. In Table 60 we give the value of its aggregate fixed capital at reproduction cost according to Professor Douglas,[7] and sales and profits plus overheads according to the census of manufactures.[8]

[5] A similar argument to that of Mr Whitman is advanced by another critic of my theory, Mr P. T. Bauer, who maintains that $(P - C)/P$ 'is almost certain to rise with every increase in the importance of capital, more particularly with secular growth of capital per head' (*Economica*, May 1941, p. 197). (Cf. Table 60.)

[2] Though Kalecki's argument that Whitman's example does not invalidate his analysis is correct, this example does highlight an important shortcoming of Kalecki's measure of the degree of monopoly, because it is affected by changes in such variables as overhead costs, which are not necessarily related to the degree of competitiveness or market structures (cf. Kriesler, *Kalecki's Microanalysis*, p. 42).

[6] It must be noticed that if in this way the utilization of equipment reaches a point where the marginal cost curve begins to rise, our assumption of equality between marginal cost and average prime cost cannot hold good any more, and our analysis must then be modified.

[7] Obtained by multiplying the index of real fixed capital by the price index of investment goods. Both series are taken from P. H. Douglas, *The Theory of Wages*, New York, Macmillan, 1934, p. 121.

[8] The changes in the scope of the census in 1914 are accounted for by linking the relevant series.

Table 60. *Fixed Capital, Sales, and Overheads plus profits in the US Manufacturing Industry, 1899–1923 (1899 = 100)*

Year	Reproduction cost of fixed capital (1)	Sales (2)	Overheads plus profits (3)	Ratio (3):(2) (4)	Ratio (3):(1) (5)
1899	100	100	100	100	100
1904	137	130	130	100	95
1909	216	182	181	99	84
1914	280	212	205	97	73
1919	816	549	522	95	64
1923	940	539	542	101	58

As we see, the ratio of profits plus overheads to sales—i.e. $(P - C)/P$—remained very stable over the period considered, while there was a strong fall in the ratio of profits plus overheads to capital.

4. Mr Whitman's argument against my application of the concept of degree of monopoly to the cyclical changes in the distribution of income is of less 'fundamental' character than the above objections against my long-run analysis. He disagrees that the rise in $(P - C)/P$ in the depression (even granted again that marginal cost equals average prime cost) means a rise in the degree of monopoly, because he maintains that it is rather the absolute margin of gross profits $P - C$ which, according to him, measures the 'degree of monopoly power'. This implies that it is $P - C$ which is the 'determinant', while $(P - C)/P$ simply results from the value of $P - C$ and from that of prime costs per unit of output; in particular, $P - C$ in this theory is quite independent of the changes in prime costs per unit of output. In support of this theory Mr Whitman says: 'The businessman must pay interest, dividends and salaries in dollars. Given a certain investment and fixed charges, the ratio of gross profits to sales $(P - C)/P$ is much less important or meaningful than the dollars and cents netted on each unit sold.' But to pay interest, dividends, and salaries in dollars the businessman must be concerned, surely, not only with the dollars and cents netted on each unit sold, but also with the number of units he is able to sell at the price he charges. And it is just the concern about the volume of sales which is the central point in the problem of degree of monopoly.

Let us imagine a number of entrepreneurs producing a certain product. They charge for it the prices $p_1, p_2 \dots p_n$, which are in general not equal, since the market is imperfect. Their average prime costs (which, according to my assumption, are approximately equal to the marginal costs) are $c_1, c_2 \dots c_n$, respectively. The short-period equilibrium of the price system is maintained as follows. The entrepreneur k does not cut his price, because he believes, on the basis of his knowledge of the market, that a reduction of p_k by $\alpha\%$ would reduce the gross profit margin $p_k - c_k$ in a greater proportion than that in which it would increase the volume of sales s_k. (In his consideration he takes into account both the 'mobility' of customers—i.e. market imperfection as he estimates it—and the probable reaction of other entrepreneurs—i.e. the oligopolistic factors.) In the same way he decides that there is no profit in raising p_k.

Imagine now a fall in the cost of materials and wages which reduces $c_1, c_2 \dots c_n$ in the same proportion to the level $c'_1, c'_2 \dots c'_n$, respectively. According to Mr Whitman's theory, the absolute gross profit margins then remain constant, so that we have $p'_k - c'_k = p_k - c_k$. It is easy to see that if the entrepreneur's assumptions about the character of the market are unchanged, there will be a tendency for a further price reduction. For now a cut of p'_k by $\alpha\%$ means a smaller percentage cut in the gross profit margin $p'_k - c'_k$ than previously, because p'_k is smaller than p_k. Therefore, the price fall will continue. If it is not the case, the market imperfection (or rather entrepreneurs' ideas about it) and/or the degree of oligopoly must have risen.

If, however, the profit margins fall in the same proportion as prime costs, so that $(p'_k - c'_k)/p'_k = (p_k - c_k)/p_k$, the same type of short-period equilibrium as prevailed initially is reached. For now a cut in p'_k by $\alpha\%$ means again the same percentage fall in the gross profit margin as in the initial situation.

We thus see that a short-period equilibrium with gross profit margins reduced in the same proportion as prime costs, and thus with $(P' - C')/P' = (P - C)/P$, means an unchanged degree of market imperfection and degree of oligopoly; while a short-period equilibrium with unchanged absolute gross profit margins, and thus $(P' - C')/P' > (P - C)/P$ implies a rise in market imperfection and/or degree of oligopoly. This is the theoretical basis for considering $(P - C)/P$, and not $P - C$, as the measure of 'degree of monopoly'.[9]

[9] It may perhaps be objected to the above argument that if market imperfection is partly due to transport costs and these remain unaltered while prime costs decline, the fall of gross profit margins in the same proportion as prime costs does not establish short-period equilibrium, for a price cut of $\alpha\%$ fails to attract as much custom in the new as in the initial position. As a result $p_k - c_k$ will fall less than c_k. This is quite true, but it is common sense to consider the rise of transport costs in relation to prime costs as a rise in market imperfection, as indicated by a rise in $(P - C)/C$. It is, of course, necessary to keep in mind, when interpreting changes in the 'degree of monopoly', that market imperfection depends on our interpretation of the relation of transport costs to prime costs.

5. I shall now give some statistical evidence in support of the theory that the gross profit margin $P - C$ is affected by changes in the wage and raw-material cost. However, the parallelism between the fall in the average prime costs C and the margin $P - C$ from the top of the boom to the bottom of the slump—e.g. between 1929 and 1932—would not be convincing for Mr Whitman, for he maintains that $P - C$ falls in depression owing to 'a weakening of entrepreneurial control of the market in that period'. I have therefore chosen cases where a strong fall in unit prime costs was combined with an expansion of trade activity. (I quote also one case where a strong rise of unit prime costs happened at practically unchanged output.) The relevant figures are given in Table 61.

The simplest interpretation of this table, I think, is to admit that gross profit margins $P - C$ tend to fall and rise with the unit prime

Table 61. *Proceeds, Prime Costs, and Output in Selected Manufacturing Industries*

Industry	Years	% Changes in		
		$P - C$	C	Output
Textile in USA[a]	1931–3	− 22	− 19	+ 11
Leather in USA[a]	1931–3	− 18	− 23	+ 7
Cotton in UK[b]	1924–7	− 23	− 34	+ 15
Manufacturing in France[c] (Blum experiment)	1936–7[d]	c. + 60	c. + 60	+ 3

[a] $P - C$ obtained by dividing overheads plus profits and wages plus costs of materials, respectively (as given by the census of manufactures), by the respective indices of production of the Federal Reserve Board (textiles: mill products; leather: inclusive of its finished products).
[b] Calculation of Mr Y. N. Hsu for his Ph.D. thesis at Cambridge University, described in my 'Supply Curve of an Industry under Imperfect Competition', *Review of Economic Studies*, Feb. 1940, p. 110.
[c] See my 'Lesson of the Blum Experiment', *Economic Journal*, Mar. 1938, p. 28. [See *Collected Works*, vol. i.]
[d] Apr.–Apr.

costs C. Of course, they need not change in exactly the same proportion, because 'my' degree of monopoly cannot be assumed to remain constant.[10]

Kalecki sent Keynes the typescript of this article on 25 Oct. 1941, with the following note:

Dear Mr Keynes,

In the last *Economic Journal* there appeared a note by Mr Whitman containing a severe criticism of my application of the concept of the degree of monopoly to the theory of distribution of the product of industry. Since I consider this criticism rather misleading, I found it necessary to write a comment which I should like to have published.

Yours sincerely
M. Kalecki

Keynes replied on 29 Oct. 1941:

Dear Kalecki,

I shall be glad to print your reply in the *Economic Journal*, and you will receive a proof shortly. I do not expect, however, that I shall be able to print it before March. The December issue is already full, so far as I can calculate, and the Paper Controller now allows us little latitude.

This will have the advantage that I can submit your proof to Mr Whitman in case he wants to make a rejoinder, though I shall certainly not encourage him to make one.

The difficulty is, I think, that the phrase 'degree of monopoly' does not easily convey to the intuition of the reader the precise analytical meaning which your strict definition attaches to it.

Yours sincerely,
J. M. K.

(This correspondence has survived both in Kalecki's and in Keynes's papers. I am grateful to Lord Kahn for his permission to republish Keynes's letter. There is no evidence in Kalecki's papers of R. H. Whitman writing a rejoinder, or of any correspondence between Whitman and Kalecki on this subject.)

Kalecki's rejection of the assumption of increasing marginal costs and his questioning of the significance of the concept of perfect competition also produced vehement reactions. From the early 1930s he had assumed that firms generally operate below full employment of capital equipment. However, while he had earlier assumed that firms face rising curves of short-period

[10] If the unit prime costs change slowly, this change may be even sometimes fully offset by a change of the degree of monopoly in the opposite direction, so that $P - C$ remains unaltered.

costs, from 1938 he constantly maintained that in the range of output changes the average prime cost is constant and equal to the marginal cost.

In neo-classical economics the assumption of the U-shaped marginal-cost curve played an important role, ensuring the stability of the economic system. Kalecki's reverse L-shaped cost curve undermined this stability. As noted by J. T. Dunlop: 'Economists have a strong bias in favour of steeply sloped cost curves, since curves approaching the horizontal over large ranges of output make small changes in demand result in large changes in output; the system becomes highly unstable' ('Price Flexibility', p. 528; see also H. Staehle, 'The Measurement of Statistical Cost Functions: An Appraisal of some Recent Contributions', *American Economic Review*, 32/2, 1942, p. 328; F. Machlup, *Political Economy of Monopoly*, Baltimore, Johns Hopkins Press, 1952, pp. 513–16, and the same author's 'Theories of Firm: Marginal, Behavioral, Managerial', *American Economic Review*, 57/1, 1967).

Moreover, if the curve of marginal cost is U-shaped, one can determine, on the basis of neo-classical economics, the size of the firm and the industry. One can also find the point of 'equilibrium' of a firm, an industry, or the entire economy. What determines the size of a firm and its position of 'equilibrium' when its cost curve is reverse L-shaped? This question cannot be answered within the analytical apparatus of neo-classical economics (in Kalecki's theory these functions were performed by the availability of capital for particular firms along with his principle of 'increasing risk'—see 'The Principle of Increasing Risk', *Collected Works*, vol. i).

Kalecki's assumption concerning the constancy of marginal cost in the considered range of output changes was first questioned by J. M. Keynes, in whose theory the concept of equilibrium (though understood differently from the concept in neo-classical economics) played an important role. He believed that the marginal cost should include the 'user cost' omitted by Kalecki. Its inclusion would have pushed the slope of the curve of marginal cost (and that of the variable cost) upwards, thereby increasing the stability of the system (see J. M. Keynes, 'Relative Movements of Real Wages and Output', in *Collected Writings*, vol. vii, pp. 44–5; a different position was taken later by Joan Robinson, who maintained that, owing to great arbitrariness in estimating the 'user cost', it is advisable to regard it as part of depreciation and along with the latter to include it into overhead costs—see her *Accumulation of Capital*, London, Macmillan, 1969, p. 183).

The assumption that the marginal cost is constant was also criticized by M. Reder, who argued that, even if all firms in a given industry had horizontal curves of prime costs, the ordinates of these curves would have different values, and then the curve of prime costs of the industry would slope upwards (see M. Reder, 'Rehabilitation of Partial Equilibrium Theory', *American Economic Review, Proceedings*, 1952, esp. pp. 191–2). Others held that the assumption of constant underemployment of capital equipment, on which Kalecki's curve of prime costs was based, limited the application of his theory of distribution to a static economy or to the phase of depression. For otherwise one could not explain why—with underemployed capital equipment—capitalists during a boom nevertheless make net investments (see e.g. F. Hahn, *The Share of Wages in the National Income*, London, Weidenfeld & Nicolson, 1972, pp. 40–1).

On the other hand, Kalecki's assumption about the constancy of unit prime costs in the manufacturing industry was subsequently confirmed by many empirical studies. (See the summary of J. Dean's paper, read at a conference of the Econometric Society in Philadelphia, 'Statistical Cost Curves in Various Industries', *Econometrica*, 8/2, 1940, p. 188; Staehle, 'The Measurement of Statistical Cost Functions'; National Bureau of Economic Research, *Cost Behavior and Price Policy*, New York, NBER, 1960; J. Johnston, *Statistical Cost Curves*, New York, McGraw-Hill, 1960; B. Gold, 'New Perspectives on Cost Theory and Empirical Findings', *Journal of Industrial Economics*, Apr. 1966; A. A. Walters, 'Production and Cost Functions: An Economic Survey', *Econometrica*, 41/1, 1973. More recently, see P. Sylos-Labini, 'Prices and Income Distribution in Manufacturing Industry', *Journal of Post Keynesian Economics*, 2, 1979; A. Koutsoyiannis, *Modern Microeconomics*, 2nd edn., London, Macmillan, 1980.) Kalecki consistently upheld this assumption in his later studies of the capitalist economy.

The discussions on the significance of the concept of perfect competition were more fundamental in nature. They concerned whether prices are determined through the mechanism of the 'invisible hand', or whether firms themselves set the prices for their products. The object of the dispute here was essentially a matter of faith, whether the 'normal' state of affairs in the capitalist economy is 'perfect competition', from which only temporary deviations are observed, or whether the normal state of affairs consists in setting prices in conditions commonly considered as 'monopolistic'.

Kalecki wrote in 1939 that 'free competition, as an assumption, may be useful in the first stage of certain investigations, but as a description of the normal state of a capitalist economy it is merely a myth' (see *Collected Works*, vol. i, p. 252), and he consistently maintained this view in his later publications (see 'A Contribution in the Discussion on O. Lange's Paper "The Practice of Economic Planning and the Optimal Allocation of Resources"', in *Collected Works*, vol. iii, and 'Class Struggle and Distribution of National Income', this volume). Thus it is not surprising that, for economists who saw the concept of perfect competition as the basic organizing element of economic theory, Kalecki's theory, which rejected this concept, could not supply the basis for a *general* theory of distribution. These criticisms of Kalecki's theory can be traced even in much later publications (see e.g. M. Bronfenbrenner, *Income Distribution Theory*, Chicago, Aldine–Atherton, 1971, pp. 410–11; J. Pen, *Income Distribution: Facts, Theories, Policies*, New York and Washington, Präger, 1971, p. 134), though the findings of many empirical studies clearly show that the prices of industrial goods are hardly set by the mechanism of a competitive market.

The first publications showing that, in practice (at least in the manufacturing industry) enterprises themselves set the prices for their products, adding to prime costs the gross profit margin which covers overheads and a 'normal' profit, appeared at the end of the 1930s. (Among the first was a paper by R. L. Hall and C. J. Hitch, 'Price Theory and Business Behaviour', *Oxford Economic Papers*, 2/2, 1939; repr. in T. Wilson and P. W. S. Andrews (eds.), *Oxford Studies in the Price Mechanism*, Oxford, Clarendon Press, 1951; see also P. M. Sweezy, 'Demand under Conditions of Oligopoly', *Journal of Political Economy*, 47, Aug. 1939; for a discussion of the Oxford Group and the historical background of its research, see F. Lee, 'The Oxford Challenge to Marshallian Supply and Demand: The History of the Oxford Economists' Research Group', *Oxford Economic Papers*, NS, 33, 1981.) Hall's and Hitch's findings, also concerning the relation between the profit mark-up and the level of demand, stimulated an animated discussion and further studies of the practice of determining prices for industrial products. Though Hall's and Hitch's study gave rise to some objections (see R. F. Kahn, 'Oxford Studies in the Price Mechanism', *Economic Journal*, 62/1, 1952), other studies of pricing, especially by large American corporations, confirmed their main findings (see A. D. H. Kaplan, J. B. Dirlam, and R. F. Lanzilotti, *Pricing in Big Business*, Washington, DC, Brookings Institution, 1958; *United States Senate Committee on the Judiciary Sub-Committee on Antitrust and Monopoly*, Washington, DC, 1957–63; P. W. S. Andrews, *Manufacturing Business*, London, Macmillan, 1949; A. Silberston, 'Price Behaviour of Firms', *Economic Journal*, 80/3, 1970, esp. pp. 541–82). The theory of prices based on so-called 'full cost' was developed mainly from the study of Hall and Hitch. Studies of price changes from that of R. R. Neidl ('Pricing and Employment in the Trade Cycle', National Institute of Economic and Social Research, Occasional Paper No. 2, 1963), W. Godley and W. Nordhaus ('Pricing in the Trade Cycle', *Economic Journal*, 82, 1972), K. Coutts, W. Godley, and W. Nordhaus (*Industrial Pricing in the United Kingdom*, Cambridge, Cambridge Univ. Press, 1978), and M. C. Sawyer (*Business Pricing and Inflation*, London, Macmillan, 1983) have emphasized the importance of cost changes in the determination of price changes.

Kalecki's rejection of the view that prices are set by the mechanism of the competitive market came piecemeal. In his early articles on income distribution theory, the gross profit margin, as in neo-classical economics, is determined by elasticity of demand for the product of a given firm. It is clear, however, that when he writes of the degree of monopoly, he thinks constantly of the market structure, and that in his approach the elasticity of demand is meant to measure the actual market structures. In the second version of his theory of income distribution (1939–40), he began to consider oligopolistic factors by making this elasticity dependent on prices for the same product manufactured by other enterprises in a given branch (see 'The Supply Curve of an Industry under Imperfect Competition' and 'A Theory of Long-Run Distribution of the Product of Industry', this volume; for a discussion and criticism of this version of Kalecki's theory, see Kriesler, *Kalecki's Microanalysis*, ch. 5). Having abandoned, in 1943, this version of his theory, Kalecki maintained his basic assumptions and insights into factors determining prices and income distribution. Moreover, in the third (and final) version of his theory he also points out the difference between the 'full-cost' theory and his own approach. In the former, every change in the average prime cost is automatically passed on to the price. For Kalecki, on the other hand, the price also depends on the prices set by other manufacturers, and hence there is no automatic mechanism here (see *Studies in Economic Dynamics* and *Theory of Economic Dynamics*, pp. 132–5 and 217, this volume; for a criticism of Kalecki's rejection of 'full-cost' theory, see F. S. Lee, 'Kalecki's Pricing Theory: Two Comments', *Journal of Post Keynesian Economics*, 8/1, 1985). Moreover, the logic of the 'full-cost' pricing formula requires that, in the course of the business cycle, prices should tightly follow production costs; this is not supported by statistical evidence (see Coutts *et al.*, *Industrial Pricing in the United Kingdom*).

With respect to the relationship between changes in demand and profit mark-ups and prices, the majority view seems to be that such changes do not directly influence prices but do affect profit margins (see G. C. Harcourt (ed.), *The Microdynamic Foundations of Macroeconomics*, London, Macmillan, 1977; P. Sylos-Labini, 'Industrial Pricing in the United Kingdom', *Cambridge Journal of Economics*, 3/2, 1979); this is consistent with Kalecki's pricing formula.

The next widely debated element in the early version of Kalecki's theory was the dependence of the degree of monopoly (and hence also of the relative shares in income distribution) on the elasticity of demand for the product of a firm. At first Kalecki assumed that entrepreneurs maximize profits by setting volume of output at a level for which the marginal revenue equals the price. Under this assumption, the relation of price to the unit prime cost as well as the degree of monopoly were determined by the elasticity of demand for the product of the firm.

Among numerous criticisms of making the degree of monopoly dependent on the elasticity of demand, Oskar Lange's is especially noteworthy. I ange noted that the degree of monopoly can determine the distribution of the national income if we drop the assumption that entrepreneurs equalize marginal revenue and marginal cost. 'The degree of monopoly then is not the reciprocal of the elasticity of demand but depends on the price set by custom or by the tacit agreement of the group' (O. Lange, review of Kalecki's *Essays in the Theory of Economic Fluctuations*, *Journal of Political Economy*, 49, 1941, p. 281; see also N. Kaldor, 'Alternative Theories of Distribution', *Review of Economic Studies*, 23/2, 1955–6, p. 192).

Other consequences of Kalecki's early approach to the degree of monopoly were pointed out in 1960 by P. Davidson (*Theories of Aggregate Income Distribution*, New Brunswick, NJ, Rutgers Univ. Press, p. 53). If the marginal cost is constant and the price is determined by elasticity of demand, the ratio of price to marginal cost is also constant for all levels of output below full capacity. This would mean that every change in the volume of production (below full employment of capital equipment) is the effect of iso-elastic shifts of demand curves for the product of individual firms (or that changes in the elasticity of demand for the product of one firm exactly offset changes in the elasticity of demand for the product of another firm, so that in the end there is no change in the degree of monopoly). Davidson regarded these assumptions as unwarranted, either for a single firm or for the economy as a whole.

At the same time, Davidson pointed out that 'the weighted average price for an industry, upon which Kalecki builds his new concept of the degree of monopoly, is a nebulous concept' (ibid. 54). Indeed, from 1939–40 Kalecki used a concept of an 'industry' which is important for his theory, because only once individual degrees of monopoly of each firm (or individual profit mark-ups, in the 1971 edition of the third version of his theory) are aggregated into industry aggregates, and next into a weighted-average degree of monopoly in the whole economy, is it possible for his micro-economic mechanism of price determination to determine, at a macro-economic level, the relative shares in national income. However, except for perfect competition on the one hand and strict monopoly on the other, i.e. the two cases in which Kalecki's theory does *not* hold, for all intermediate market structures the definition of an 'industry' gives rise to methodological difficulties.

> What is the essence of the difficulty in defining an 'industry' under oligopoly competition? The product of each firm included in an 'industry' must differ from products of other firms so that each firm can determine the price for its product, i.e. so that each product has its own price. Yet the product differentiation must not be too big, because every oligopoly firm (unless it ceases to be an oligopoly and becomes a monopoly) must take into account prices fixed for similar products by its oligopoly competitors. The prime-cost curves of individual firms in an 'industry' must not differ too much between themselves, yet they must be mutually independent. Those contradictions can be solved only by an arbitrary definition of the scope of an 'industry'. (J. Osiatyński, 'Kalecki's *Theory of Economic Dynamics* after Thirty Years', *Oeconomica Polona*, 1, 1986, p. 29.)

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p. 223; see also G. L. S. Shackle, *The Years of High Theory*, Cambridge, CUP, 1967, p. 66). But the critics remain unpersuaded (for a recent restatement of this criticism, see Kriesler, *Kalecki's Microanalysis*).

The third version of Kalecki's theory of income distribution, put forward in his 1943 *Studies in Economic Dynamics* (see pp. 119–38, this volume), is no longer subject to the criticism which followed from linking the determination of prices and relative shares with elasticity of demand for the product of individual firms. Profit-maximizing behaviour in individual firms is not mentioned there, and in a development of this version of his theory, in the *Theory of Economic Dynamics*, Kalecki states explicitly that he does not assume that firms attempt to maximize their profits in any precise manner (see p. 210).

As soon as he abandoned the link between elasticity of demand and the determination of prices and national income distribution, however, Kalecki was subject to the criticism that he had become satisfied 'with a purely tautological approach according to which the ratio of price to prime costs is *defined* simply as the "degree of monopoly". Propositions based on implicit definitions of this kind make of course no assertion about reality, and possess no explanatory value' (Kaldor, 'Alternative Theories of Distribution', p. 92; see also Bauer, 'A Note on Monopoly', pp. 197–8; P. Davidson, *Theories of Aggregate Income Distribution*, p. 54; A. Mitra, *The Share of Wages in National Income*, The Hague, Central Planbureau, 1954, pp. 28–30; C. E. Ferguson, *The Neoclassical Theory of Production and Distribution*, Cambridge, Cambridge Univ. Press, 1969, pp. 310–11; J. Eatwell, 'Theories of Value, Output and Employment', in J. Eatwell and M. Milgate (eds.), *Keynes's Economics and the Theory of Value and Distribution*, London, Duckworth, 1983, p. 125; for some early defence against the tautology charges, see P. Sylos-Labini, *Oligopoly and Technical Progress*, Cambridge, Mass., Harvard Univ. Press, 1962; P. A. Riach, 'Kalecki's "Degree of Monopoly" Reconsidered', *Australian Economic Papers*, 10/16, 1971, pp. 51–2).

The criticism of the tautological nature of the later formulations of Kalecki's theory, including that in his *Theory of Economic Dynamics*, may have followed from the fact that he gave no precise definition of his concept of the degree of monopoly. Comparing Kalecki's theory with the marginal-productivity theory of income distribution, Kaldor wrote:

> Just as the positive content of the marginal productivity theory can be summed up by the statement that the rate of profit on capital (and the margin of profit in output) is governed by the need to prevent the capital–output ratio from being either too large or too small, the positive content of 'the degree of monopoly' theory can be summed up in the sentence that 'profit margins are what they are because the forces of competition prevent them from being higher than they are and are not powerful enough to make them lower than they are'. Unfortunately neither of these statements gets us very far. (Kaldor, 'Alternative Theories of Distribution', p. 93.)

Similar criticism was made earlier, implicitly, by Joan Robinson, who wrote that the mark-up price theory did not provide an explanation of what made the absolute values of profit margins be whatever they were, and concluded that such a theory did not enlarge our knowledge on how gross profit margins were in fact determined (see *An Essay on Marxian Economics*, London, Macmillan, 1942, p. 95; in one of the detailed comments on her book, attached to his letter to her of 30 July 1942, Kalecki replied: 'By analysing the profit margin in terms of imperfect competition and oligopoly we gain the advantage of being able to say something about its *changes*'; see Joan Robinson's papers, King's College Library, Cambridge).

In 1968, replying to these charges of tautology, Kalecki explained that in the later formulations of his theory the degree of monopoly is a 'catch-all' concept, embracing factors which have a bearing on the formation of prices and are reflected in the parameters of his price equation (see p. 438 above). This explanation hardly puts an end to doubts. The difficulty of the later formulations of the concept of degree of monopoly is that Kalecki does not supply a quantitative explanation of what determines the respective values of the individual parameters of his pricing equations. It is on this basis that the later formulations of his theory continue to be considered 'tautological' or 'open' even by some of his admirers who develop and popularize his views (see e.g. D. M. Nuti, '"Vulgar Economy" in the Theory of Distribution', *De Economist*, 18/4, 1970, p. 367; for a discussion of recent attempts to 'close' Kalecki's theory and defend it against tautology charges, see p. 510 below; for a rejection of these charges with respect to all versions of Kalecki's theory, see Kriesler, *Kalecki's Microeconomics*, appendix).

The full appreciation of Kalecki's theory is not helped either by his handling of statistical analysis, which can be considered rather as a rationalization of observed movements in the time series than as an empirical testing of his theory.

> Examination of the time series is interesting in highlighting the extent to which changes in income distribution were due to changes in the ratio of raw materials to wage costs, to changes in the ratio of aggregate proceeds to prime costs, or—for US data only—changes in industrial composition. However, they do not provide us with a test of the crucial hypothesis that it is changes in the degree of monopoly . . . that were responsible for the changes in the ratio of aggregate proceeds to aggregate prime costs. To verify this hypothesis, we would need to specify, and identify precisely, the relationship postulated and to obtain the appropriate time series for the degree of monopoly factors. Kalecki completed neither of these tasks. (P. J. Reynolds, 'Kalecki's Degree of Monopoly', *Journal of Post Keynesian Economics*, 5/3, 1983, p. 498.)

Another controversial aspect of Kalecki's theory was the share of wages in national income under free competition. In the first version of his theory, Kalecki wrote that under free competition the degree of monopoly is equal to zero; thus capitalists not only would not realize any net profits, but could not even cover their overheads. He regarded this paradox as only apparent, since the concept of degree of monopoly, owing to its underlying assumptions, is not applicable to the study of income distribution under free competition (see pp. 9–10).

From the very beginning this question gave rise to various doubts, however. As long as Kalecki's concept of the 'degree of monopoly' was identified with Lerner's concept of the 'degree of monopoly power', the zero value of the degree of monopoly under free competition seemed justifiable. Even at that stage, however, some critics (Dunlop, Whitman, and Bauer) pointed out that there can be only a weak link between the degree of monopoly and profits of an enterprise. Later this thesis of Kalecki was criticized by Andrews (*Manufacturing Business*), M. Nasiłowski ('The Share of Wages in the National Income of the USA and England', Warsaw, PWN 1962, pp. 140–2 (in Polish)), and others. M. Dobb gave special attention to these difficulties of what he called Kalecki's 'monopoly-theory of distribution':

> It is clear that monopoly, and monopolistic price-policy, is a factor of which account must be taken in any explanation of distribution that is to fit the modern capitalist world. Some have found ground for criticism in the fact that Kalecki's use of the notion of monopoly power is represented as the downward slope of the demand-curve facing the seller (and hence of its derived marginal revenue curve). Admittedly, this is a considerable simplification, omitting (or else in some manner subsuming) such aspects as so-called 'monopsony', and sheer bargaining-power in factor-markets, in particular the labour market. On the other hand, is it possible to deal with monopoly and monopoly-price-fixation *except* in terms of market-conditions and hence of the state of demand? Is one not inevitably here within the category of 'market price'? If so, it can hardly be valid ground for criticism that the matter should be handled in such terms. How far it can form a sufficient basis for a general theory of distribution and employment, as distinct from a particular *ad hoc* theory (e.g. of the realization problem and investment fluctuations), is another question. But then it may well be that, as some have held, . . . no general determinate theory of monopoly is possible, especially of situations approximating to 'oligopoly'. (M. Dobb, *Theories of Value and Distribution since Adam Smith*, Cambridge, CUP, 1973, pp. 224–5.)

Turning next to the difficulties connected with Kalecki's theory of income distribution, this great admirer of Kalecki's theories, who always stressed their close affinity to those of Marx, writes:

> A more substantial difficulty is that by implication the mark-up would be zero under conditions of perfect competition. If surplus-value is *solely* the creation of monopoly, its emergence under the 'normal' competitive conditions envisaged by the classical economists and by Marx would seem to be denied. This objection would not be a serious one if the theory were clearly labelled as one appropriate to monopoly capitalism *per se*; an alternative explanation of surplus-value being admittedly appropriate to an earlier, competitive stage of the system, in conditions of a reserve of labour and elastic labour supply. . . .
>
> Alternatively, and with a somewhat different emphasis, one might say that, while the classical Marxian explanation for the emergence of surplus-value continues to apply to modern capitalism, as to its earlier stage, the influence of monopoly enters in as an additive element in the stage of monopoly capitalism—an influence reminiscent of forms of exploitation characteristic of pre-capitalist stages of development. (Ibid. 269–70.)

Although the theory of income distribution absorbed Kalecki to the end of his life, from 1939 he never repeated the assertion that under free competition the degree of monopoly equals zero. Instead of defending this equality or explicitly abandoning it, he concentrated on showing the inadequacy of the concept of free competition and its limited applicability for explaining the real world. To this day, this position gives rise to many doubts in interpretations of his theory, among which perhaps the following is the most important. Should the core of a general theory explaining profits in capitalism, their origin, their relative share in national income and its changes, be founded on a model of oligopolistic economy and its analytical categories? Or, alternatively, can such a theory be based on the model of a free-competition economy, using such categories as the average rate of profit, 'prices of production' (long-run equilibrium prices), etc., with the analysis of distribution under oligopoly conditions treated only as a certain modification of this theory, or its special case? This is the gist of the difficulty pointed out by Dobb and others.

Following some reinterpretations of Kalecki's theory, the underlying conceptual framework is that of the free-competition model, with the rate of profit (expected, 'normal', etc.) taking a central part in the explanation of price-setting (see e.g. Riach, 'Kalecki's "Degree of Monopoly" Reconsidered'; A. Asimakopulos, 'A Kaleckian Theory of Income Distribution', *Canadian Journal of Economics*, 8/3, 1975; Reynolds, 'Kalecki's Degree of Monopoly'). There the mark-up on prime costs is determined with reference to the expected rate of return on capital. Some of the work of the post-Keynesian economists falls into this category too. This is also the underlying motive of the criticism of Kalecki's approach by E. Nell and B. Jossa (see their respective contributions in M. Sebastiani (ed.), *Kalecki's Relevance Today*, Macmillan, London, 1989; see also M. Nasiłowski, 'The Share of Wages in the National Income of the USA and England') and of the criticism by B. Fine and A. Murfin (*Macroeconomics and Monopoly Capitalism*, Brighton, Wheatsheaf, 1985).

The attempts to impose a uniform rate of profit onto Kalecki's analysis are flatly rejected by Peter Kriesler:

> The uniform rate of profit is an important concept for economists in the Sraffian tradition and historically for classical economists (including Marx). However, there are important analytical differences between Kalecki and the classical economists—particularly in their analysis of the workings of the competitive process.
>
> This is not to argue that there is no tendency towards uniformity in rates of profits, but rather any such tendency is weak, and other economic factors . . . dominate it. For all these reasons, any attempt to impose either a uniform rate of profit, or long-period

analysis on Kalecki must be rejected. (Contribution to the conference on 'Kalecki's Relevance Today', Perugia, 22–29 April 1986, mimeo.)

Kalecki does not give a direct answer to this question, but from his own studies it seems to follow that the problems of determinants of the distribution of national income in a capitalist economy should be handled instead with the model of an oligopolistic economy.

In one stage of the discussion it was thought that Kalecki in fact put forward not one but two theories of distribution. This was first suggested by M. Dobb:

Just before the war, however, two novel and alternative theories were advanced by the same author, the Polish economist, . . . Michal Kalecki. . . . One of these was adapted to fit the traditional case of perfect competition, the other was framed explicitly to deal with conditions of imperfect competition and monopoly. ('Two Modern Theories of Wages', *Indian Journal of Labour Economics*, 1, Oct. 1958, p. 271.)

A similar interpretation was given a few years later by Joan Robinson:

As well as the short-run theory of distribution connected with the 'degree of monopoly' his *Essays* [*in the Theory of Economic Fluctuations, Collected Works*, vol. i] contained a long-run theory based on the principle that 'the workers spend what they get and the capitalists get what they spend'. From this is derived the conception that the rate of profit on capital is determined by the rate of accumulation and the propensity to save of capitalists. ('Kalecki and Keynes', in *Collected Economic Papers*, vol. iii, Oxford, Blackwell, 1965, p. 99; see also G. R. Feiwel, *The Intellectual Capital of Michal Kalecki*, Knoxville, Tenn., Univ. of Tennessee Press, 1975, p. 89.)

Kalecki rejected these interpretations. In 'A Note on Dobb's "Two Modern Theories of Wages"', he wrote:

I do not fully agree with Dobb's interpretation of my two theories, since I do not consider them alternative but supplementary. According to the first theory the *absolute* level of profits is determined by capitalist consumption and investment. According to the second theory the *relative share* of profits in the national income is determined by the 'degree of monopoly'. In this way capitalist consumption and investment conjointly with the 'degree of monopoly' determine the national income and the wage bill. (*Indian Journal of Labour Economics*, 3/3, 1960, p. 121.)

Kalecki made an even sharper rejoinder in a letter of 14 Mar. 1966 to M. Lutfalla, an interpreter of his *Theory of Economic Dynamics* and the author of the preface to the French edition of the book:

I find your preface very well written although I would disagree on the interpretation and emphasis at a few points. In particular, I think that you should have emphasized that capitalist decisions to invest and consume in a given period taken in the past determine the *absolute* value of profit in this period; while the factors on which the distribution of national income between capitalists and workers depends—such as degree of monopoly—determine the relative share of profits in the national income. It is in this way that the value of the national income is determined by profits and the 'distribution factors' and not vice versa. The misunderstanding of this rather simple concept led some economists to believe that I have really two theories of distribution of national income, which is entirely wrong. (A copy of the letter is in Kalecki's papers.)

Changes in relative shares in national income distribution: polemics on the theoretical model and its statistical testing

The introduction of oligopolistic competition and of the concept of the degree of monopoly required revision of Kalecki's earlier conclusions, which were based on the assumption of free competition and concerned the influence of changes in money wages on real wages, as well as changes in relative shares in income distribution during the business cycle and in the long run.

From 1938 onwards, in Kalecki's writings a reduction in money wages does not affect real wages, provided only that the degree of monopoly does not change. But under imperfect competition some prices are inelastic and do not fall in the same proportion as money wages. Consequently, Kalecki drops the assumption about the degree of monopoly being constant in these conditions (see p. 34 and *Collected Works*, vol. i, p. 467). If a reduction in money wages—the level of which Kalecki, for the purposes of the analysis, considers as given, nothing being said about the actual determination of money wages in the economy—follows from a rise in the degree of monopoly, it reduces real wages and their share in national income; then total demand, output, and employment all shrink. Removal of the assumption of the unchanged degree of monopoly, however, in no way affects Kalecki's earlier conclusion that a reduction in money wages does not cause an increase in capitalist spending.

Kalecki also modifies his earlier conclusions on the share of wages of manual workers in the income of the private sector in the course of the business cycle. He now considers the influence of two factors. The first represents cyclical changes in the degree of monopoly which has a tendency to increase during a depression and to fall during a boom. This factor by itself would lead to a fall of real wages and their share in income during a depression, and to their increase during the upswing. The second factor is the dependency of the share of wages in income on the ratio of prices of basic raw materials to money wages.

During the 1929–33 crisis, prices of raw materials fell more than twice as much as those of manufactured goods; that is, by about as much as might be expected, considering that the cost of material inputs represented about a half of total direct costs in industry. (See P. Sylos-Labini, 'New Aspects of the Cyclical Development of the Economy', *Banca Nazionale del Lavoro Quarterly Review*, 148, 1984, p. 19 n.)

This was the background for Kalecki's 'two-tier' pricing formula. According to it, on the one hand prices for manufactured goods are 'cost-plus'-determined and, on the other hand, prices for raw materials and agricultural goods are demand-determined.

This pricing formula (which is now in common use and finds support in many statistical inquiries—see e.g. P. Sylos-Labini, 'Rigid Prices, Flexible Prices and Inflation', *Banca Nazionale del Lavoro Quarterly Review*, 140, 1982) leads Kalecki to the conclusion that the ratio of raw-material prices to money wages increases during an upswing and declines during a depression. However, since at a given degree of monopoly the share of wages in income is a decreasing function of the ratio of raw-material prices to wages, this factor would work towards lowering the share of wages during a boom and increasing it during a depression. Therefore, the influence of both these factors taken together is mutually offsetting, making the share of wages in national income highly stable throughout the cycle.

In the third version of his theory of income distribution, Kalecki is less categorical on changes in the degree of monopoly during crisis, and allows for a possibility of a 'cut-throat' competition developing during a depression (see p. 216); in such unusual cases there would follow a strong rise in the share of wages in national income. Moreover (partly in response to criticism by P. T. Dunlop and others—see pp. 506–7 below), in *Theory of Economic Dynamics* Kalecki also takes into account the influence of changes in output structure on relative shares in income distribution (see pp. 228–9).

All these considerations of additional factors affecting cyclical fluctuations of relative shares in national income lead him, however, to the same conclusion as in his earlier studies, namely, that 'the relative share of wages, whether in the value added of an industrial group or in the gross income of the private sector as a whole, does not seem to show marked cyclical fluctuations' (ibid.).

Turning to the considerable stability of relative shares in national income over the long period, Kalecki explained it as a result of mutually offsetting long-term changes in the degree of monopoly, increasing on account of the ever greater concentration of production, and long-term changes in the ratio of prices of raw materials to wages, showing a declining trend (see pp. 227–8). In his empirical analysis, which essentially confirmed the constant share of wages in income, he explained some changes in this share by a stronger influence either of the first or of the second factor (on the shortcomings of this analysis, see pp. 228–31 above).

In the first and second versions of his theory of income distribution Kalecki believed that it was difficult to trace some long-term regularities in changes of the ratio of raw-material prices to wages. (This view was criticized by Sylos-Labini, who held that the relative decline in raw-material prices was hardly an accident, but the result instead of an endogenous process that ultimately depends on the concentration of production—see Sylos-Labini, *Oligopoly and Technical Progress*, p. 110 n. 14.) On the other hand, Kalecki's position on the long-term increase of the degree of monopoly was later less categorical, allowing for the possibility that a general tendency of the degree of monopoly to increase in the long run may be 'much stronger in some periods than in others' (p. 227 above). This, together with consideration of the influence of changes in the composition of industrial output, led him to conclude, in *Theory of Economic Dynamics*, that it was impossible a priori to settle the long-run trend of the relative share of wages in national income (ibid.).

This theoretical explanation of changes in relative shares during the business cycle and in the long run, resting on the degree of monopoly theory of income distribution, as well as the interpretation of the statistical data which Kalecki used to test his conclusions, generated many polemics and statistical research.

At the beginning, the criticism centred rather on Keynes's belief that an increase in demand must necessarily lead to increased prices of manufactured goods and therefore to a fall in real wages in the upswing phase of the business cycle. In 1939 it was shown that no such relationship could be established; indeed, the real wages tended to follow changes in money wages during the business cycle (see J. T. Dunlop, 'The Movement of Real and Money Wages', *Economic Journal*, 48/3, 1938). The study of Hall and Hitch gave support to Dunlop's thesis (see Hall and Hitch, 'Price Theory and Business Behaviour', p. 124). Keynes was disconcerted by this evidence, and used some of Kalecki's conclusions to explain Dunlop's findings (see Keynes, 'Relative Movements of Real Wages and Output', and the correspondence between Dunlop and Keynes published in Keynes's *Collected Writings*, vol. xxix, London, Macmillan, 1979).

This criticism implicitly applied to Kalecki's earlier views rather than to his degree of monopoly theory of income distribution, as in the latter, apart from cyclical changes in the degree of monopoly, the share of wages in national income was also influenced by changes in the ratio of raw-material prices to wages. The findings of Dunlop and of Hall and Hitch could merely mean that the second factor was stronger than the first in the period considered. The data given by Keynes in his reply to Dunlop (see 'Relative Movements of Real Wages and Output', pp. 37 ff.), as well as further studies of this question, showed that changes in real wages during the cycle were rather minor and irregular (see L. Tarshis, 'Changes in Real and Money Wages', *Economic Journal*, 49/1, 1939; J. R. Richardson, 'Real Wage Movements', *Economic*

Journal, 49/3, 1939, No. 3; for an appraisal of these discussions, see J. E. Schor, 'Changes in the Cyclical Pattern of Real Wages: Evidence from Nine Countries, 1955–80', *Economic Journal*, 95/2, 1985).

Kalecki's explanation of the considerable stability of the relative share of wages in national income in the USA and Great Britain was considered by Keynes unsatisfactory, and the phenomenon itself rather puzzling:

Kalecki makes, to the best of my understanding, no definite progress towards explaining why, when there is a change in the ratio of actual to capacity output, the corresponding changes in the degree of the imperfection of competition should *so exactly* offset other changes. Nor does he explain why the distribution of the product between capital and labour should be stable in the long run, beyond suggesting that changes of one kind always just serve to offset changes of another; yet it is very surprising that on balance there should have been a constant degree of monopoly over the last twenty years or longer. His own explanation is based on the assumptions that marginal real costs are constant, that the degree of imperfection of the market changes in the opposite direction to output, but that this change is precisely offset by the fact that the prices of basic raw materials (purchased by the system from outside) relatively to money wages increase and decrease with output. Yet there is no obvious reason why these changes should so nearly offset one another. ('Relative Movements of Real Wages and Output', p. 49.)

Some years later, J. T. Dunlop also questioned Kalecki's explanation of the empirical stability of relative shares over the short and long run. In Dunlop's opinion, examination of individual industries shows considerable fluctuations of relative shares, while final conclusions as to the share of wages in aggregate income are obscured by large changes in the branch composition of output. In his opinion, these changes, and not changes in the degree of monopoly, have a decisive influence on relative shares. After studying changes in the composition of output of 30 branches of the American economy, Dunlop concluded that the relative stability of the share of wages during the period examined by Kalecki was due primarily to structural shifts (see Dunlop, *Wage Determination under Trade Unions*, pp. 174–80).

Dunlop's argument has been quoted by many of Kalecki's critics. Kalecki's position on this criticism is expressed in a note of 14 Aug. 1951 which has survived in his papers:

In my *Essays in the Theory of Economic Fluctuations* I estimated the relative share of wages in the gross national income for the United States. This estimate showed a considerable stability of the relative share of wages in depression. These estimates are not reproduced here because they were based on certain rather arbitrary assumptions. On the other hand, the criticism of Mr Dunlop in his *Wage Determination under Trade Unions*, in which he attributes this stability to a large extent to the shift in importance of the main sectors of the economy, is not correct. From his own Table XI it follows that this shift accounts only at the most for 1.5 percentage point. (The relative share of wages in 1932 is changed from 38.7 to 40.2.) It is obvious that in referring to the stability of the relative share of wages I had in mind only an absence of considerable fluctuations so that a correction of this order is of no importance.

Attached to this note is Kalecki's recalculation (on the basis of table xi of Dunlop's book) of the values of the relative share of manual labour of table 2 of Kalecki's *Essays* (see *Collected Works*, vol. i, p. 238, table 7). After considering changes in the composition of output, Kalecki obtains the following values of the relative shares (%): 1929: 39.0; 1930: 38.7; 1931: 39.6; 1932: 40.2; 1933: 41.7; 1934: 39.9.

A more fundamental criticism of Kalecki's use of degree of monopoly to explain distribution over the long run was made in 1948 by W. W. Rostow, who questioned the empirical soundness of three of Kalecki's basic assumptions for long-term studies: (i) that the short-term marginal cost is constant and equal to the average variable cost; (ii) that this cost is directly linked with the formation of price; (iii) that, with respect to the economy as a whole, the position of a single firm can be expressed by means of such an aggregate concept as the degree of monopoly (see his *British Economy of the Nineteenth Century*, Oxford, Clarendon Press, 1948, pp. 234–5).

On the other hand, the study by S. C. Tsiang of cyclical and long-term changes in gross profit margins in the entire American manufacturing industry, and in selected branches, during the period 1919–37 (*The Variations of Real Wages and Profit Margins in Relation to the Trade Cycle*, London, Pitman, 1947, esp. chs. 5 and 6) confirms Kalecki's thesis that cyclical changes in gross profit margins are influenced by open and tacit price agreements among producers, and that these agreements have a much stronger influence on profit margin fluctuations than factors influencing elasticity of demand. The empirical studies of E. H. Phelps Brown and P. E. Hart ('The Share of Wages in National Income', *Economic Journal*, 62/2, 1952, pp. 257–77) and E. H. Phelps Brown and B. Weber ('Accumulation, Productivity and Distribution in the British Economy', *Economic Journal*, 63/2, 1953, pp. 263–88) have confirmed the constancy of relative shares in income. The findings of the first study have also shown that, if shifts in the structure of employment were considered (i.e. the declining share of manual workers to the advantage of technical–managerial personnel), then the stability of the share of wages of manual workers examined by Kalecki would be even greater. Thus, taking into account Kalecki's note in connection with Dunlop's criticism, neither changes in the structure of production nor changes in the structure of employment can by themselves explain the stability of the share of wages in national income.

A very extensive criticism of Kalecki's theory was also made by Mitra (*The Share of Wages in National Income*, pp. 22–51). In his opinion, the major limitation of Kalecki's analysis is that it lacks a suitable statistical measure of the degree of monopoly. So Mitra puts forward his own concept of such a measure. Then, on the basis of an empirical analysis of its parameters, he concludes that it shows no great changes either in the long run or throughout the cycle. Finally, Mitra presents his own theory of pricing and the distribution of national income, based on Cournot's assumptions. (For a criticism of Mitra's theory, see J. K. Sengupta, 'Some Theoretical Observations towards a Synthetic Distributive Model'. *Calcutta Review*, Dec. 1959, pp. 282 ff., and Nasiłowski, 'The Share of Wages in the National Income of the USA and England', pp. 146–56. In the latter's opinion, Mitra statistically tests Kalecki's theory 'in a way that completely misses its essence. Comparing the more or less constant trend of the "degree of monopoly" with large fluctuations in prices for raw materials, he states that both of these values do not mutually offset each other. He forgets, however, that Professor Kalecki's formula does not speak directly about the prices of raw materials but about their ratio to worker wages, which is not the same thing' (ibid. 138). Mitra maintained his criticism of Kalecki's theory in his *Terms of Trade and Class Relations: An Essay in Political Economy*, London, F. Cass, 1977, pp. 70, 79–80 n. 4.)

The problem of changes in gross profit margins during the cycle and over the long run in the American manufacturing industry in the period 1917–56 was further studied by K. Sato ('Price–Cost Structure and Behavior of Profit Margins', *Yale Economic Essays*, 2, 1961, pp. 361–418). In his opinion, statistical analysis has not confirmed either a long-term increase in gross profit margins, or a tendency for them to increase during depression on account of tacit or open agreements between sellers.

In the mid-1970s Kalecki's theses on changes of relative shares during the cycle were questioned by Boddy and Crotty. While underlining the importance of Kalecki's 'Political Aspects of Full Employment' (see *Collected Works*, vol. i) for its emphasis on the contradiction between a policy of full employment and the social and political requirements of liberal capitalism, and on the political foundations of the opposition of capitalists to such a policy, Boddy and Crotty note that, besides the class instinct, capitalists have another reason to believe that full employment is an unhealthy condition. This reason is the empirically confirmed fall in the share of profits in income during a boom: in the second half of the upswing the share of wages typically increases, and a limitation of profits does indeed take place (R. Boddy and J. Crotty, 'Class Conflict, Keynesian Policies, and the Business Cycle', *Monthly Review*, Oct. 1974, p. 4).

Boddy's and Crotty's conclusions are based on a study of changes in the ratio of profits to wages in the USA in 1954–69. On the one hand, however, their statistical data can apparently be interpreted as evidence of a fall of the share of real wages during the upswing (see H. Sherman, 'Inflation, Unemployment, and Monopoly Capital', *Monthly Review*, Mar. 1976; R. Boddy and J. Crotty, 'Wage-Push and Working Class Power: A Reply to Howard Sherman', *Monthly Review*, Mar. 1976). On the other hand, failure to consider

changes in the ratio of raw-material prices to wages makes their data inadequate for questioning Kalecki's thesis on the relative stability of income distribution during the business cycle.

Notwithstanding various detailed methodological problems related to Kalecki's theory (e.g. the definition of marginal costs; see M. C. Sawyer, *The Economics of Michal Kalecki*, London, Macmillan, 1985, pp. 272–4), in the 1980s there have been further attempts to test his theory against statistical series. Some of these have dealt with a particular aspect of Kalecki's theory; others are of a more general nature.

The first group includes a study by M. Riese. On the basis of UN data on industrial statistics in 9 developed countries, he examined whether the factors assumed in Kalecki's theory to govern the distribution of income can be shown to have been operative in the period after the 1973 'oil shock' and the ensuing world recession. He found that

> An inverse relationship between [Kalecki's] two variables seems to be confirmed in those industries for which raw materials play a major role in prime costs, and which purchase their material inputs in flexprice markets. . . . nevertheless, the variations were too large to be compatible with a *strict* stability hypothesis of the wage share. ('Raw Material Prices and Kalecki's Wage Share Theory', *Journal of Post Keynesian Economics*, 4/4, 1982, pp. 538–9. For a criticism of Riese's conclusion, see D. Mair, 'Raw Material Prices and Kalecki's Wage Share Theory: A Comment', *Journal of Post Keynesian Economics*, 10/3, 1988; see also Riese's reply in the same issue.)

P. J. Reynolds's 'Wage Rises and Income Distribution: A Note' (*Manchester School*, 55/1, 1967), which offers some tentative evidence that wage rises do have a constraining impact on mark-ups, also belongs to this group.

In the second group belongs P. J. Reynolds's 'An Empirical Analysis of the Degree of Monopoly Theory of Distribution' (*Bulletin of Economic Research*, 36/1, 1984), which criticizes a number of earlier empirical tests of Kalecki's theory (including Riese's, whose study is found to be an application of Kalecki's theory rather than a test of it) and concludes that Kalecki showed great insight in identifying the major influences on the degree of monopoly:

> Mark-up on prime costs does appear to be determined by at least some of the institutional/environmental factors. In fact, up to 80% of the inter-industry variation in mark-up is explained by variations in the 'degree of monopoly'. Hence, Kalecki's degree of monopoly theory of distribution does have a behavioural content and is useful in helping to explain variations in labour share. (Ibid., p. 80.)

Other attempts at measuring the degree of monopoly were undertaken by V. K. Borooah and F. van der Ploeg ('Oligopoly Power in British Industry', Cambridge Growth Project, Department of Applied Economics, Univ. of Cambridge, 1984, mimeo, GPP 553) and for the manufacturing sector of the USA, 1939–82, by M. J. Gordon ('The Postwar Growth in Monopoly Power', *Journal of Post Keynesian Economics*, 8/1, 1985).

In the early 1980s Kalecki's theory of income distribution was revised and developed by some post-Keynesian economists, most notably by Sidney Weintraub. Weintraub's theory and its 'Kaleckian background' were then re-examined by J. D. Hedlund ('Distribution Theory Revisited: An Empirical Examination of the Weintraub Synthesis', *Journal of Post Keynesian Economics*, 6/1, 1983), but this belongs to the area covered in the next section of this note.

Further debates and developments

In the late 1970s and early 1980s there appeared some new strands in discussions on Kalecki's theory which need be taken into account here. The first relates to attempts at 'closing' his theory by providing a formal model of determination of the 'degree of monopoly' (or profit mark-ups). Such a model was first published by K. Cowling and M. Waterson ('Price Cost Margins and Industrial Structure', *Economica*, 43/171, 1976) and then developed in K. Cowling's *Monopoly Capitalism*, London, Macmillan, 1982, ch. 2. It represents a generalized model of short-run profit maximization by each of a number of firms which operate in an industry and take into account the expected behaviour of their rivals. The model determines a relationship between the profit mark-ups, on the one hand, and the industry price elasticity of demand and a particular (Herfindahl) index of industrial concentration on the other hand (for a criticism of the implausible implication of Waterson's and Cowling's models that high concentration leads to lower collusion, see V. A. Dickinson, 'Collusion and Price-Cost Margins', *Economica*, 49/193, 1982).

The Cowling-Waterson model has subsequently been adopted as one of the building blocks of Kaleckian macro-economics by M. C. Sawyer (see his *Macroeconomics in Question: The Keynesian-Monetarist Orthodoxies and the Kaleckian Alternative*, Brighton, Wheatsheaf, 1982, and *The Economics of Michał Kalecki*).

> As attempts to build a macroeconomics based on the foundations of profit maximization at the microeconomic level come much closer to the reductionist approach, this may provide the important link necessary to open up Kalecki's work to a wider range of economists. Furthermore, the model [Cowling's] seems to have been quite well received by many industrial economists and there have been a number of studies that have both extended the model and used it as a theoretical framework for subsequent empirical analysis. (P. J. Reynolds, *Political Economy: A Synthesis of Kaleckian and Post Keynesian Economics*, Brighton, Wheatsheaf, 1987, p. 59.)

A new problem arises here, however. Kalecki's theory presupposes a positive relationship between industrial concentration on the one hand and profit mark-ups (or the degree of monopoly) on the other. Yet apparently this need not be the case. For instance, the concentration wave in the period

1960-75 has not increased the profitability of the merged firms; they often earned lower rates of profit immediately after the merger was completed and did not earn higher rates of profit later on, as compared with the profitability of the previously separate companies (their expected profitability had they not merged being, of course, of a highly speculative nature; for empirical studies of the impact of merger on profitability see e.g. R. D. Buzel, 'Bringt vertikale Integration Vorteile?', *Harvard Manager*, 1, 1984, and W. P. Möller, *Der Erfolg von Unternehmenzusammenschüssen*, Munich, Minerva, 1983).

The second strand relates to a recent fashion of detecting the micro-economic foundations of Keynesian and post-Keynesian economics, with the accusation, added by modern neo-classical economists, that neither the former nor the latter have other than *ad hoc* foundations, if any at all. Kalecki's theory occupies a special place in these debates. For the neo-classical, general-equilibrium economists, macro-economic phenomena are merely an aggregate outcome of the assumed micro-economic interrelationships. In Keynesian and post-Keynesian analysis, the micro-economic relations are deduced from a backward extrapolation of their macro-economic conclusions, thus 'providing' post-Keynesian macro-economics with a matching micro-economic foundation (see e.g. G. C. Harcourt (ed.), *The Microeconomic Foundations of Macroeconomics*, London, Macmillan, 1977). This contrasts with Kalecki's view that the micro-economic analysis of pricing and income distribution determines the relative shares in national income, and with his macro-economic theory of investment and profit determination, where inter-sectoral interdependencies determine the level of output and its cyclical changes.

The essence of Kalecki's micro-economic theory consists in this—that, within the limits of capacity output, profit mark-up is invariant with respect to changes in effective demand and prime cost (as long as the degree of monopoly does not change). In other words, the determination of relative shares in national income is independent of the level of output, and the determination of the level of profits (and therefore of output) is independent of both prices and relative shares. The question of how, if at all, Kalecki's theory of prices provided a proper (i.e. price-invariant) setting for his theory of effective demand was discussed by (among others) A. Chilosi (see his introduction to *Kalecki: Antologia di scritti di teoria economia*, Bologna, Il Mulino, 1979), V. Denicolò and M. Mateuzzi (in their introduction to M. Kalecki, *Saggi sulla teoria delle fluttuazioni economiche*, Turin, Rosenberg & Sellier,1985), in the already quoted works of P. Kriesler and P. J. Reynolds, and in a number of papers by A. Asimakopulos.

As convincingly demonstrated by this research, once we leave the most simplified of Kalecki's models and introduce positive net worker savings, international trade, overheads consisting in part of wages and salaries, etc., the separation between the theory of distribution determining relative shares and the theory of profits determining total output and employment cannot be maintained (see e.g. Asimakopulos, 'A Kaleckian Theory of Income Distribution', pp. 331–2, and, by the same author, 'Kalecki and Robinson', in Sebastiani, *Kalecki's Relevance Today*). Thus, outside his most simplified model, Kalecki's micro-economic foundations for his macro-economics are found wanting.

One may note now that the assumption that the degree of monopoly at firm level is given and stays constant when production varies implies that when aggregate demand changes the demand curves for the individual firms shift in such a way that the price that corresponds to the intersection point between the curve of marginal revenue and the line of marginal cost stays constant. This implies that at any level of equilibrium output the elasticity of demand in the profit maximizing point is a constant *u* . . . These are rather peculiar assumptions that in Kalecki's reasoning are justified by the assertion that only a change in 'fundamental data' characterizing the competitive structure of industry and not a change in aggregate demand as such may lead to a change in the elasticity of demand for the various firms at any given prices, so that, if such a change does not take place, demand curves shift isoelastically . . . when aggregate demand changes. (A. Chilosi, 'Kalecki's Quest for the Microeconomic Foundations of his Macroeconomic Theory', in Sebastiani, *Kalecki's Relevance Today*, p. 111.)

Having noticed that the assumption of constant variable costs is in fact necessary to Kalecki in the same way as rising marginal costs (in the relevant range of output changes) was crucial for Keynes, Chilosi concludes, however:

Kalecki faced the issue of the functioning of the economic system as a whole under conditions of imperfect competition in a period in which the theory of imperfect competition was essentially a theory of partial equilibrium and the study of the aggregative behaviour of the economic system was tackled (by Keynes in particular) assuming perfectly competitive conditions.

Kalecki's theory of distribution, with all its ad hoc assumptions and approximations, has the great merit of taking in due account the crucial importance that the competitive structure of markets has on [*sic*] income distribution in a capitalist economy. His theory of income determination was the first one coached in an imperfectly competitive framework. Being, by contrast with Keynes's, truly fixprice it has the merit . . . of being in some ways the cultural antecedent of most textbook income determination models. (Ibid., p. 116–17.)

For Kriesler too, the shortcomings of Kalecki's formal analysis do not undermine his macro-economic conclusions:

In terms of the rigidity of the degree of monopoly to changes in demand, Kalecki's basic insight that the clue to distribution lies in the pricing decision of the capitalist, is sufficient to generate the required result, independently of any formal model. Similarly, for the determination of output, what is required is not a robust model, but simply the proposition that distribution is not influenced by changes in output. This demonstrates that his basic insights rather than any formal model provide the microeconomic foundation for Kalecki's macroanalysis. (*Kalecki's Microanalysis*, pp. 95–6.)

The third strand relates to the post-Keynesian theory of income distribution. This is built on Kalecki's distinction between 'cost-determined' and 'demand-determined' prices, and represents a combination of a short-run theory, often referred to as the degree of monopoly theory of distribution, and a long-run theory which is usually associated with the studies of Nicholas Kaldor, Joan Robinson, and Luigi Pasinetti. Some of the post-Keynesians also build on the work of Robin Marris (*The Economic Theory of Managerial Capitalism*, London, Macmillan, 1964): in their models, firms are assumed to maximize their rate of growth; thereby a link is provided between their pricing and their investment decisions.

Sidney Weintraub is possibly the single most important figure responsible for reformulating Kalecki's theory into the post-Keynesian theory of income distribution (see his 'Generalizing Kalecki and Simplifying Macroeconomics', *Journal of Post Keynesian Economics*, 1/3, 'An Eclectic Theory of Income Shares', *Journal of Post Keynesian Economics*, 4/1; 'A Macro-distributive Theory: Dispelling the Econometric Fog', *Banca Nazionale del Lavoro Quarterly Review*, 144, 1983; see also E. R. Canterbery, 'Galbraith, Sraffa, Kalecki and Supra-Surplus Capitalism', *Journal of Post Keynesian Economics*, 7/1, 1984). The main differences between Weintraub's and Kalecki's approaches to mark-up pricing consist in this: that for Kalecki the mark-up is on prime costs and relates to the manufacturing sector alone, while for Weintraub it refers to wage cost only (some post-Keynesian economists refer mark-up to 'normal cost', whatever this may mean) but covers the entire business sector, including agriculture and retail trade.

For Canterbery, the link between profit mark-up and investment decisions is fairly simple:

The mark-up and investment plans are inexorably linked. Because of the degree-of-monopoly factor, actual prices charged by the industrial firms do not reflect current demand conditions; they more closely mirror the funds requirements of the planned investment expenditures the technostructure deems sufficient to increase capacity . . . to meet *expected future* demand. Such a mark-up serves the technostructure's affirmative purpose of growth. ('Galbraith, Sraffa, Kalecki and Suprasurplus Capitalism', p. 83.)

A similar position is taken by the main contributors to a symposium on price formation theory (see *Journal of Post Keynesian Economics*, 4/1, 1981). This contrasts with the more balanced view of Weintraub:

There is, too, a modern doctrinal current that argues that firms which contemplate capital investment are prone to lift their markups to generate enough profits to finance their investment programs. . . .

At bottom, these theories rely on an unused residual of unexploited monopoly power. The argument assumes implicitly (perhaps explicitly at times) that firms are *not* profit-maximizers, and that they can always exert more monopoly leverage. This is a key supposition; yet there must be *some* limit to the prospect.

The unexploited monopoly-residual theory can collide with the other view, also descendant from Kalecki, that profits in the aggregate are largely derivative from the investment volume. This would entail that only *after* the *investment* *I*'s are made that the *R*'s [gross profits] are forthcoming, and the profit share is enlarged. It would not convey that the profit aggregate can be enhanced to provide the investment sustenance *before* the *I*-outlay is made. ('An Eclectic Theory of Income Shares', p. 14.)

As already mentioned, Weintraub's theory of income distribution was re-examined and tested by J. D. Hedlund.

Finally, some other 'post-Keynesian' revisions and extensions of Kalecki's theory should be mentioned here. It was adapted and applied, for instance, to the explaining of inflation (see D. Dogas, 'Monopoly and Prices: A New Explanation', *Journal of Post Keynesian Economics*, 5/1, 1982), and of the relationship between inflation and unemployment (see A. Myatt, 'On the Non-Existence of a Natural Rate of Unemployment and Kaleckian Micro Underpinnings of the Philips Curve', *Journal of Post Keynesian Economics*, 8/3, 1986). Kalecki's pricing theory was applied to the operation of the financial sector (see S. Rousseas, 'A Markup Theory of Bank Loan Rates', *Journal of Post Keynesian Economics*, 8/1, 1985). An attempt was made to integrate Kaleckian micro- and macro-analysis with international trade and finance between the industrialized and the developing economies (see J. L. Nicolini, 'The Degree of Monopoly, the Macroeconomic Balance and the International Current Account: The Adjustment to the Oil Shocks', *Cambridge Journal of Economics*, 9/2, 1985). And new evidence in support of Kalecki's argument that monopoly power is enhanced by concentration but reduced by unions, and a survey of some empirical studies testing this proposition, were provided by T. Karier ('New Evidence on the Effect of Unions and Imports on Monopoly Power', *Journal of Post Keynesian Economics*, 10/3, 1988).

Appraisals

Kalecki's studies on the theory of income distribution is widely admitted to have played an important role in explaining the operation of monopoly capitalism. Joan Robinson stressed several times that it was Kalecki, and not she, who combined the theory of imperfect competition with the theory of effective demand; this she regarded as the most important accomplishment of his theory of distribution. E. J. Nell, who classifies Kalecki's theory as neo-Marxist, points out that it cannot be easily reconciled with the assumption of full employment, which also sets it apart from other theories of income distribution (see C. E. Ferguson and E. J. Nell, 'Two Books on the Theory of Income Distribution: A Review Article', *Journal of Economic Literature*, 10/3, 1972, pp. 450–1). Discussing the importance and originality of Kalecki's theory, K. W. Rotschild notes that, though they gave rise to no 'school',

Kalecki's studies have inspired many empirical and theoretical enquiries into the distribution of the national income (see 'Some Recent Contributions to a Macroeconomic Theory of Income Distribution', *Scottish Journal of Political Economy*, 8, Oct. 1961, p. 179). He also notes that the starting-point for Kalecki's macro-economic theory of distribution is micro-economic analysis, and that this theory is essentially a side-product of his special approach to the theory of the firm (ibid., p. 175).

In the opinion of two eminent American Marxists, P. A. Baran and P. M. Sweezy, the way the system of monopoly capitalism works is still

The unintended outcome of the self-regulating actions of the numerous units that compose it. And since market relations are essentially price relations, the study of monopoly capitalism, like that of competitive capitalism, must begin with the workings of the price mechanism.

The crucial difference between the two is well known and can be summed up in the proposition that under competitive capitalism the individual enterprise is a 'price taker', while under monopoly capitalism the big corporation is a 'price maker'. . . . But the analysis of the implications of this difference for the functioning of the system as a whole has been surprisingly meager. There is a vast literature, both theoretical and empirical, on the pricing of individual commodities or the products of particular industries but very little on the workings and consequences of a monopoly price system. . . .

There have of course been exceptions, but as usual in such cases their work has received little of the attention it deserves. The leader of reintegrating micro and macro theories was Michał Kalecki who . . . was first to include what he called the 'degree of monopoly' in his overall model of the economy. . . . A further long step in the same direction, which owed much to Kalecki's influence, was Josef Steindl's *Maturity and Stagnation in American Capitalism* (1952). And anyone familiar with the work of Kalecki and Steindl will readily recognize that the authors of the present work owe a great deal to them. (P. Baran and P. M. Sweezy, *Monopoly Capital*, New York, Monthly Review Press, 1966, pp. 53–4, 56.)

For a similar, later evaluation of Kalecki's theory, see P. M. Sweezy, 'On the Theory of Monopoly Capitalism', *Monthly Review*, 23, Apr. 1972, p. 13. In a letter to G. R. Feiwel of 7 Feb. 1971, Sweezy wrote of Kalecki's theory of income distribution that 'this may even have been Kalecki's single most original contribution'; see Feiwel, *The Intellectual Capital of Michal Kalecki*, p. 478.

As we have already seen, in more recent years there have been many new attempts at a reappraisal of Kalecki's theory. Two of them need mentioning here. One is by L. Basile and N. Salvadori ('Kalecki's Pricing Theory', *Journal of Post Keynesian Economics*, 7/2, 1984–5). Their review helps to fill in a gap in Kalecki's argument, providing a proof of the existence of unique solutions to his price equations. The other is P. Kriesler's *Kalecki's Micro-analysis*, which represents a systematic and thorough discussion of the development of Kalecki's ideas, not only highlighting Kalecki's achievements, but also pointing out the difficulties and shortcomings of his analysis and describing Kalecki's efforts to overcome them.

[2]
S. Kuznets, *National Income and Capital Formation, 1919–35*, New York, NBER, 1937.

[3]
Kriesler (*Kalecki's Microanalysis*, p. 115, n. 2) notes that fig. 2 (as well as fig. 13 in Kalecki's *Collected Works*, vol. i) has an error, as the 'price-curve' *QRC* is not drawn as a straight line. However, Kalecki does not assume here that the marginal cost is *strictly constant* up to capacity level of output, but merely that 'the short-period marginal-cost curve does not differ appreciably from the average-cost curve of manual labour and raw materials'.

[4]
For a revision of Kalecki's argument up to the end of s. 1 and in the whole of ss. 2 and 3, see *Collected Works*, vol. i, pp. 245–7.

[5]
The text which follows was significantly revised in the 1939 edition of this article; see *Collected Works*, vol. i, pp. 249–52.

Money and Real Wages

[1]
This essay was first published in 1939 by the Institute for Social Problems, Warsaw. Then, with minor editorial changes, it was reprinted in a collection of Kalecki's papers: *Prace z teorii koniunktury 1933–1939*, Warsaw, PWN, 1962, pp. 61–104. This collection appeared in the following translations: English (*Studies in the Theory of Business Cycles 1933–1939*, Warsaw/Oxford/New York, PWN/Blackwell/Augustus M. Kelley, 1966; 2nd edn. 1969), Spanish (*Estudios sobre la teoria de los cyclos economicos*, Caracas–Barcelona, Ariel, 1970), and Italian (*Studi sulla teoria dei cicli economici 1933–1939*, Milan, Il Saggiatore, 1972). A German translation of the essay, 'Geld und Reallöhne', appeared in the collection: M. Kalecki, *Werkauswahl* (Neuwid, Luchterhand, 1976, pp. 88–128), and its pt. I in M. Kalecki, *Krise und Prosperität in Kapitalismus* (Marburg, Metropolis, 1987, pp. 71–91). A Portuguese translation of pt. I, 'Salários Nominais e Reais', appeared in M. Kalecki, *Crescimento e ciclo das economias capitalistas* (São Paulo, Hucitec, 1977, pp. 71–91; 2nd edn., 1980).

The publishers' permission to reproduce the English translation of this essay is gratefully acknowledged.

In its original version the essay opened with the following introduction by Kalecki:

The view that reduction of wages is the most effective way of combating unemployment is very widespread.[1] 'Wage rate is a price of labour, hence the demand for it rises when its price falls'—so runs the primitive argument often put forward by pseudo-economists. Orthodox economics, while applying much more sophisticated reasoning, ultimately reaches a similar conclusion, however. Only recently a new trend in economics, which denies the validity of such an approach to the question of wages, comes to the surface.

In this essay we shall first summarize the 'classical' theory of money and real wages. Next we shall criticize this on the basis of Keynes's theory of wages,[2] and of my own theory published in Poland and abroad.[3] The results of our theoretical investigation will be then used to examine the changes of wages and employment in Poland, in the years 1928–37.

We aim at the greatest possible simplicity of argument, and may at times sacrifice its rigour. Some details are neglected in order to give a clear outline of the most essential interdependencies.

'Money and Real Wages' was written for the Polish Ministry of Labour and Social Welfare, which asked Kalecki to prepare a study on wage policy and 'to emphasize from the economic point of view the positive effects of the tranquillizing of social relations through collective labour agreements and through the work of mediatory institutions'. Also significant is another passage of the ministry's letter of 30 Aug. 1938 to Kalecki: 'The Ministry of Labour and Social Welfare believes that if the point of view of the author agrees completely with the views of the Ministry, the Ministry itself will publish the said work. If there are some differences of opinion, the Ministry will publish it at its own expense and effort, handing over the task to one of the scholarly institutions affiliated with the Ministry' (Kalecki's papers). The study was published by the Institute of Economic and Social Research at the request of the Ministry.

In connection with this study, Kalecki wrote to Joan Robinson:

I had also to finish some work for the Polish Ministry of Labour which I accepted last summer. It consists in writing a paper on the wage cuts being not the way to fight unemployment. (That being what

[1] Such views were eagerly propagated in Poland by J. Wątecki in his booklet *Sztywne place źródłem bezrobocia* [Rigid Wages as a Source of Unemployment], Cracow, Towarzystwo Ekonomiczne, 1938.

[2] See J. M. Keynes, *The General Theory of Employment, Interest and Money*, London, Macmillan, 1936.

[3] See *Essay on the Business Cycle Theory* and *Essays in the Theory of Economic Fluctuations, Collected Works*, vol. i.

they want may seem, I guess, strange to you, but may be easily explained. From 'professional' point of view the officials of the Ministry are frightened by the prospect of being compelled by the Government to assist the wage reductions which naturally causes a lot of troubles. And in some of them this professional interest may be unconsciously shaped into a sincerely progressive ideology.) (Extract from letter of 30 Jan. 1939; Joan Robinson's papers, King's College Library, Cambridge.)

The fight against the 1929–33 crisis in Poland was conducted mainly by means of a deflationary policy, one of whose elements was wage reductions. None the less, initially the government was against wage cuts, trying to keep wages more or less on the level of 1928. Money wages of industrial workers did not fall below the 1928 level until 1932, the wages of government employees one year earlier. Large reductions in money wages were made in the following years, under the pressure of major industry, reaching their lowest level in 1936 (money wages of industrial workers in 1936 were 80.5% of the 1928 level, the wages of white-collar workers were only 71.2%). The fall in money wages, although subsequently halted, was sharper in Poland than in other countries. Not once during the entire economic upswing of 1936–9 did wages reach their pre-crisis level.

Government intervention in the post-crisis years—in the name of 'social peace'—in relation to working conditions, standardizing the length of the working week, collective agreements, etc., was inconsistent. The establishment of mediatory commissions to examine labour disputes in industry and commerce were accompanied by anti-strike laws and regulations limiting the freedom of action of trade unions. However, despite this and despite the relatively low level of wages in 1936–9, the government intervention was sharply opposed by the economic profession, which launched a campaign of warnings against the consequences of 'reckless reforms'. This was the background of Wątecki's booklet.

Wątecki's pamphlet was sharply criticized by the trade unions and the socialist left. This criticism was rather superficial, however, and lacked a systematic, scholarly refutation of the views of supporters of 'flexible' wages. Hence 'Money and Real Wages' filled an important gap in the argument of the socialist left by subjecting Wątecki's thesis—as the reviewers of Kalecki's essay emphasized—'to a calm, dispassionate, matter-of-fact, strictly scholarly analysis'.

Shortly after its publication, Kalecki's paper was discussed by A. Zdanowski in the article 'An Exploded Legend of Bourgeois Economics' (which appeared on 9 Aug. 1939 in the Polish Socialist party press) and by J. Mieszkowski ('Contradiction of Reactionary Arguments for the Necessity of Fighting against "Rigid Wages"', *Dziennik Powszechny*, 10, Aug. 1939).

Kalecki's essay has also been often discussed and cited in post-war publications about wages in Poland in the inter-war period. The following comment is typical of the post-war evaluations of Kalecki's study:

> Wątecki's views were shared by many economists (e.g. A. Krzyżanowski) and economic practitioners. . . . Kalecki's criticism of Wątecki was not only a theoretical but also a valid political stand. (H. Jędruszczak, *Place robotników przemysłowych w Polsce 1924–1939* [Industrial Workers' Wages in Poland, 1924–39], Warsaw, PWN, 1963.)

Kalecki's study was preceded by a preface by an eminent Polish sociologist, economist, and socialist thinker, Ludwik Krzywicki. This preface, dated 13 July 1939, is published in Annex 2 below.

ANNEX 2
Preface[1]
L. Krzywicki

Political economy is hardly a science in which the principle of absolute objectivity is always adhered to. The economic interests of the current day were, and are, too much at the centre of its interest for this. Only a few scholars have taken an absolutely objective position towards the working classes. The first attempts by the government to extend control over working conditions, including reducing the length of the working day, have been passionately opposed by all too many economists, who have warned about the highly negative consequences of such 'reckless' reforms. We will not take up these old and well-worn arguments, which have been adequately rebuffed once already. Later, the formation of trade unions met with the same flood of complaints that their existence would bring ruin to industry. Charges of this kind have revived lately. The matter concerns collective agreements on wages through mutual consent of representatives of capital and labour, and the consequences of such agreements, especially of rigid wages, which are of great benefit to the working class. Unemployment insurance also is strongly opposed. Economists of this type maintain that such things as unemployment insurance or regulation of wages through collective agreements make it impossible for spontaneous relations and healthy trends to adjust the labour market during crisis, bearing fruit merely in the form of a lengthening of the slump.

Recently this question has appeared more often in the arguments of economists. Jacques Reuff[1] opened a polemic against rigid wages; and these

[1] M. Kalecki, *Place nominalne i realne*, Warsaw, IGS, 1939, pp. 1–10.

1 'Assurance-chômage cause du chômage permanent' (*Revue d' Économie Politique*, 1931).

arguments are spreading ever wider, like circles from a rock thrown into a pond. They have also reached Poland, where Mr Wątecki has become a champion of views of this kind.[2]

These opinions must, therefore, be examined more thoroughly. This task has been taken up by Mr M. Kalecki in his essay.

A few words about the author. A few years ago he published an *Essay on the Business Cycle Theory*[3] which—presented and discussed later in professional journals[4]—became the starting-point for his more extensive study, *Essays in the Theory of Economic Fluctuations*. In the present essay, Mr. Kalecki develops the theory of wages which is an inseparable part of his theory of the business cycle.

Mr Kalecki's position is the following.

In his opinion, advocates of fighting the crisis through wage reductions see the consequences of such a policy, not from the angle of social and economic relations as a whole, but from the narrow bailiwick of a single entrepreneur. The entrepreneur, who becomes hypnotized by a wage reduction in his own firm, is convinced that nothing else is taking place in the market besides the consequences his action has had in his firm. He forgets that worker wages are not only a component of the production costs of the commodity manufactured by him. They are also a component determining the amount of active purchasing power on the market and the volume of this market. Wage reductions mean a shrinkage of this purchasing power, a shrinkage of the demand for goods, price reductions! Though the effects of this may not be felt immediately by our entrepreneur, they are felt by others. Other entrepreneurs will not remain behind, and will follow the example of this initiator. The result will be—to use someone else's version of things—as though ten persons, who contribute every day to a common pool, pay it out as a bonus to each one of them in succession. On the day of payout, the participant in the game believes that he has won, but before he looks around, ten days have passed, and it turns out that everyone has gained only as much as he has paid in. With wage reductions, this wave, once set in motion, moves quickly and without interruption!

The final result of wage reductions are changes in prices. Besides this, there is no other important change, for wage reductions create no conditions for entrepreneurs to increase output.

In these arguments the author starts from the assumptions of classical economics. Among them is the assumption of effective operation of free competition. But Mr Kalecki extends his analysis by introducing the assumptions of the recent theory of 'imperfect competition', which in fact represents the actual operation of the market, and on this basis he concludes

[2] J. Wątecki, *Sztywne place źródlem bezrobocia.*

[3] [See *Collected Works*, vol. i.]

[4] Especially in *Econometrica*, the journal of the International Econometric Society.

that wage cuts not only do not increase employment, but in fact reduce it. Naturally, wages—that is, real wages—undergo adaptive changes. This is not a consequence of changes in money wages, however, but an effect of corresponding changes in prices.

A separate problem is the adjustment of wages to conditions of production, examined in the context of the structure of industry. We should say a few words about this. It was probably this structure that laid the basis in Poland for the attack on 'rigid wages' in the form which we find in Mr Wątecki's booklet: the fight against collective wage agreements in industry.

Given effective operation of free competition, real wages are mainly determined by the marginal productivity of capital equipment in use. If this equipment is relatively homogeneous, the deviations of wages from this norm are not too great in individual cases. However, if in the country there are on the one hand plants with modern equipment and, on the other, plants with rather primitive equipment, the distance between labour productivity in the former and the latter is so great that two separate labour markets with very different levels of wages will exist there. For wages even much higher than those possible in the crafts can be paid by modern industrial plants, which will not prevent them from earning profits adequate to meet the high cost of capital in backward countries. These industrial plants agree to pay such wages in order to attract high-quality labour, which is especially important in countries with a low educational level. However, they always remember that there is cheaper labour close at hand that is enticing because of its low cost, and they are always ready to take advantage of this opportunity, especially in difficult times.

As shown by Mr Kalecki, this would not lead to the desired result, either in the course of the business cycle or in the long run. For in order for employment in industry to increase more rapidly over the long run, the rate of investments would have to increase. However, entirely different factors, not excessive wages or profit margins which are too low, restrain the progress of capitalization, especially the inflow of capital, which is so important for semi-industrialized countries. But in these conditions, when the wages of industrial workers are determined not only by economic factors in the strict sense, their regulation in collective agreements becomes a matter of prime importance. Hence for Poland the question is even more important than for the highly industrialized capitalist countries, and the protection of wages from attacks by one side or another must be especially vigilant.

The Supply Curve of an Industry under Imperfect Competition

[1]

First published in *Review of Economic Studies*, 7/2, 1939–40, pp. 91–122. The publishers' permission to reprint this article is gratefully acknowledged.

After Kalecki's research grant (to help him finish his *Essays in the Theory of Economic Fluctuations*) ended, in June 1930, he found himself with no permanent job and moved back to London. Efforts to arrange an assistantship for him at the Faculty of Economics at Cambridge University apparently failed. Some time later he was attached to a project on statistical testing of the ratios of costs and prices in British manufacturing industries ('Cambridge Research Scheme of the National Institute of Economic and Social Research into Prime Costs, Proceeds, and Output'). Clearly, the project was of central interest to Keynes and his closest collaborators in Cambridge, in relation to the above-mentioned debates about the changes of wages (and prime costs as a whole) and output in the course of the business cycle. The project could also throw more light on the argument put forward in Kalecki's article 'The Determinants of Distribution of the National Income' and in his *Essays in the Theory of Economic Fluctuations*. To this end Kalecki investigated the ratio of sales proceeds to total prime costs, which was crucial for his explanation of the distribution of national income.

In relation to this research project, Piero Sraffa wrote on 4 Aug. 1938 to Joan Robinson:

Kalecki was here yesterday, very sensible and less 'nervous' than usual. Tomorrow he goes to France for 10 days, and then to Poland for the rest of the summer; he has already had his passport renewed and will have no difficulty in coming back in October. It seems to me a good plan, as he will convince himself that there is no possibility for him there and will return more cheerfully here. He was quite satisfied with the prospects here, which I explained to him. . . .

Our aim is to hold up the appointment till the Hall scheme is safe. We are having a board meeting this week or next, to approve the great plan of research, so that it can go to the Nat[ional] Institute with all the sacraments, and be approved by them at their meeting in September. Kalecki will be financed by Hall; that is agreed by all (wait and see however what happens at the Board meeting); what is in dispute is whether Rothbarth should be on the same ticket, with a proper computer [*sic*] appointed as Ass[istan]t; or he should get the Assistantship.

So far there is no rival research project and we are all brothers.

A few months later, on 28 Dec. 1938, Sraffa wrote again to Joan Robinson on the research project and Kalecki's work for it:

The main event has been the launching of the great research scheme; it has been successful, at any rate, in providing Kalecki with a £350 job, or £100 more than he would have had as assistant to Champ[ernowne]. We have a board of directors, of which Maynard is chairman, and Austin [Robinson], Kahn, Kalecki, Champ[ernowne] and myself members; we have had a couple of meetings, at which I am the only one not to have opened his mouth, but the others haven't said anything much more useful. Kalecki does not take too much notice of the resolutions of the board, and has settled down to work quite happily, with his two research students (Tew and Hsu, of whom only one is a Chinese); he certainly is a great success with them and they are very devoted to him. . . . Rothbarth has turned out much better than we expected, is very good tempered in his rather difficult position of pseudo-computer, and gets on quite well with Kalecki. They both come to my seminars and add considerably to the interest of the discussions, although they don't allow much say to the research students, not even to the Americans.

(Pierangelo Garegnani's permission to quote from both these letters is gratefully acknowledged. The letters are deposited with Joan Robinson's papers, King's College Library, Cambridge.)

Shortly afterwards, in the letter already quoted from Kalecki to Joan Robinson of 30 Jan. 1939, he reported: 'I am working now rather hard. The scheme is proceeding satisfactorily and we have already the ratio of prices to prime costs for a number of industries.' And in 'An interim summary of results', prepared some time in the summer of 1939, Kalecki wrote:

The task of this inquiry is to throw some light on the process of price formation. For this purpose the ratio of aggregate proceeds to aggregate prime costs (i.e. raw material bill plus wage bill) has been calculated for six industries (coal, pig iron, steel, cotton, shipbuilding, tobacco). . . . [T]his series are compared, for each of the industries in question, with the corresponding indices of the volume of output, which have also been computed. The nature of the relation between these two series may indicate whether diminishing returns were at operation. In addition an index of average (money) prime costs per unit of output has been calculated. For when the prices of final products are 'sticky' the fall in the prices of raw materials and wages may prove an important reason for the increase of the degree of monopoly. Finally we have computed also the relative share of wages in the value of net output. This, as an index is actually an index of labour cost in terms of net output. If diminishing returns affecting labour, but not raw materials, play a more prominent part than the degree of monopoly in the price formation, it is this series which has to show a close correlation with output rather than the ratio of proceeds to prime costs; the latter series being in this case influenced also by the change of raw material prices relative to wage costs. On the other hand when it is the degree of monopoly which matters most in the process of pricing, the ratio of proceeds to prime costs is more significant than the share of manual labour in the net output. . . .

While a detailed theoretical interpretation of the above will not be attempted at the moment, some points may be considered at this stage. A positive correlation between the ratio of proceeds to prime costs and output is sometimes to be observed . . . , but is of a rather vague and fragmentary character. It seems that these tendencies are not to be explained by the operation of diminishing returns *sensu stricto*, but represent rather a more complex phenomenon. . . . It is, for example, possible that they are connected not with the operation of diminishing returns in a given enterprise, but only with the existence of more or less efficient firms. When output falls some of the latter will find it difficult to cover their overheads. Thus it may be profitable for the more efficient firms to lower their prices relative to prime costs, because a relatively small reduction may be sufficient to force the less efficient firms to close down. Such a state of affairs involves a much vaguer and more fragmentary connection between the ratio of proceeds to prime costs and output, than the operation of diminishing returns *sensu stricto*.

The relative share of manual labour in the net output shows at no point a closer correlation with the volume of output than does the proceeds: prime-costs ratio. This seems to show that in the industries considered diminishing returns did *not* play a predominant part in the price formation as compared with the degree of monopoly. (M. Kalecki, 'Prime Costs and Proceeds: An Interim Summary of Results', mimeo, Kalecki's papers, p. 1.)

Kalecki's investigation for the Cambridge Research Scheme, as well as the work done under his supervision by Brian Tew and Yu-Nan Hsu (in the statistical part of the study Richard Stone also took part), attracted many discussions in Cambridge. They focused on the shortcomings of the statistical base (R. Stone and R. Kahn) as well as on more fundamental questions concerning the concept of the degree of monopoly (J. Robinson and R. Stone), the theoretical and empirical possibility of constructing a supply curve for a given branch of industry (R. Kahn), the possibility of separating factors determining the degree of monopoly from among those determining the ratio of proceeds to prime costs (R. Kahn and J. Robinson), etc. (J. T. Dunlop, who at the time was visiting Cambridge, also showed great interest in Kalecki's study; in his *Wage Determination under Trade Unions* of 1944, Dunlop calculates many indices of the ratio of proceeds to prime costs and of the relative share of wages in net output which are similar to those of Kalecki's study.)

Shortly afterwards, Kalecki's investigations were discontinued, in part owing to financial difficulties and a change in research priorities on the eve of the war, but possibly also due to the difficulties mentioned above and Keynes's disappointment with the results of the study.

'The Supply Curve of an Industry under Imperfect Competition' is a summary of Kalecki's work for the Cambridge Research Scheme, and the statistical appendix to this article contains the results of Kalecki's, Tew's, and Hsu's empirical analysis. In this appendix Kalecki omitted the tobacco

industry, probably on account of comments which indicated a strong dependency of the proceeds: prime-cost indices for this branch on sales policy and changes in the output structure. (Tew incorporated the contents of his study in his Cambridge Ph.D. thesis on 'Cost, Prices and Investment in the British Iron and Steel Industries, 1920–39'.)

In Feb. 1976 Professor Richard Stone, one of the participants of these discussions, then the director of the Department of Applied Economics at the Faculty of Economics and Politics of the University of Cambridge, passed on to the editor of Kalecki's *Works* a folder of papers and documents entitled 'Kalecki's Investigation for the Cambridge Research Scheme into Price, Costs, Proceeds and Output', which until then he had kept in his private papers. Apart from loose papers with various comments and calculations, whose authorship cannot be identified, the folder contains the following materials:

Works by Kalecki:

1. Prime costs and proceeds, etc. in tobacco (5 pp.)
2. A note on coal-mining employment (3 pp.)
3. A supplement to note on coal-mining (2 pp.)
4. A summary of results (2 pp.)
5. Prime costs and proceeds: an interim summary of results (4 pp.)
6. The general index of the proceeds: prime-cost ratio (4 pp.)

Works by other authors:

1. B. Tew, 'The Ratio of Proceeds to Prime Costs in the British Pig-Iron Industry 1920–1937' (Interim Report No. 5), June 1939 (11 pp.)
2. B. Tew, 'Proceeds, Prime Costs and Output in the Steel Industry: General Considerations' (24 pp.)
3. Yu-Nan Hsu, 'Prime Costs, Proceeds and Output in the Cotton Industry' (18 pp.)

Comments and correspondence:

1. Yu-Nan Hsu's reply to a critique by R. Stone and Mrs Stone (concerning his paper on the cotton industry)—letter of 1 Sept. 1939
2. Notes on tobacco (by R. Stone)
3. Two letters of R. Khan to M. Kalecki, 10 July 1939 and 11 July 1939
4. J. Robinson's commentary, of early July 1939, on Kalecki's 'Interim Report'

Kalecki's article was not merely a statistical testing of his theory of income distribution, however. Together with 'A Theory of Long-Run Distribution of the Product of Industry', it represents an important revision of his theory, indeed its new (i.e. second) version. In it he tries to derive the relationship between the 'fundamental data' on the market structure and the degree of monopoly through a reformulation of the latter concept. Profit maximization by imperfectly competitive firms (i.e. equality between their marginal cost and marginal revenue) is assumed, and he attempts to prove, under these conditions, that the supply curve is horizontal if the average prime cost is constant, provided that a suitably defined degree of monopoly is given.

In Kriesler's opinion the second version of Kalecki's theory represents a disruption to the continuity of the evolution of his thoughts; he also notes that Kalecki largely ignored it, failing to mention it in his later writings on income distribution theory. Moreover, Kriesler shows that in this version Kalecki ignores the role of the interdependence of firms typical of oligopoly situations, and that his analysis of why capacity is not fully utilized is inadequate, as it does not offer an explanation of how the level of output of an individual firm is determined (see Kriesler, *Kalecki's Microeconomics*, ch. 5; on this latter point see also J. Halevi, 'On the Relationship between Effective Demand and Income Distribution in a Kaleckian Framework', *Banca Nazionale del Lavoro Quarterly Review*, 31/125, 1978).

> [D]espite the fact that Kalecki appears to have been familiar with the underlying principles of the Oxford analysis, he does not appear to have understood the mechanics of the model. . . . [A]n essential result of the analysis is that the marginal revenue curve is discontinuous, and hence marginal revenue is undefined at the existing price. Despite this, Kalecki incorrectly analyzed the oligopoly position described above in terms of marginal revenue. . . . However, even if this was not the case [*i.e. if at the relevant point marginal revenue were defined*], it is unclear why the price charged would not be at the point where marginal cost equalled marginal revenue, as this would be the profit maximizing point for each firm. (Kriesler, *Kalecki's Microeconomics*, pp. 54, 56.)

Kriesler also points out that Kalecki's use of the tools of 'orthodox' microeconomic theory in his 1939–40 article is unsatisfactory and at times erroneous (e.g. Kalecki's confusion between the positive and the negative definition of the elasticity of demand; his use of the conventional, normal, point definition of that elasticity where he needed the elasticity with respect to the ratio of own-price to industry average price; the extension of results obtained under the assumption of 'pure imperfect competition', where it is legitimate to fix the average price of all firms in the industry, to positions of oligopoly, where a variation of one firm's price must influence that average). For all these reasons, Kriesler concludes that these two articles of Kalecki represent a digression that led nowhere and hence was discarded by him, having little influence on his subsequent analysis (ibid., p. 60).

[2]
This is most probably a reference to the article by Hall and Hitch, 'Price Theory and Business Behaviour'.

[3]
Kalecki and Tew shortly afterwards published a new method of trend elimination and applied it to separating the trend factor from the index of real costs of labour in the British steel industry (see their 'A New Method of Trend Elimination', *Econometrica*, 8/2, 1940, pp. 117–29, and their correction of this method in *Econometrica*, 9/1, 1941, pp. 93–4; see also *Collected Works*, vol. vi).

A Theory of Long-Run Distribution of the Product of Industry

[1]
First published in *Oxford Economic Papers*, NS, 5, 1941, pp. 31–41. The publisher's permission to reproduce this article is gratefully acknowledged.

A Model of Hyper-Inflation

[1]
First published in *The Manchester School*, 32/3, 1962, pp. 275–81. The original text of Kalecki's lecture has not survived. A Polish translation of the article appeared in *Ekonomista*, 2, 1963, pp. 312–16. The publishers' permission to reproduce this article is gratefully acknowledged.

M. C. Sawyer draws attention to H. G. Johnson's reminiscences of Kalecki's lecture. Johnson, who was at Cambridge until 1956 and attended the lecture, wrote many years later:

> [T]here is another ironical possibility, that had Kalecki been kept in Cambridge, he would have developed an economics far more relevant to, and capable of handling Britain's post-war economic difficulties than 'Keynesian economics' as it developed at Cambridge, and more specifically at the Institute of Statistics at Oxford. My reason for thinking this is that, on the one occasion on which I met him at Cambridge (his being *en route* back to Poland) Kalecki delivered a lecture on inflation that employed a simple quantity theory of money together with expectations about the future trend of prices—and which met with a reception from his former admirers so hostile that he was discouraged from publishing it. (Quoted by M. C. Sawyer, *The Economics of Michał Kalecki*, p. 124 n. 4.)

Kalecki had already addressed the problem of inflation in his studies of the British war economy. There he viewed inflation as the problem of the distribution of consumer goods and services in short supply. In an article published in 1941, 'What is Inflation?' (see *Bulletin of the Oxford University Institute of Statistics*, 3/6, and *Collected Works*, vol. vii), he put forward such a definition of inflation, which was also meant to measure the intensity of inflationary pressures (Kalecki did not return to this definition and the implied measure of inflation in his later publications). In his analysis of inflation he concentrated on conditions of equilibrium in individual sectors of the economy, and on the influence of imbalances in one sector on inflationary pressures in the economy as a whole. The remedy for inflation he saw mainly in the rationing of goods and services in short supply.

Kalecki also studied inflationary and deflationary phenomena later on, when he worked for the United Nations. The Economic Stability Section, which he headed, prepared a number of documents on these problems, including two reports: *Survey on Current Inflationary and Deflationary Tendencies* (UN Sales No. 1947. II.5, Sept. 1947) and *Inflationary and Deflationary Tendencies 1946–1948* (UN Sales No. 1949. IIA.1, June 1949; for more information, see 'A Note on M. Kalecki's Work in the United Nations', in *Collected Works*, vol. vii, annex 9). The introductory chapter of the second of these reports ('Introductory Remarks on Inflationary and Deflationary Processes') gives a theoretical foundation for a study of inflationary processes, while its section 3—where hyper-inflation is presented as a final stage of inflation—contains many passages similar to Kalecki's article on hyper-inflation. S. Braun, Kalecki's friend who worked in the Economic Stability Section, remembers that almost the entire introductory chapter of the report was written by Kalecki, while the section on hyper-inflation was written by T. Chang under Kalecki's close supervision.

In later years Kalecki dealt with the problems of inflation and market disequilibrium, especially during accelerated economic development, in connection with his studies on socialist and the mixed economies.

According to M. C. Sawyer (*The Economics of Michal Kalecki*, pp. 285–6), the 'conflict theory of inflation' (see e.g. B. Rowthorn, 'Conflict, Inflation and Money', *Cambridge Journal of Economics*, 1, 1977, and Sawyer, *Business Pricing and Inflation*) can be seen as a development of Kalecki's ideas (although not of his alone).

Class Struggle and Distribution of National Income

[1]

Kalecki sent the typescript of this article to *Kyklos* in Mar. 1970; the article appeared posthumously, with small editorial alterations, in *Kyklos*, 24/1, 1971, pp. 1–9. An edited version was included in *Selected Essays on the Dynamics of the Capitalist Economy, 1933–1970*, pp. 156–64. The *Kyklos* version was reprinted in J. E. King (ed.), *Readings in Labour Economics*, Oxford, OUP, 1980, pp. 439–44, and the CUP version in J. B. Foster and H. Szlajfer (eds.), *The Faltering Economy*, New York, Monthly Review Press, 1984, pp. 74–84. The CUP edition has been translated into Italian (*Sulla dinamica dell'economia capitalistica: saggi selecti 1933–1970*, Turin, Einaudi, 1975), Spanish (*Ensayos escogidos sobre dinámica de la economia capitalista 1933–1970*, Mexico City, Fondo de Cultura Económica, 1977, 1982), Hungarian (*A tőkés gazdaság működéséről: válogatott tanulmányok 1933–1970*, Budapest, Közgazdasági és Jogi Könyvkiadó, 1980). The Swedish translation of this article, 'Klasskamp och nationalinkomstens fördelning', appeared in M. Kalecki, *Tillväxt och stagnation i modern kapitalism* (n.p., Bo Cavefors, 1975, pp. 59–67). The German translation, 'Klassenkampf und Verteilung des Volkseinkommens', is included in two collections *Werkauswahl*, pp. 203–14, and *Krise und Prosperität im Kapitalismus*, pp. 242–50. The

Polish translation, 'Walka klas a podział dochodu narodowego', appeared in *Zycie Gospodarcze*, 16, 1976. The Portuguese translation, 'Luta de Classe e Distribuição de Renda Nacional', appeared in the collection *Crescimento e Ciclo das Economias Capitalistas*. The Cambridge Univ. Press edition is followed in this volume. The publishers' permission to reproduce this article is gratefully acknowledged.

Kalecki's article attracted considerable interest. For a time it was considered to represent a wholly novel approach to the theory of income distribution as compared with the version put forward in Kalecki's *Theory of Economic Dynamics* (see e.g. Asimakopulos, 'A Kaleckian Theory of Income Distribution'); then it was shown rather to be a rearrangement of Kalecki's pricing equations (see e.g. Basile and Salvadori, 'Kalecki's Pricing Theory'; Kriesler, *Kalecki's Microanalysis*). The main difference between Kalecki's 1954 and 1971 formulations consists in this: that in the latter, workers are assumed to be able to influence the mark-up, and hence the struggle for wages at a firm's level; moreover, the system of wage bargaining may influence relative shares in national income and this will affect employment and capacity utilization. (Another difference is that the concept of the degree of monopoly, which evoked so many misinterpretations and accusations of tautology, is no longer mentioned there.)

Thus the 1971 formulation shares both the advantages and the shortcomings of the 1954 version of Kalecki's theory, already discussed above. It also attracted some more specific criticism. According to Asimakopulos, for instance, Kalecki's attempt to allow for the factor of competition between firms by relating a firm's price to the weighted average price for the industry as a whole, by means of function *f*, did not succeed, since this function has no explanatory power and it does not provide a causal relation between a firm's mark-up and average industry price ('A Kaleckian Theory of Income Distribution', p. 318). On the other hand, this new formulation of Kalecki's theory was used as a starting-point for an analysis of the relationship between effective demand and income distribution (see Halevi, 'On the Relationship between Effective Demand and Income Distribution in a Kaleckian Framework'), and for a study of the impact of trade union activity on profit mark-ups (see K. Cowling and I. Molho, 'Wage Share, Concentration and Unionism', *Manchester School*, 50, 1982).

PART 2
Elements of Economic Dynamics

A Theorem on Technical Progress

[1]
This article first appeared in *Review of Economic Studies*, 8/3, 1940–1, pp. 178–84. A Portuguese translation, 'Um teorema sobre o progresso técnico', was published as ch. 9 in *Kalecki Economia*, São Paulo, Editora Ática, 1980. The publishers' permission to reprint this article is gratefully acknowledged.

The essays collected in pt. 2 of this volume represent Kalecki's early attempts to bring in factors of long-run economic development to his analysis of capitalist cyclical reproduction. While this is the single subject-matter of the opening and the closing articles of this part, in his *Studies in Economic Dynamics* only its 'pt. II' is devoted to it, 'pt. I' containing the third version of Kalecki's theory of pricing and income distribution (see p. 498), a paper on the rate of interest, and a reformulation of his theory of profit.

Kalecki sought to publish his article in the *Economic Journal*, and sent it to Keynes at the end of Jan. 1941. After consulting Joan Robinson and Nicholas Kaldor, Keynes, however, did not publish it. What survived of the editorial exchanges on this article in Keynes's papers (nothing survived in Kalecki's) was published in *The Collected Writings of John Maynard Keynes*, vol. xi, London, Macmillan, 1983, pp. 829–36. We are grateful to the publishers of Keynes's *Collected Writings* for permission to reproduce this correspondence.

4 Feb. 1941

My dear Joan,

Here is Kalecki's article. As I said the other night, after a highly rational introduction of a couple of pages my first impression is that it becomes high, almost delirious nonsense. I am ready to believe that there are some assumptions in relation to which his conclusions are correct. But so many of them are latent and tacit that no-one could say, I should have thought, whether he has proved his proposition. Indeed I do not feel perfectly sure whether the hypotheses may not be self-contradictory. Is it not rather odd when dealing with 'long-run problems' to start with the assumptions that all firms are always working below capacity?

Or take his final conclusion that technical progress causes a reduction of output. I imagine that he really means by this that if, as a result of technical progress, two blades of grass grow where one grew before there would nevertheless be no increase in output, either because he measures output in terms of marginal wage cost or because he has made some assumption that leads to the conclusion that only half as many fields would be cultivated, the working day being reduced by half. But if the former explanation is so, he gives no definition of output. Has not the whole method been

carried to ludicrous length? However, I must not try to prejudice you but await your verdict.

Yours ever,
J. M. K.

4 Feb. 1941

Dear Maynard,

I am prepared to stick up for Kalecki. He is making an attempt to extend the *General Theory* beyond the short period—tho' not to the long period in the old sense, since that concept involves the whole Classical theory. He is not saying that inventions leave output constant, for in his 'reference system' output is increasing as capital accumulates. He needs an indefinitely large reserve of labour in his reference system so that employment can increase as required. But granted that, he is all right. The trick is to make assumptions by which effective demand in terms of commodities is the same in the two systems. Then output is the same, and inventions by increasing output per head, reduce employment (relatively to the reference system). The case which he hints at at the end, where output falls (relatively) arises when inventions increase the share of capital relatively to the share of labour and so increase thriftiness. Two blades of grass grow where one grew before, but the demand for hay falls.

As for under-capacity working—that is part of the usual bag of tricks of Imperfect Competition theory. To say that price normally exceeds marginal cost sounds commonplace enough, but that is really the same thing. Where Kalecki *is* barmy is insisting on writing articles in this inhuman style. It is a kind of sinful pride that makes him do it.

Perhaps you could find a spare moment in the week-end. I will keep the article till then and chew over it again. I enclose some notes addressed to Kalecki which I could send him if you approve.

Yours,
Joan

12 Feb. 1941

My dear Joan,

Thanks for your notes on Kalecki. If he is extending the *General Theory* beyond the short period but not to the long period in the old sense, he really must tell us what the sense is. For I am still innocent enough to be bewildered by the idea that the assumption of all firms always working below capacity is consistent with 'a long-run problem'. To tell me that 'as for under-capacity working that is part of the usual pack of tricks of imperfect competition theory' does not carry me any further. For publication in the *Journal* an article must pass beyond the stage of esoteric abracadabra.

You tell me that it is a kind of sinful pride which makes Kalecki write like this. I think it is a sort of profound stupidity, though physical and aesthetic, perhaps, rather than intellectual. At any rate, he must write the article in such a style that it is fairly evident on the surface whether or not he is talking through his hat. I do not doubt that he is saying something. But I suspect him of being at one of his old tricks in an extreme form, namely, of taking artificial assumptions which have no possible relation to reality or any other merit except that they happen to lead up to a needed result.

All this does not mean that I am not most grateful to you for tackling him. I think much the best way would be if, as you suggest, you would write to him yourself, send him the enclosed notes, which I return, tell him that I, with my head occupied in other directions, had asked you to look through it, and use all your influence to persuade him to set it all out so that it is possible for some readers at any rate to exercise rational judgement on it.

Yours ever,
J. M. Keynes

14 Feb. 1941

My dear Maynard,

I have written to Kalecki as you suggest. I must protest at your calling Imperfect Competition an esoteric doctrine. It may be awful rot—as you have always suspected—but for better or worse it is in all the text books now.

Under Imp[erfect] Comp[etition] there is surplus capacity even in full equilibrium [see Fig. 47]. Under perfect comp[etition] any firm which is working at all must be working bang up to capacity even in a deep slump. This is certainly more and not less ridiculous.

Yours,
Joan

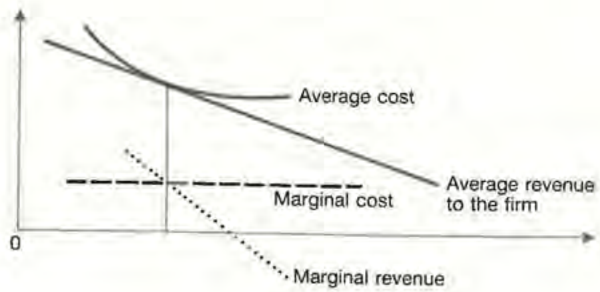

FIG. 47

18 Feb. 1941

My dear Joan,

That is not what I said or at any rate not what I mean to say. Imperfect competition as such has become quite the contrary of esoteric!—indeed one of the most fashionable subjects going, especially in [the] USA.

What I call esoteric is bringing in certain assumptions of this sort tacitly and assuming that the reader can be expected to supply out of his knowledge or imagination, not only the relevant assumptions, but the relevant consequences of them and, above all, the solution of how all this works in the 'long-run conditions'.

Kalecki must tell me exactly what he is assuming in his model, exactly in what respects it differs from the real world; in particular, he must justify for the purpose of his final comparison the assumption that there is no inconsistency between the assumptions governing each of the two states of affairs he is considering, so that it is legitimate to pass from one to the other.

The esoteric fault is to write subject to a whole contraption of secret knowledge, atmosphere and assumption, quite unknown to above half a dozen readers in the *Journal* at the outside.

Yours ever,
J. M. Keynes

24 Feb. 1941

Dear Maynard,

Kalecki has met the criticism I made on his article, and I hope you will now find it publishable.

His conclusions differ from my Long-Period Theory [*Zeitschrift fur Nationalökonomie*, Mar. 1936] (which you swallowed all right at the time) only in showing that capital-using inventions do not reduce the share of labour in the Nat[ional] Div[idend]. And this is a bull point because the share of capital doesn't in fact rise as much as my original argument would lead one to expect.

In general I think Kalecki is explaining mysteries, not creating them.

Yours,
Joan

4 Mar. 1941

My dear Joan,

Thank you very much for taking so much trouble about Kalecki. The article is enormously improved in its present form and is not open to my previous criticism, at any rate of presentation.

But, unfortunately, my complaints have become of exactly the opposite kind. Now that I believe myself to understand exactly what it says, it all seems plain as a pikestaff. Indeed, so much so that I cannot discover that the elaborate apparatus of the reference system leads to any conclusion which is not obvious from the start. Kalecki sums it all up on page [115] where he says—'The significance of our theorem is to show that technical progress influences output only through the channels of inventions stimulus, oligopoly and the general price level (or by overcoming [the] scarcity of labour).' But in what other way has anyone ever supposed that it did operate?

Moreover, if the reference system led to a more interesting conclusion, is it not a highly dangerous and fallible method since it makes unsupported assumptions as to the legitimacy of superimposing one fact on another without any interaction?

Does the article tell you anything you did not know before? You say that it proves that capital-using inventions do not reduce the share of labour in the national dividend. Where does it show this? I have not discovered it. Don't you mean that, if it reduces it, it only reduces it through one or other of the agencies mentioned above?

I should like to send it to Kaldor for another opinion.

Yours ever,
J. M. Keynes

4 Mar. 1941

My dear Kaldor,

As I have not now much spare brains for this sort of thing, I should be very grateful if I could have your opinion on the value of the enclosed article by Kalecki.

My *prima facie* criticisms on it are two.

1) I think that his method of a reference system is a dangerous one since it seems to me to make unsupported assumptions about the legitimacy of superimposing one fact upon another without any risk of interactions. I should, therefore, suspect it if it led to any conclusion not acceptable to my intuition on other grounds.

2) The conclusion which in fact it leads to seems to me to be obvious from the outset. It is summed up at the bottom of page [115], where he says, 'The significance of our theorem is to show that technical progress influences output only through the

channels of invention stimulus, oligopoly and the general price level (or by overcoming the scarcity of labour)'. But how else has anyone ever supposed that it did operate?

However, I must not try to prejudice you against the article in advance.

Yours sincerely,
J. M. Keynes

6 Mar. 1941

My dear Maynard,

Yes, now you have gone to the other extreme. Surely if anyone asked you Do capital-using inventions increase capital per unit of output? you would have said Of course—what a dotty question.

It is the interplay of utilization of capital which changes in technique that Kalecki brings out.

True it seems rather an elaborate mechanism just to add one point to our analysis, but it seems to me a gallant attempt to deal with the analysis of a developing economy without using pure short-period or full long-period assumptions—neither of which is adequate.

I think you are looking a gift horse in the mouth—after all even one valid proposition, extending the *General Theory*, throwing light on the old problem of the constancy of relative shares is something to be thankful for.

The real advantage of the theorem is to clear out of the way an unnecessary difficulty so that some progress can be made with long-run (but not full equilibrium) analysis. Without this theorem one is held up by thinking one has to allow for effects of changes in technique on thriftiness etc., as I thought when I did my Long-Period Theory. Kalecki is on to something important, and this is a necessary step on the way.

Yours,
Joan

On 9 Mar. 1941 Kaldor replied:

Dear Keynes,

I am inclined to agree with you as regards the value of Kalecki's present article. It contains a single proposition, which if not made explicitly, is at any rate implicit in your General Theory, and which moreover has been amply emphasised in Mrs. Robinson's paper on the Long Period Theory of Employment, published some years ago,—I mean the proposition that if the fundamental factors determining the level of employment are taken as given—i.e. the propensity to consume, the marginal efficiency of capital and the rate of interest—the long-run effect of technical changes raising the productivity of labour is not to increase aggregate real output, but to reduce the level of employment. In other words, the forces which determine the level of employment under short period assumptions—when output and employment are assumed to be uniquely related to one another—determine not so much employment, but output under long period assumptions, so that any increase in output per head, given the value of the independent variables, reduces employment.

Of course the independent variables—in particular, the marginal efficiency of capital and the propensity to consume—are not likely to remain unaffected by technical changes; hence the guarded statement that 'technical progress influences output only through the channels of invention stimulus, etc.'—which makes his proposition appear even more platitudinous than it is. The method of proof adopted in the 'reference system' makes the analysis unnecessarily cumbrous and lengthy. And his assumption that technical progress *necessarily* raises the 'degree of oligopoly', thus counteracting the beneficial effects of technical improvements on the propensity to consume, appears unwarranted.

(I am grateful to Lady Clarisse Kaldor and to A. P. Thirwall, Kaldor's literary executor, for permission to reproduce the above letter.)

Keynes then wrote to Joan Robinson on 12 Mar. 1941:

My dear Joan,

What *am* I to do about the wretched Kalecki?

If you had asked me—'do capital-using inventions increase capital per unit of output?' of course I should have said 'yes', since I should have interpreted this to mean per unit of capacity output. If you make it clear to me that by output you do not mean capacity output, then I should say it obviously depends on whether their effect is to bring actual output nearer to or further from capacity. If you say you can invent an artificial system in which they would bring actual output on a lower level in relation to capacity than before, I should say it would be a balance as to what the answer was. (In Kalecki's notation it would depend on whether u was falling faster than c was rising.) If you assert as a dogma that in the actual world the effect of capital-using inventions is always to reduce u more than it increases c, I should probably have replied—'What a dotty idea!'

I have not realized that the whole object of the article was to make the above mentioned assertion. For the last page scarcely seems to amount to a proof of this and, at the best, he will only be showing that u falls. I do not notice any discussion to lead one to suppose that in the actual world u must always fall faster than c rises. Certainly, if this is the whole purpose of the paper, it should be made a little clearer.

Meanwhile, I have sent the article to Kaldor and enclose his reply. You will see that, in his judgement, Kalecki has not made out your point; though I do not think Kaldor puts it quite strongly enough, since it might be true that technical progress necessarily raised the degree of oligopoly, and yet did not do so sufficiently to offset the other effects.

So I am inclined to return to the opinion that the article is pretentious, misleading, inconclusive and perhaps wrong. I would rather have cheese to a weight equal to the paper it would occupy in 5,000 copies of the *Journal*!

Yours ever,
J. M. K.

13 Mar. 1941

My dear Maynard,

As you still do not get the point about inventions and relative shares, and Kaldor also fails to see it, I have to confess that Kalecki's article is not a success.

I have suggested to him to rewrite it much more briefly making the main point clear.

Yours,
Joan

And on 18 March 1941 Keynes wrote to Kaldor:

My dear Kaldor,

Thanks very much for your note on Kalecki which fell in with my ideas but not, you will have heard, with Joan's. Indeed I went a little further than you because it seemed to me that, even if Kalecki could establish that the effect of capital-using inventions was to increase the gap between actual output and capacity output, he would still have to show that this was quantitatively large enough to offset the opposite effect. I could not see that he made a trace of an effort to establish this. However, Joan has been able to discover that the article is really about something quite different, which neither you nor I noticed. So she is sending it back to Kalecki in the hope that he will elucidate it further. I do not doubt that in the end she will write quite a good article for him!

Yours sincerely,
J. M. Keynes

Studies in Economic Dynamics

[1]

The book was published by Allen & Unwin, London, 1943; repr. by Farrar & Rinehart, New York, 1944. The publishers' permission to reproduce it is gratefully acknowledged.

During the war Kalecki worked in the Oxford University Institute of Statistics, where he dealt with the problems of the British war economy and post-war development (see *Collected Works*, vol. i, pp. 371–2, and vol. vii). He also lectured at Balliol College on, among other things, his theories of the business cycle and national income distribution, which he continued to develop. The 5 essays which constitute the book, 3 of which were published for the first time, represent these developments.

Studies in Economic Dynamics was well received by its reviewers. Tibor Scitovsky emphasized the importance of Kalecki's theory of income distribution for the undermining of the concept of perfect competition and the orthodox theory of prices, the importance of his theory of the business cycle, and the novelty of his analysis of a long-run trend. Scitovsky concluded: 'In general, one may say that the book whets rather than assuages the reader's appetite. It contains many more ideas than can be adequately discussed within the compass of its ninety pages, but to the intelligent reader this should be a stimulus rather than a source of dissatisfaction' (*Economic Journal*, 56, 1946, p. 452).

The review by G. L. S. Shackle (*Economica*, 11/44, 1944, pp. 217–18) was enthusiastic ('Any economist who is asked "What can economic theory do by way of explaining actual concrete facts?" would do well to point out these essays', he ended). Similar in tone was the review by H. Dutschler in *Schweizerische Zeitschrift für Volkswirtschaft und Statistik* (1, 1946, pp. 68–9), and by W. Hagemejer in *Ekonomista* (2, 1947, pp. 91–4), who noted that 'the problems whose solution the author undertakes are among the most difficult and most important in the theory of economic development; this study is pioneering in this direction' (p. 93).

An extensive discussion of Kalecki's business cycle theory, including a review of revisions introduced in its successive versions from 1935 to 1943 (and even those of his 'A New Approach to the Problem of Business Cycles',

see above) was presented by A. Paquet in his essay 'Michel Kalecki' (in M. Kaldor *et al.*, *Fluctuations économiques*, vol. ii, Paris, Domat, 1954, pp. 63–90). Paquet pointed out that Kalecki had been a 'Keynesian' already before Keynes's *General Theory* was published, and that he made Keynes's static approach more dynamic. In Paquet's opinion, the great merit of Kalecki's theory was that it replaced the method of equilibrium with the method of disequilibrium. Paquet concluded (pp. 89–90):

> While traditional business cycle theorists thought that the cycle could be explained by using the method of equilibrium elaborated by Walras and Wicksell, contemporary theorists are searching for models from which evolution and disequilibrium result. ... The real methodological revolution was the development of analytical tools implying internal macroeconomic disequilibrium caused by the endogenic features of a given economy. ... Kalecki was one of those who made this revolution.

Kalecki's lectures in Oxford were appreciated, but the greatest influence he exerted there was upon his colleagues rather than upon his students. This influence is seen best in Joseph Steindl's *Maturity and Stagnation in American Capitalism* (Oxford, Blackwell, 1952), as readily admitted by its author. Many years later Steindl wrote about the origin of his book as follows:

> On one occasion I talked with Kalecki about the crisis of capitalism. We both, as well as most socialists, took it for granted that capitalism was threatened by a crisis of existence, and we regarded the stagnation of the 1930s as a symptom of such a major crisis. But Kalecki found the reasons, given by Marx, why such a crisis should develop, unconvincing; at the same time, he did not have an explanation of his own. I still do not know, he said, why there should be a crisis of capitalism, and he added: Could it have anything to do with monopoly? He subsequently suggested to me and to the Institute, before he left England, that I should work on this problem. It was a very Marxian problem, but my methods of dealing with it were Kaleckian. He did not see my book until it was published. I lost by not having his advice, which was motivated by the distance of New York, but also by a secret wish on my part to escape to some extent the overwhelming dominance of a so much superior mind and personality. He remains my inspiration and my reference system till to-day. ('Reflections on the Present State of Economics', *Banca Nazionale del Lavoro Quarterly Review*, 37/148, 1984, p. 8; see also his 'Ideas and Concepts of Long Run Growth' in the same journal, 34/136, 1981.)

Steindl's theory differs from Kalecki's in that the former embodies two important assumptions which are not present in the latter, i.e. that (i) firms wish to establish a planned degree of capacity utilization over a period long enough to embrace both boom and slump, and (ii) if the actual utilization is below the desired level, this deters investment. In Kalecki's theory, on the other hand, capacity utilization is a passive variable. (For a support of Steindl's rather than Kalecki's approach, see e.g. B. Rowthorn, *Demand, Real Wages and Economic Growth*, Studi Economici a cura della Facoltà di Economia e Commercio dell'Università di Napoli, No. 18, 1982.)

Kalecki's *Studies* was one of the important reference points for Joan Robinson's *The Rate of Interest and Other Essays* (London, Macmillan, 1953). In her 'Acknowledgements and Disclaimers', she wrote of Kalecki:

Mr Kalecki's discovery of the General Theory independently of Keynes was a classic example of the coincidence of science. His version of the analysis led directly (which Keynes' did not) to a model of the trade cycle. Based upon the same conception of short-period equilibrium, his theory fitted naturally into Keynes' scheme, and became absorbed into it in the subsequent development of the General Theory. By now it is impossible to distinguish what one has learned from which.

I am chiefly conscious of a debt to Mr Kalecki for his way of handling expectations as an average of past experience—a simple device which enables us to conceive of beliefs about the future which are going to be proved correct (in stable conditions) without being obliged to deprive those who hold them of Free Will.

My chief difference from Mr Kalecki is in respect of his treatment of finance as the short-period bottleneck. (p. 159)

However, Kalecki thought there were other important differences as well, at least in the earlier version of her book which she had sent him for comments. In her letter of 4 May [1951?] she wrote:

Dear Michel [*sic*],

I would very much value your comments on this. It disagrees with your system in not taking Finance as the limit.

My debts to you are rather sketchily acknowledged here. I shall put in a bit in the published version.

I send a second copy to be shared by Chang and Knapp. Would you please pass it on?

Yours
Joan Robinson

(The letter survived in Kalecki's papers: Joan Robinson's permission to reproduce it is gratefully acknowledged.) In his reply of 26 July 1951, Kalecki wrote:

Dear Joan,

I am sorry to send you my comments so late. I have been quite busy recently. Even now I have not read your paper so thoroughly as to make all the necessary comments. I confine myself to raising the most important points.

I shall start with the problem of the 'limiting influence of finance' which you mention in your note as being the main difference between my treatment and yours. I should like to state first that the role of finance in my theory does not correspond to what you say on pages 45 and 46. [*All page references are to the typescript she had sent him.*] It is rather related to the problem discussed on pages 20 and 24. Roughly speaking, I think that investment decisions in a given period depend to a great extent on entrepreneurial savings in that period. I do not understand why you assume that such decisions depend on the distribution of total savings but on their level. It is quite true that the distribution determines what part of total savings is saved by entrepreneurs as opposed to the rentiers (or even by 'more dynamic' firms as opposed to rentier firms). But surely if with a given distribution of savings the level of savings is reduced, then [an] entrepreneur will be *ceteris paribus* reducing the volume of his investment decisions, because if he continued to invest at the same level he would tend to increase his indebtedness. I formulated [it] very roughly because I gave more elaborate formulation in my previous writings. Moreover, I assume that the investment decisions are a function not only of current entrepreneurial savings but also of the change in the factors determining the rate of profit. Here I assume a certain flexibility in the supply of finance because it follows directly from the formula that if the rate of profit is increasing, investment will be higher than when it is constant, and that the entrepreneur will be able to secure the finance for that in such a case. It is assumed that at the end of each period the entrepreneur has undertaken all such investment plans which he considered profitable and for which he could obtain the finance. What makes him undertake any investment in the next period is the new supply of his own savings and the change in the rate of profit.

The second general point concerns your tacit assumption that the capitalist system has an inherent tendency for development at a constant rate and that only the 'vicissitudes' which you analyze on pages 30 to 44 disturb such a development. Now, I can imagine very well a system which would not develop but would be stationary or even shrink without any such 'vicissitudes' but generally as a result of, say, absence of innovations.

I am now coming to more particular points. You will not be surprised, for instance, that I am not sure whether in the boom 'abnormal' profits in your sense are always earned (page 32). I do not know whether I understand correctly your paragraph at the bottom of page 33. I believe that if the short-period prime-cost curve over the relevant range of output is always horizontal, the capital favouring changes in technique should not be taken into consideration at all. Because, on this assumption, which seems to me plausible, the change in technique can affect the ratio of proceeds to prime-cost only if it influences the degree of monopoly.

I disagree with the whole section entitled 'Cessation of growth in numbers' on page 35. You present the argument in such a way that scarcity of labour is not involved. However, if this scarcity does not arise, for instance because of the increased employment of women, I do not understand, why the development should be disturbed. At some point scarcity of labour has to intervene in the disturbance, although it is possible that as a result of this a situation will develop where no more scarcity of labour exists. Such a case, however, seems to me unrealistic because in the past such a situation was usually overcome by migration from the rural districts where increase in productivity compensated for the reduction in employment, and more generally by application of labour-saving devices. (Of course, in many instances shortage of labour was overcome simply by immigration from less developed parts of the world.)

I am not very happy about your analysis of the business cycle which starts on page 51. It is not clear what sort of function for investment decisions you have in mind. From some passages, like for instance, 'No rise in income occurs after April, and no new plans are laid', on page 56, it seems that you subscribe to the acceleration principle. Now this theory has been criticized by myself and other writers as unrealistic because it yields a much shorter cycle than that which is in existence (six to ten years). At some point, however, you also refer to mine and Kaldor's theory, which are quite different.

When you ask the question why the boom does not last indefinitely, you do not take into consideration the possibility that the parameters of the investment function may be such that the process is convergent. One could ask in the same way the question why a rise in investment does not cause consumption to rise indefinitely. The reply is simply that the proportion of marginal consumption to marginal income is less than 1. My idea, which you analyze on pages 52 and 53, serves merely to show why every boom has to reach a stage when the process *is* convergent, so that there should be no need for any specific assumptions on the parameters of the investment function. I hold no brief for this idea now because after having analyzed the data for the United States I do not see any statistical basis for it. However, your argument on page 56 does not seem convincing to me. From the fact that the entrepreneurs assume at the beginning of the boom that it will last for a few years but not indefinitely, is a pretty far way to their disregarding the boom altogether.

Your statement at the top of page 57 that the experience fully confirms that the boom is stopped by inadequate capacity in investment goods industries, seems to me farfetched. I do not know of any data which would necessarily confirm it.

I do not share your opinion that the emergence from the slump presents such an insuperable difficulty for trade cycle theories. For instance, the acceleration principle theories, although unrealistic in their present form, can explain the emergence from the slump very easily. The same is true of my theories both in my first and in my second book. (Incidentally, I have shown that my theory in the first book is only a special case of the second.) Incidentally, in the paragraph at the bottom of page 60 you make the same mistake which I pointed out to you with regard to the manuscript you sent me many years ago. The negative investment in the slump may be just as large as the positive investment in the boom. In fact, if you consider the deviations from the trend line, the positive and negative deviations are of necessity equal.

Speaking generally, I think that a reasonable theory of the business cycle should permit to explain the fluctuations without assuming any bottle-necks. The end of the slump is then pretty symmetrical with the end of the boom. On the other hand it is necessary to allow for such [a] case when the parameters of the investment function are such that the boom is ended because of bottle-necks.

How are you getting on in general? When do you intend to publish your new book? As Knapp wrote you I am trying now to produce some sort of synthesis of my two books which would be published in lieu of second editions of both of them.

Yours,
Michał

I am grateful to Joan Robinson for presenting me with the original of Kalecki's letter to her. J. Burke Knapp was subsequently a senior vice-president of the World Bank.

[2]
This essay represents the first formulation of what is now considered a third version of Kalecki's theory of distribution of the national income (for discussions of all 3 versions, see pp. 479–516; for the development of the latter, see chs. 1 and 2 of his *Theory of Economic Dynamics*).

[3]
This is a synthesis of 2 articles: 'The Short-Term and the Long-Term Rate of Interest', *Oxford Economic Papers*, 4, 1940, pp. 15–22, and 'The Short-Term

Rate of Interest and Velocity of Cash Circulation', *Review of Economic Statistics*, 33/2, 1941, pp. 97–9. For a subsequent development of Kalecki's views on this subject, see chs. 6 and 7 of his *Theory of Economic Dynamics*, this volume. This essay very much impressed G. L. S. Shackle:

> The author's gift of producing, with extreme economy of argument, an elegant and fruitful theory, and straightaway confirming it with statistical evidence, gives to these essays a quality which one may almost call dramatic. This impression is strongest perhaps in the chapter on the Short-term and the Long-term Rate of Interest, where data covering the relation of these rates for nearly a century are shown to be explainable by no more than two linear functions, and where the one or two points which do not fall on these regression lines actually add force to the argument because in each case there is a special and powerful circumstance explaining and requiring such a discrepancy, so that here indeed the exception does prove the rule. What is more, Mr Kalecki is able to show that if the regression co-efficients at which he arrives were, say, half of the value actually obtained, some of the co-efficients in his theoretical equation (equation (4) on page [145]) would assume absurd values. Thus the statistical test to which he has submitted his hypothesis is one which could have disproved it, had it been wrong in certain respects: but, on the contrary, the hypothesis passes this test with striking success. There is, perhaps, some necessary arbitrariness in the division of the whole period into intervals; and this may have allowed an extra good fit to be obtained. But this does not prevent the essay as a whole from carrying conviction. (*Economica*, 11/44, 1944, p. 217.)

The doubts expressed at the end of the quote were shared by Scitovsky: 'The presentation of the theory is elegant and the coefficients derived plausible; but the reviewer cannot help suspecting that the plausible results have a lot to do with the somewhat arbitrary choice of the averaging intervals and of the excluded "intervals between the intervals"' (*Economic Journal*, 56, 1946, p. 451; for some later criticism of Kalecki's approach, see pp. 569–71).

[4]

This article first appeared in *Economic Journal*, 52/2, 1942, pp. 258–67. For earlier formulations of Kalecki's theory of profits, referred to on p. 154 n. 30, see *Collected Works*, vol. i, and for their discussion, see ibid. 473–5. For a later development of this theory in Kalecki's *Theory of Economic Dynamics*, and subsequent discussions of this development, see pp. 239–61 and 567–9 respectively.

Kalecki sent his article to Keynes on 13 Dec. 1941. The exchange of correspondence which followed (and which has survived in Keynes's papers) was published in vol. xi of his *Collected Writings*, pp. 837–41. The publishers' permission to reproduce this correspondence is gratefully acknowledged.

2 Jan. 1942

Dear Kalecki,

I should like to have your article for *The Economic Journal*, though when I shall be allowed enough paper to publish it is rather uncertain. No chance, I am afraid, earlier than the August issue, and whether that will be possible remains to be seen. We have not yet got any paper allocation for 1942.

When you come to look at it in proof, there are one or two points which I should be glad if you would consider. I have a suspicion that a good many more assumptions are involved than you have explicitly stated. I mention two in particular:-

(a) Are you not in effect assuming constant prices? That would certainly facilitate the argument. If you are not assuming constant prices, then it seems to me a variety of particular assumptions have to be made. For example, suppose there was a policy of work or full maintenance at a constant real reward so that workers' real consumption is constant. Would not that disturb you?

(b) Is it not necessary for you to assimilate doles to capitalists' consumption rather than to workers' consumption? Your conclusions seem to me to relate to the sum of capitalists' consumption *plus* doles rather than to capitalists' consumption alone. For example, suppose a system of unemployment relief paid by direct taxes on capitalists.

(c) As always in these cases, I am bothered about what assumptions are being made about the independence of factors. A rise in prices might affect the real weight of direct taxes owing to the nature of the tax system, though this particular difficulty you would get round if, as I suggest above, you are assuming constant prices.

My other point is that by the time you have got to the end of the article you seem to have persuaded yourself that you are dealing with the real world. This makes it all the more important to emphasise the assumptions you are making which distinguish your model from reality.

I am retaining the article meanwhile.

Yours sincerely,
J. M. K.

9 Jan. 1942

Dear Mr Keynes,

Thank you very much for your letter. To clear up the points you raise I should like to mention first that throughout the argument I consider profits *net* of direct taxes. (This I state on p. [151] but perhaps I did not stress it sufficiently.) Accordingly capitalists' consumption is meant as their *personal* consumption *exclusive* of direct taxes (cf. footnote to p. [151]). And the equation profits = capitalists' consumption + investment means that profits *net* of taxes are equal to personal capitalists' consumption + investment. Therefore doles paid by direct taxes on capitalists are *not* included in profits or capitalists' consumption. And the changes in the real weight of taxes dependent on price changes do not affect profits in my sense (they do, however, affect the non-profit incomes).

A system of work or full maintenance at a constant real reward so that workers' real consumption is constant does not disturb my results in any case because it does not affect the equality of profits net of tax and personal capitalists' consumption plus investment just as it does not affect the equality of saving and investment.

I am certainly *not* assuming constant prices. Nor am I aware of any assumptions which have not been clearly stated although some are introduced only in chapter II ('slowness' of long-run development, p. [154]; the relation between real capitalists' consumption and real capitalists' income, p. [155]).

Yours sincerely,
M. Kalecki

10 Jan. 1942

Dear Kalecki,

Yes, I did not appreciate that you were considering profits net of direct taxes. That makes a difference and ought to be emphasised.

I will not pursue the question whether you are making unstated assumptions. The worst of your sort of procedure is that there is no means of knowing what assumptions are involved except by exercising intuition and trying to consider various possible cases. For example, suppose there is a system of E[xcess] P[rofits] T[ax] which keeps profits constant in terms of money, no doubt your equations regarded as truisms would hold good, but the practical conclusions one could draw from them would be widely different. For instance, in that case, capitalists' consumption would no longer be in any respect independent of their investment. Yet I think the reader would naturally assume that you were taking their consumption and their investment to be independent factors. One could probably go on like that for a long time. I believe that your conclusions are valid relative to some particular situation, but to decide exactly what that particular situation is you do not make one reader at least feel that he has full guidance.

Yours sincerely,
J. M. K.

15 Jan. 1942

Dear Mr Keynes,

Thank you very much for your letter. The problem of E.P.T. you raise is solved by the fact that by taxes related to a certain period I mean taxes paid and not taxes due. The Government cannot collect E.P.T. and spend the proceeds (which is required by my assumption of a balanced budget) in the same period in which the profits accrue. There arises therefore in general a difference between tax liabilities and tax payments.

The capitalists cannot be prevented from spending in a certain short period on consumption and investment the amount they have decided.* But if E.P.T. tends to keep profits constant the excess of the sum of capitalists' consumption and investment over this fixed level will be just equal to the excess of tax liabilities over tax payments. One can ask whether this amount should be included in profits in the period considered, but if it is not, the savings also are net of this amount, and they are clearly not equal to investment in that case.

One could imagine an Excess Saving Tax which tends to keep saving constant, and argue that savings in such a case are not determined by investment, and therefore the conclusions of the *General Theory* are valid only in relation to some particular situation. Such an argument would, of course, be wrong for reasons indicated above.

I admit, however, that E.P.T. would disturb my argument in section I—not because I make there any tacit assumption but because an assumption I make there explicitly becomes then unplausible. On page [152] I assume that the real capitalists' consumption is a function of real profits (with a time lag). Profits include, however, the excess of tax liabilities over tax payments, and capitalists' consumption will clearly depend not only on the total value of profits but also on what part of it is accounted for by this item. I shall therefore add there a footnote qualifying the assumption in question [*see p. 151 n. 28*]. (The argument in the *General Theory*, pp. 90–96, 115, is subject to the same qualification.)

Yours sincerely
M. Kalecki

* Both capitalists' consumption and investment are determined by decisions dependent on factors which operated prior to the short period considered and therefore are not independent in this sense (cf. pp. 3–4 of my MS). But they are independent after the relevant decisions have been formed.

20 Jan. 1942

Dear Kalecki,

In practice E.P.T. is retained by the concern and is at no stage transferred to the profit-earning consumer. Thus there is, I should have supposed, no time-lag in its effect.

If Excess Savings Taxes were in fact not infrequent events, I should, I think, have done well in the *General Theory* to call attention to their peculiar consequences.

Have you worked out your theory on what is today the more realistic assumption, that all or the bulk of the saving is done by the wage earning and salary earning class? The three broad conditions which prevail today are that profits are fixed in terms of money by E.P.T., so that any rise of prices reduces real profits and saving is preponderantly performed by the non-profit earning class.

Yours sincerely,
J. M. K.

27 Jan. 1942

Dear Mr Keynes,

The time lag effect in the operation of E.P.T. arises simply because the Government cannot collect and spend E.P.T. proceeds (the latter is required by my assumption of a balanced budget) before the profit for a certain period has accrued. The excess of capitalists' consumption *plus* investment over the level at which E.P.T. tends to fix profits makes for accumulation of tax reserves which are of course retained by the concerns.

If this accumulation of tax reserves is included in savings (namely, in undistributed profits) savings are always fully determined by investment whatever the method of taxation.

My theory is definitely not applicable to a war economy, not only because of my assumption that workers do not save, but also because I postulate a balanced budget and because of the complication which I mentioned at the end of my last letter.

Yours sincerely,
M. Kalecki

28 Jan. 1942

Dear Kalecki,

Thanks for your letter of January 27th. My letters were not meant to be merely teasing. I appreciate that there are certain assumptions on which your conclusions are correct. But, as I said before, the worst of your technique is that it is impossible for the reader as he goes along to know what those assumptions are. And when the conclusion is reached there is an atmosphere as though it had some application to the real world.

I regard it as a very interesting schematism and a useful tool of thought and I cannot but feel that the article would be a great deal better if it was represented like that. But there is also the point that, even regarded as a schematism, it is not much use unless the reader knows fairly precisely just what the assumptions are.

Yours sincerely,
J. M. K.

[5]

'Maintenance' was added in the definition of gross profits in the 1943 edn. of the article.

[6]

'Salaries' were included into 'other incomes' in the 1943 edn. of the article.

[7]

Where in the 1943 edition Kalecki writes of 'the degree of market imperfection and oligopoly', in the 1942 edn. he wrote of 'the degree of monopoly'.

[8]

The sentence in brackets was added in the 1943 edn. The following sentence in the 1942 edn. opened with the words: 'Profits per unit of output increase ...'.

[9]

In the original version of this article, Kalecki assumes in the above example that $i_{\min} = -0.02$, and obtains from (9) that $a > 4.5\%$; then there follows the text (omitted in the 1943 edition):

Of course even if $a = 4.5\%$, but $i > i_{\min}$, the rate of profit is higher than the rate of interest. However, when $i = i_{\min}$, the rate of profit falls to the level of the rate of interest. And once it has happened in a certain period, it is by no means certain that the system will automatically 'extricate' itself from this tangle.

Indeed, let us assume that in one of our full-cycle periods $p = p_{\min} = r$. Do developments in this period prepare the ground for a higher rate of profit in the next full period? Certainly i which $= i_{\min}$ in the period considered is negative, therefore the capital K_0 at the beginning of the next period will be smaller. And this will tend to increase a of the next period, which is the ratio of the average of the stable part of capitalist consumption A to the capital K_0 at the beginning of the period. However, dis-saving which takes place in the period considered will certainly tend to depress the stable part of capitalist consumption in the next period: the less wealthy the capitalists feel the less is the amount they are apt to consume irrespective of their current income. Also, the persistence of a very low capitalist income in the period considered will tend to press down the capitalists' customary standard of living, and this will be reflected in the fall in the stable part of their consumption in the next period.

Thus not only will K_0 at the beginning of the next period be smaller, but so also is A likely to be in that period. It is thus not at all certain that $a = (A/K_0)$ will increase. And if it remains at the same level as in the period considered, nothing has happened to push the rate of profit upwards, which may thus continue to be equal to the rate of interest.

S. 3 was added in the 1943 edn. while the last two paragraphs in the final section of the 1942 edn. were deleted.

N. Kaldor in his 'Alternative Theories of Distribution' (p. 94 n. 3) notes that his formulation of the Keynesian theory of income distribution owes 'a great deal of stimulus to a paper of Kalecki "A Theory of Profits" ... whose approach is in some ways reminiscent of the "widows' curse" of Keynes' *Treatise* even though Kalecki uses the technique, not for explanation of the share of profits in output, but for showing why the *level* of output and its fluctuations is peculiarly dependent on entrepreneurial behaviour'.

[10]
This new formulation of Kalecki's theory of the business cycle and the superimposing of business fluctuations on a trend line was highly appreciated by the above-mentioned reviewers of the *Studies*. In the opinion of Scitovsky, for instance:

The most important among the essays is the one dealing with business-cycle theory. Dr Kalecki's business-cycle theory, well known from his earlier publications, explains the business cycle in terms of the interaction of two main determinants of investment: the stimulating effect of a higher activity and incomes, and the depressing effect of an increasing stock of capital equipment. In the present volume the author restates this theory in improved form. The main determinants of investment are broken down into their component factors, and the use of algebraic symbols enables the reader to keep track of the different factors and the nature of their influence on investment and business activity. Also remedied here is a serious shortcoming of the earlier versions of the theory: the instability of the amplitude of the business cycle. While in many ways Dr Kalecki's theory is the most convincing explanation of the business cycle, in its earlier form it showed the degree of damping (or anti-damping), and hence the amplitude of the cycle, to be a very sensitive function of the parameters of the system, which seems to be contradicted by experience. The first attempt to remedy this shortcoming of Dr Kalecki's theory was made, I believe, by Mr Kaldor, who has shown that the amplitude of the business cycle is stabilised by the fact that the influence of incomes on investment and of investment on incomes (the multiplier effect) vary with the phases of the cycle—being weakest at the top of the boom and the bottom of the depression. Dr Kalecki's argument in the volume under review is very similar, except that he neglects the variations in the multiplier and pins his main argument on the entrepreneur being cycle-conscious, and hence more cautious in his investment decisions after a prolonged boom than at the beginning of it. The reviewer feels that the argument would have been rendered more convincing by a shift of emphasis and a more complete discussion of all the factors that tend to keep the amplitude of the cycle stable. (*Economic Journal*, 56, 1946, pp. 451–2.)

Then, turning to the last essay in the *Studies*, Scitovsky notes that it 'breaks new ground in being the first theoretical analysis of a dynamic long-run trend, its determinants, and its relationship to the pure business cycle', and he regrets that 'this interesting subject is treated in so summary a fashion' (ibid.).

[11]
See 'A New Approach to the Problem of Business Cycles', this volume, where Kalecki shows the existence of a strong positive correlation between investment decisions on the one hand and the volume of national income and the rate of its changes on the other.

[12]
Rothbarth was a German refugee who, as soon as it became possible, in 1943, volunteered for service in the Allied air forces, and in 1944 was killed in action over Holland. Kalecki wrote of Rothbarth's work and its relation to his own work as follows:

I met Rothbarth for the first time at the London School of Economics in 1936. We soon became friends and we engaged in a series of discussions on economic dynamics which we continued during the next few years. It is at that time that Rothbarth started his work on business cycles, trends, and long waves. He took as a basis my mathematical model of the business cycle [*see* Econometrica, *1935, and* Collected Works, *vol. i*] and intended to introduce in this model new factors which would produce, in addition to the business cycle, the trend and the long waves. The trend factor which emerged from our discussions was the fact that capitalists' consumption depends on the past income and wealth of capitalists.* ...

Some of his research, although not directly related to the model mentioned above, was still on the subject of business cycle and trend. Rothbarth presented the results of this research in a brilliant lecture to the Economic Society of the London School of Economics in 1939. His most striking point was that, owing to the existence of 'rentier firms', not all entrepreneurial savings are reinvested at the top of the boom, even though the rate of profit is not yet falling and this 'leakage' precipitates the end of the boom.† ('The Work of Erwin Rothbarth', *Review of Economic Studies*, 12/2, 1944–5, p. 121.)

* This factor plays a part in the mechanism of trend in my *Studies in Economic Dynamics* ... I certainly owe much to my discussions with Rothbarth on this subject.
† I developed this idea in my *Studies in Economic Dynamics*, acknowledging that it was first mentioned by Rothbarth in his lecture.

Kalecki's synthesis of the cycle and the trend factors was later criticized by Kaldor, who considered Kalecki's 'amended' model of the *Studies*, as well as models put forward in the early 1950s by V. Marrama, J. R. Hicks, and R. Goodwin, all to consist of 'the superimposition of a linear trend introduced from the outside on an otherwise trendless model without altering, in any way, its basic character' (N. Kaldor, 'The Relation of Economic Growth and Cyclical Fluctuation', in his *Essays on Economic Stability and Growth*, London, Duckworth, 1960, p. 224).

A New Approach to the Problem of Business Cycles

[1]
First published in *Review of Economic Studies*, 17/1, 1949–50, pp. 57–64. The publishers' permission to reproduce this article is gratefully acknowledged.

PART 3
Theory of Economic Dynamics

Theory of Economic Dynamics: An Essay on Cyclical and Long-Run Changes in Capitalist Economy

[1]

The book was first published in Feb. 1954 by Allen & Unwin, London. The 2nd impression appeared in July 1954 and the 3rd in 1956. A revised 2nd edn. was published in the series 'Unwin University Books' in 1965; this was republished by Monthly Review Press, New York, in 1968. Chs. 1–5, 8, 9, and 11 of the 2nd edn., together with the corresponding parts of the statistical appendix, were included in Kalecki's *Selected Essays on the Dynamics of the Capitalist Economy, 1933–1970*; for translations of this volume, see p. 528.

The first edition was translated into Spanish (*Teoria de la dinámica ecónomica*, Mexico City, Fondo de Cultura Económica, 1956; 2nd edn., 1973; 3rd edn., 1977), Italian (*Teoria della dinamica economica*, Turin, Einaudi, 1957), Polish (*Teoria dynamiki gospodarczej*, Warsaw, PWN, 1958; 2nd edn., in Kalecki, *Dziela*, vol. 2, Warsaw, PWE, 1980; 3rd edn., Warsaw, PWN, 1986), Japanese (*Keizai hendo no riron*, Tokyo, Shin Hyoron, 1958), and Portuguese (*Teoria da Dinâmica Econômica*, in V. Civita (ed.), *Os Pensadores XLVII, Ensaios Econômicos*, São Paulo, Abril, 1976, pp. 55–207; 2nd edn., 1978; 3rd edn. in V. Civita (ed.), *Os Economistas: Kalecki, Sraffa, Robinson*, São Paulo, Abril, 1983, pp. 1–146; a new translation of ch. 3, following the 2nd English edn., was published as ch. 3, 'Os determinantes dos lucros', of *Kalecki Economia*).

The 2nd edn. of the book was translated into French (*Théorie de la dynamique économique*, Paris, Gauthier-Villars, 1966) and German (*Theorie der wirtschaftlichen Dynamik*, Vienna, Europa, 1966). Parts of the book contained in the *Selected Essays on the Dynamics of the Capitalist Economy, 1933–1970* were reproduced also in the Swedish translation (Kalecki, *Tillväxt och Stagnation i Modern Kapitalism*, pp. 93–186) and in German (in Kalecki, *Kriese und Prosperität im Kapitalismus*, pp. 100–92 and 291–8).

The 2nd English edn. of the book is used in the present volume; the publishers' permission to reproduce it is gratefully acknowledged.

Early reception

In spite of great interest in the book, shown among other ways in the number of its translations and reprints, it was (at least until its 2nd edn.) received with

restraint. It is rather hard to establish now exactly why this was so. One of the reasons could have been that the novelty of Kalecki's fundamental ideas and concepts had already been noted in the 1930s, when he had formulated the first versions of his theories of the business cycle and of income distribution. Another reason might have been the development of research into the business cycle and econometric studies in general, which took place in 1935–55. Possibly the main reason, though, was Kalecki's conviction that the capitalist economy was by nature highly stagnant; in keeping with this view, his *Theory of Economic Dynamics* contained a theory of stagnation of capitalism rather than a theory of its development. According to the formal argument of the book, the long-run development of the capitalist economy, and even its passage to the phase of the business upswing, was only possible under the influence of exogenous factors.

This sharply contrasted with the post-war boom, high levels of employment and capacity utilization, and perceptible economic growth, interrupted by only mild recessions, which lasted almost until the end of the 1960s. The mood was overwhelmingly optimistic, as was faith in the economic efficiency, social rationality, and vital strength of capitalism. Economics focused on the questions of steady growth with full utilization of factors of production. This was not a favourable climate for popularizing the pessimistic theses of the *Theory of Economic Dynamics*. This was quite unlike the situation that prevailed during the Great Depression. Kalecki's publications of the 1930s met a 'social' need; in the 1950s the need was for optimism, and this book could not provide it.

Most of the reviews of the book are casual (among exceptions is a thorough discussion of the Italian translation, by D. Tosi in *Politica ed Economia*, May–June 1958). All reviewers, most of them straight away, note that the book replaced 2 earlier, well-known books by the same author; then the contents of the book are outlined and a regret is expressed that problems of long-run development have been treated so tersely (see e.g. the reviews of A. W. Philips in *Economica*, 21/84, 1954, p. 364; of R. W. Pfouts in *Southern Economic Journal*, 22/1, 1955, pp. 117–18; of B. M. Cheek in *Economic Record*, 30/59, 1954, pp. 321–3; and of R. M. Goodwin in *Economic Journal*, 66/3, 1956, pp. 509–10). Sometimes a charge is made of a lack of reference to the literature (e.g. in Cheek's review). In nearly all reviews, Kalecki's novel approach to the theory of the business cycle and his development of Frisch's idea on the impact of random shocks on the amplitude of the business cycle are praised. Sometimes the book is also praised for considering the role of monopoly as a dynamic determinant of the capitalist economy (see Pfouts's review).

There were also some very critical and unfriendly reviews, such as those by R. L. Threlfell (*South African Journal of Economics*, 24/1, 1956) and J. S. Chipman (*Econometrica*, 24/2, 1956, pp. 215–17). In both reviews the criticisms were based mainly on misunderstandings or misrepresentation of

Kalecki's views. L. R. Klein wrote to Kalecki:

Chipman's review of your book was a shabby piece of work. I had similar trouble with him over a review of my Textbook of Econometrics. In correspondence he later admitted having made all sorts of misleading remarks in the review. I should not take him very seriously. (Excerpt from Klein's letter to Kalecki of 10 Jan. 1957; Prof. Klein's permission to reproduce this letter is gratefully acknowledged.)

It is interesting to note that there is no mention of the book in the only Polish periodical devoted to economic theory, *Ekonomista*. After the publication of the Polish translation, however, its reviewer in *Życie Gospodarcze*, after an extensive discussion, wrote that Polish readers had gained access to one of the most outstanding works of world economic literature; and he gave a notable interpretation of the role of the monopoly factor in Kalecki's theory:

Monopolies hold the capitalist economy in pincers, as it were; one of them, operating in production, impedes the capacity of the economy to develop by blocking innovations in productive processes; the other, operating in distribution, limits the national income per unit of time. However, if the degree of monopoly of the capitalist market increases with economic development and causes further shifts from wages to profits, this is an additional factor weakening the long term rate of growth of output. (Władysław Sadowski, 'Prof. Kalecki's Theory of Economic Dynamics', *Życie Gospodarcze*, 43, 1959, p. 2 (in Polish).)

This line of interpretation was later taken up independently of Sadowski by P. A. Baran and P. M. Sweezy (see pp. 563–6 below).

Kalecki's book was also reviewed in Poland by S. Kurowski in *Polish Perspectives* (Apr. 1960, pp. 88–91).

Interest in *Theory of Economic Dynamics* increased with time, and it enjoyed particular popularity in the second half of the 1960s. For example, in only 2 years after the publication of its German translation at least 18 notes, reviews, and articles on it appeared in German periodicals alone. In this period the book became a classic of economic literature. It was cited and discussed in many studies dealing with the theory of business cycles and economic dynamics in general, and with the theory of national income distribution (see pp. 498–516 above). It also entered a number of academic textbooks—a process which had already started in the late 1950s.

The new version of Kalecki's theory of the business cycle put forward in the book was discussed in 1956–8 by R. G. D. Allen (*Mathematical Economics*, London, Macmillan, 1956) and O. Lange (see his *Papers in Economics and Sociology, 1930–1960*, Oxford, Pergamon/Warsaw, PWN, 1970). In these presentations both Allen and Lange stated, among other things, that Kalecki's earlier version of the business cycle theory was more 'elegant' than its development in *Theory of Economic Dynamics*. Kalecki regarded these charges as unjustified. In foreword to his *Studies in the Theory of Business Cycles, 1933–1939*, p. 1, he wrote:

This book contains my early studies in the theory of the business cycle published in Poland in the years 1933–9 which were almost inaccessible after the war. As the reader will find, I had dealt in these essays with a number of basic issues which were in the centre of economic discussion during the subsequent twenty years. . . . The studies also reflect the most essential features of my theory of the business cycle. I modified in my later work only the factors determining investment decisions and I allowed for changes in inventories in the course of the business cycle, from which I abstracted in the first version.

Incidentally, this development of my theory (as presented in the *Theory of Economic Dynamics* . . .) which was quite laborious, hardly earned me any applause. It was frequently maintained that the first version was more lucid and elegant. . . . I myself consider that the modifications introduced meant some progress since the later version of the theory seems to me better founded and more realistic.

In Kalecki's papers there also survived a copy of his letter to R. G. D. Allen (10 Aug. 1957) on the same question:

Dear Professor Allen,

I have recently received your book *Mathematical Economics*. I notice on p. 261 the following observation concerning the new version of my model as compared with the old one: 'The development cannot be considered an improvement' as it 'has none of the convenient simplicity of the early version and it invokes the accelerator type relation which is both involved and likely to be explosive in tendency'.

I knew that my old model was much 'nicer' than the new one but I adopted nevertheless a more involved version because I believed that my first approach was based either on a principle which is only apparently correct or on rather specific assumptions. This matter is set out on pp. [285] and [286–7] of my *Theory of Economic Dynamics*.

I show there also that my old theory is a special case of the new one. In adopting the new version I was by no means guided by the desire 'to bring the system more in line with multiplier-accelerator models of the usual linear type' as you put it, although it is true that this type of a model is another special case of my new theory (cf. *Theory of Economic Dynamics*, pp. [284–6]).

Yours sincerely,
M. Kalecki

In the later editions of his book Allen abandoned his earlier comments on Kalecki's *Theory of Economic Dynamics* and wrote instead that 'the later versions of Kalecki's model were designed to generalize the early version in various ways. Kalecki (1954) shows that the early version is a special case of the later model, which also includes (as other special cases) multiplier-accelerator models of the usual linear types' (2nd edn., London, Macmillan, 1960, p. 261).

The above-mentioned comment by Oscar Lange on Kalecki's *Theory of Economic Dynamics* comes from Lange's 'Lecture Notes on Michał Kalecki's Models' (Lange gave a course of lectures on Kalecki's theory in the 1957/8 academic year at the University of Warsaw). He considered Kalecki's theory of the business cycle as classic but difficult for an unaided study. His lectures aimed at making it more intelligible and as a critical analysis of some of its aspects. Apart from certain limitations of Lange's presentation, which tends toward a cybernetic approach and possibly therefore restricts the essence of Kalecki's theory merely to a system of equations which Lange calls 'Kalecki's model', his 'Lecture Notes' explain the formal grounds for some of Kalecki's conclusions (such is the purpose of e.g. Lange's mathematical analysis of Kalecki's equation of the business cycle), clarify the essence of his theory, and show the main differences between this and the earlier formulations of his theory of economic dynamics.

Lange developed this interpretation of Kalecki's theory in his *Introduction to Economic Cybernetics* (Warsaw, PWN, 1970, pp. 127–43). Here, after examining Kalecki's equation of the 'pure' business cycle, Lange concludes:

> in Kalecki's model it is impossible to have a situation in which the trend is increasing ... without increasing oscillations. ... The increasing trend, i.e. the expanded reproduction of investment goods, is paid for by the instability of the system. The stability of the system, on the other hand, is paid for by simple or less than simple reproduction. This is, according to Kalecki's model, the basic dilemma of the capitalist system: growth and instability, or stability and stagnation or even decline. (pp. 140–1)

Then, following Kalecki's method of considering the long-run trend, Lange introduces into the equation of the 'pure' business cycle an additional element (which he calls 'positive supply'), representing autonomous decisions. These decisions, he writes, 'can be related to technical progress which induces investments not based on the direct short-term calculation of profitability, but on a long-run development policy of the enterprise. They may also form public investments related to a long-run government policy' (p. 142). Then in the solution of the suitably modified equation of the dynamics of the system, the source of expanded reproduction is the 'positive supply' component of the solution, whereas the structural component (representing the 'inner properties' of the system) ensures only incomplete, or at most the simple reproduction of, material capital.

In such an approach, concludes Lange, the 'growth of a capitalist economy (expanded reproduction) appears as an exogenous factor being the result of feeding the process of reproduction from "outside" by autonomous invest-

ment. To get expanded reproduction as a result of "inner properties" of capitalist reproduction rather than of exogenous feeding, Kalecki's model would require certain changes' (ibid.; Lange suggested a model related to Kalecki's, which gives, however, both the development trend and cyclical fluctuations as a result of 'inner properties' of the capitalist system of production, in his book *The Theory of Reproduction and Accumulation*, Warsaw, PWN, 1969).

Focusing on this feature of Kalecki's equation of the dynamics of the capitalist economy, Lange in effect supports Kaldor's earlier criticism of the method of *Studies in Economic Dynamics* (see p. 549); using the 'inner properties' of the system, a realistic explanation of the process of capitalist reproduction must explain both the cycle and the long-term growth. (In Lange this is also a criticism of increasingly popular approaches after the war, in which the 'inner properties' of the system ensure only steady growth, whereas business fluctuations are explained by exogenous factors.)

A different position on the relation in Kalecki's model between factors generating the business cycle and those generating the trend was taken by J. Steindl. In his *Maturity and Stagnation in American Capitalism*, he argued that the internal accumulation of savings by firms is sufficient to generate not only business fluctuations but long-run growth as well, as it does in Kalecki's *Studies in Economic Dynamics*. Owing to a rather peculiar mathematical formulation of Kalecki's equation of economic dynamics (the aim of which was to overcome some formidable mathematical problems), his equation for the business cycle 'gives the impression that the influence of the internal accumulation on investment cannot in itself generate a trend. This impression may be misleading, because the equation is based on simplifications which make it applicable only in the short run' (p. 195).

The relationship between coefficients of the equation of the business cycle and of the long-run trend, which Kalecki put forward in his *Theory of Economic Dynamics*, was examined thoroughly by Steindl:

> The movement of *net* investment i round the trend value is governed by the equation
>
> $$i_{t+\theta} = n i_t + \mu \frac{d i_{t-\omega}}{dt} \qquad (1)$$
>
> while the movement of the trend values themselves is governed by
>
> $$y_{t+\theta} = n y_t + m y_{t-\omega} + [(1-n)\beta + \gamma]K_t \qquad (2)$$
>
> this equation referring to the trend value of *gross* investment. K_t is the stock of capital.
>
> It will be seen that the parameters n and μ which occur in the equation of the cycle are met also in the equation of the trend (m is, in fact, a sum of μ and some other term). The close connection between the two phenomena of trend and cycle could perhaps be shown as follows: the term K_t, the capital stock, which occurs in the trend equation, depends obviously on the investment; we can determine it, if a uniform lifetime τ is given, as the integral of gross investment over a past period τ. This integral $\int_{t-\tau}^{t} y_{\tau'} d_{\tau'}$ can be replaced, making use of the intermediate value theorem, by the approximation

$\tau y_{t-\sigma}$ where σ is a value intermediate between 0 and τ. If we introduce this expression $\tau y_{t-\sigma}$ instead of K_t into (2), we have a homogenous equation in gross investment; now we may add to this equation (1) for the oscillations round the trend, and the equation so constituted will govern at the same time the cycle and the trend. It will yield an exponential solution, due to the term in $y_{t-\sigma}$, which represents the impact of innovations, and an oscillation due to the action of the other two terms: The term in $\dot{y}_{t-\omega}$ is a destabilizer, and the greater its coefficient m, the smaller the damping of the oscillation. The term in y_t embodies the action of the negative feed-back, which is due to the depressing effect of the growing capital stock on the rate of profit and to the incomplete reinvestment of internal savings.

Both trend and oscillation are determined by the same set of data. It can be shown that the parameter m, which acts as a destabilizer in the oscillation (the greater m, the smaller the damping) will at the same time promote the long term growth. This is apparent from Prof. Kalecki's analysis of the exponential solution . . . it follows from it that if an exponential trend is obtained at all (i.e. as long as m is not too large) the rate of growth will be the greater, the smaller $\theta - m$ (i.e. the greater m) given the other parameters. Thus, the parameter which un-damps the cycle at the same time stimulates secular growth. ('On Maturity in Capitalist Economies', in *Problems of Economic Dynamics and Planning: Essays in Honour of Michał Kalecki*, Warsaw, PWN, 1964, pp. 427–8.)

For later developments of Kalecki's approach to the factors determining cyclical fluctuations and the long-run trend, see pt. 5 and pp. 587–609, this volume.

Further discussions

In the late 1960s in Poland, the *Theory of Economic Dynamics* became an object of sharp attacks which were part of a much broader criticism of Kalecki and his followers which was motivated by extra-scientific reasons and which originated outside academic circles (for some details of this campaign, which centred on Kalecki's contributions to 'socialist economics', see *Collected Works*, vol. iv, and J. Osiatyński, 'Kalecki's School in the Theory of Growth of a Socialist Economy', in G. Fink *et al.* (eds.), *Economic Theory, Political Power and Social Justice: Festschrift Kazimierz Laski*, Vienna, Springer, 1987).

B. Minc dismissed not only Kalecki's theory of income distribution but also his entire explanation of cyclical development in the capitalist economy:

Can the process of economic growth in capitalist economy be explained by the intensity of innovations? The question immediately arises: what does the intensity of innovations explain? Are innovations a factor that is external to the economy or are they determined by it? Is not the view of those economists who say that technical innovations are a function of investments and not the reverse correct? The validity of this view is underlined by the fact that technical innovations are becoming more and more the object and result of organized economic activity. (*Problems and Trends of Development of Political Economy*, 2nd edn., Warsaw, PWN, pp. 150–1 (in Polish).)

The approach which Minc himself favours, however, falls short of explaining what determines the volume of investment which will ensure the required

'intensity of innovations', whereas Kalecki's analysis centres precisely on determinants of investment decisions.

Moreover, according to Minc, business fluctuations and crises in capitalism result from disproportions of production. Hence the study of business cycles must focus on the analysis of disproportions in output and distribution. This line of criticism of Kalecki's theory was developed by D. Sokołow, who wrote:

I must admit that I do not share the views of Professor Kalecki on the mechanism of the business cycle in contemporary capitalism. They seem to be correct only for the conditions of stagnation that prevailed in the inter-war period. Under conditions of more rapid development, reducing the mechanism of economic dynamics mainly to demand factors, and only unessential considering the impact of the development of forces of production over long periods of time (as well as neglect of the impact of physical limitations of output growth on the course of the business cycle), seem to be incorrect. ('Problems of Development of Political Economy in Poland', *Życie Gospodarcze*, 26, 1968, p. 6 (in Polish).)

Sokołow explains the business cycle and growth of the capitalist economy with the help of a 'supply-and-demand' model. This is based on 3 assumptions: (i) that in the relevant range of output, changes in unit prime costs are an increasing function of output; (ii) that the prime reasons for a business downturn are disproportions of development and the appearance of physical limitations and bottle-necks in growth, which lead to further rises in the unit cost of output; (iii) that prices are determined by the mechanism of competitive markets. Under these assumptions, during the boom the increase in output is accompanied by a rise in unit prime costs, which with the fall in the ratio of prices to costs leads to a reduction in profitability, a suspension of investments, and a change in the phase of the cycle. During the recession, we observe changes in the opposite direction.

This simple pattern of cyclical development closely resembles that of J. A. Estey's *Business Cycles: Their Nature, Cause, and Control* (New York, Prentice-Hall, 1946). A similar business cycle mechanism is advanced by some other Polish economists. Its basic differences with respect to Kalecki's theory lie in the preliminary assumptions of the two approaches. Kalecki assumes that: (*a*) except for raw-material extraction and agriculture, the unit prime cost is constant up to capacity output and then increases sharply; (*b*) even at the peak of the boom, only exceptionally full employment of capital equipment is achieved; (*c*) prices for manufactured goods are determined, not by the mechanism of the competitive market, but by their producers on the basis of their 'degree of monopoly'.

The 'demand-and-supply' theory also has an important point in common with Kalecki's theory: a change in the phase of the business cycle results from a change in the profitability of investments, i.e. the ratio of unit profits to unit capital outlays. In explaining the causes of the crisis, the demand-and-supply theory concentrates on the rise in prime costs and the resulting fall in unit profits. However, although assumptions (i) and (ii) are necessary for a fall in unit profits, they are not sufficient; the ratio of price to unit costs must also decline, and this is provided by assumption (iii). Changes in the volume of capital equipment are of secondary importance here. This again differs from Kalecki's theory, where the latter changes are of greater importance than changes in the volume of unit profits. With respect to the long-term influence of the supply of capital equipment on the business cycle, the 2 theories do not differ essentially from each other.

In this context, Kalecki's opinion on the distinction between the 'supply' and the 'demand' theories of capitalist reproduction is relevant.

The dispute in the field of supply and demand theories is a question of terminology. If theories based on Say's Law are considered as supply theories, then one can argue that theories based not on Say but on investment decisions instead will not belong to supply theories.

It is worth noting that Domar's theory can be regarded both as a demand and a supply theory, since it also fits the classical model if only in his equations we substitute ΔS for ΔI, i.e. if we assume that the increase in savings is proportional to the increase in national income and thus this equilibrium rate of growth ensures that $\Delta I = \Delta S$.

The idea of steady growth was well known in classical economics: savings are accumulated and transformed into investments which in turn generate growth. Innovation, which is prominent not only in Domar but also in Harrod, takes for its starting-point, not accumulation changed into investments, but investment decisions, and then it is argued that investments below the requirements of balanced growth cause a breakdown, disturbing the equilibrium and giving rise to a cumulative downward movement.

Domar's theory will have a different meaning depending on its interpretation: whether savings determine investment or the opposite. The equation which I use for the socialist system is an extension of Domar's equation. This does not mean that we first decide what rate of growth we want to achieve in order to generate the required accumulation. On the contrary, we determine investments centrally, and from this total accumulation must follow. While in capitalism total investments result from the decisions of individual firms and this automatically determines accumulation, in socialism we consider what the total accumulation should be, since we have to set the ratio of prices to wages so that this accumulation can be achieved, and at the same time we also consider what consumption we want to achieve.

Formally speaking, the equation is the same, but we can interpret it in different ways under different assumptions and social systems.

Domar's theory can be interpreted as a pure demand model, but then it ceases to be a growth theory. If balanced growth appears in fact unstable, then it really is non-existent. It cannot be maintained, since with the smallest deviation from the [trend] line a cumulative downward movement ensues. According to Harrod, this ends with cyclical fluctuations around the trend line, but I have tried to show that it ends in cyclical fluctuations around a quasi-static position and exogenous factors are required to ensure a lasting long-run development. [*See pp. 411–34, this volume.*] Hence the debate whether this is a supply or a demand model depends entirely on its interpretation. From the point of view of investment decisions, one can argue that this is a demand model, but then his theory is incorrect.

As regards Marx's schemata, his system can be in equilibrium only when automatic expanded reproduction is assumed, i.e. when there is a complete reinvestment of accumulation. Such an assumption is in line with classical economics, to which Marx linked himself. From the spirit of Marx's analysis it follows that this reinvestment does not always take place, and hence there is a deviation from his schemata. This deviation, which Marx did not systematically investigate, is more consistently emphasized by Rosa Luxemburg. The idea that Marx's schemata were constructed in a period when the question of [insufficient] demand played a lesser role, is consistent with the historical interpretation of the paper under discussion. The supply nature of Marx's schemata lies in his assumption of total reinvestment of accumulation. However, from this it follows that the schemata represent a certain ideal equilibrium, which is in contradiction with the fundamental and often-quoted statement of Marx on the incommensurable development of forces of production and the expansion of purchasing power. None the less, these disproportions do not appear in the schemata, which function as if every capitalist always reinvests all that he accumulates. Long-run instability appears in the schemata as soon as the automatic reinvestment of accumulation is no longer assumed, and when it is postulated that investment decisions depend only partially, and not entirely, on accumulation. (M. Kalecki, 'Contribution to the discussion on J. Górski's paper "On the Development of the Supply-and-Demand Models of Economic Growth in Bourgeois Economics"', *Zeszyty Naukowe Uniwersytetu Łódzkiego*, 10, 1965, pp. 66–8 (in Polish).)

The line of criticism mentioned above was continued in Poland in the 1970s. Kalecki's theory being accused *inter alia* of maintaining Say's Law, of money fetishism, of failure to explain cyclical fluctuations in investment profitability, of the fallacy of the proposition that a reduction in money wages cannot increase profits, of professing a theory of social harmony, and of a total discord with Marx's theory (see A. Krawczewski, *Contemporary Theories of Growth and Functioning of Economic Systems*, Warsaw, PWE, 1976, pp. 186–99 (in Polish)). Needless to say, in Poland especially the latter accusation was politically heavily loaded.

Even leaving aside Kalecki's own references to the links between his theory and Marx's, other evidence contradicting this accusation may be readily provided. Thus, according to Dobb (always extremely careful in wording his judgements):

> When we come to Michał Kalecki . . . we meet categories of thought that are much more reminiscent of Marxist discussion of the so-called 'realization problem'. His work could, indeed, be regarded as a formalization of that problem; and, except for his starkly formal and mathematical presentation, Marxists could find themselves in a familiar world. (*Theories of Value and Distribution since Adam Smith*, p. 221.)

See also T. Kowalik, *Rosa Luxemburg: Theory of Accumulation and Imperialism*, Wrocław, Ossolineum, 1971, pp. 78–83 (in Polish), which emphasizes the affinity between Kalecki's and Marx's and Luxemburg's theories; on a similar interpretation of the links between Kalecki's theory and those of Marx and Rosa Luxemburg, by Baran and Sweezy, see pp. 563–6 below. In the last chapter of his *Maturity and Stagnation*, entitled 'Karl Marx and the Accumulation of Capital', Steindl shows how his and Kalecki's theories develop and supplement Marx's analysis of the process of capital accumulation, and concludes:

> The details of this theory do not need to be gone into here, as they have been discussed in earlier sections of this book. It is of interest, however, to show that this theory can be organically developed out of the underconsumption approach of Marx. It requires a few additional concepts and hypotheses, especially the effect of excess capacity on accumulation, but basically it rests on the idea of a production of surplus value which is not realized, and this happens to be the way in which Marx literally formulated the underconsumption approach. (p. 246)

For more comprehensive discussions of the relation between Kalecki's and Marx's theories, see also M. D'Antonio, 'Kalecki e il Marxismo', *Studi Storici*, 1, 1978, and Sawyer, *The Economics of Michał Kalecki*, ch. 8.

The above criticism notwithstanding, the vast majority of Polish economists rated Kalecki's *Theory of Economic Dynamics* very highly, teaching it at university courses and taking Kalecki's ideas on the factors and mechanisms of capitalist development as a starting-point for their own theoretical and empirical investigations. Research on Kalecki's theory of income distribution

was already being reviewed (see pp. 498–509); below we mention a few studies based on his theory of the business cycle and long-run development.

Nasiłowski regarded *Theory of Economic Dynamics* as 'unquestionably an outstanding work in world economic literature', and took Kalecki's theory as a reference point for his own analysis of the theories of economic growth of Keynes, Harrod (and the neoclassical reinterpretation of Harrod's theory), Kaldor, and Joan Robinson (see M. Nasiłowski, *On the Theory of Growth of Developed Capitalism*, Warsaw, PWN, 1967 (in Polish)). Flakierski, who investigated saving patterns in the USA, considered Kalecki's theory of the business cycle to be the most appropriate analytical framework of causal macro-economic interdependencies examined in his book (see H. Flakierski, *A Study of the Rate of Accumulation in the USA in 1929–1962*, Warsaw, PWN, 1966 (in Polish)). The statistical verification of theses put forward in the *Theory of Economic Dynamics* was undertaken by Kalecki and a group of his students (Z. Dobrska, A. Szeworski, and C. Grabowski) at the Institute of Economics of the Polish Academy of Sciences. This team focused mainly on an analysis of business cycles in the USA and Western Europe in 1950–60, structural changes in the developed capitalist economies, and the export of capital from these economies to the developing countries; their results were published in the series *Studies on Business Cycles in Contemporary Capitalism* (4 vols., ed. M. Kalecki, Warsaw, PWN, 1957–60 (in Polish)). The model of the business cycle of the *Theory of Economic Dynamics* was later tested by Szeworski in his empirical enquiry into business fluctuations and government intervention in the USA and Great Britain in 1948–62 (see A. Szeworski, *The Business Cycle and Government Intervention*, Warsaw, PWE, 1965 (in Polish), and some of his later papers).

Outside Poland, *Theory of Economic Dynamics* attracted attention for a long time for its treatment of various individual aspects of capitalist reproduction (these discussions will be dealt with in editorial comments which follow) rather than for its approach to capitalist reproduction as a whole. However, in the late 1970s its theoretical system was reconsidered, especially in Italy and England, and the basic concepts of Kalecki's theory—revised in some details and developed in order to take into account new phenomena—were found to be still useful building blocks from which a Kaleckian alternative to orthodox economics could be reconstructed (see e.g. the works of M. C. Sawyer, P. J. Reynolds, A. Chilosi, V. Denicolo, and M. Matteuzzi already referred to; see also M. Zenezini, 'La teoria economica di M. Kalecki', *Critica Marxista*, 4, 1978; M. Sebastiani, *L'equilibrio di sottoccupazione nel pensiero di M. Kalecki*, Rome, La Nuova Italia Scientifica, 1985; and Osiatyński, 'Kalecki's Theory of Economic Dynamics after Thirty Years'). At the same time, Kalecki's treatment of some specific aspects of capitalist reproduction is found, from the present-day perspective, to require revisions and/or extensions. This seems to apply especially to his handling of the money and credit system (see e.g. E. J. Nell, 'Notes on Finance, Risk and Investment Spending', mimeo, New School of Social Research, 1986; H. P. Minsky, 'The Financial Instability Hypothesis: A Restatement', *Thames Papers in Political Economy* (London), autumn 1978; Sawyer, *The Economics of Michal Kalecki*, pp. 279–80), and to the mechanism of wage bargaining under inflation (see e.g. Sawyer, *Macro-Economics in Question*, pp. 106–14).

The analytic system of the *Theory of Economic Dynamics* was also often compared with that of Keynes's *General Theory*; Steindl, examining 'the open ends' of Keynes's book, wrote:

> The gaps in the argument of the *General Theory* stand out in relief very distinctly when we compare it with the work of M. Kalecki [*Theory of Economic Dynamics*] which otherwise offers a close parallel to it.
>
> The book does not contain any distribution theory and distribution is rarely mentioned in it. . . . The distinction between retained profits of business and saving of rentiers and other people outside enterprises is obscured. . . . monopoly in all its forms is largely absent from the scene except for the trade unions. In the discussion of money and real wages perfect competition is explicitly assumed . . . [Keynes] believed that an increase in demand must necessarily lead to increased prices of manufacturing goods with the implication of [an] inevitable fall in real wages in the upswing of the cycle. . . .
>
> We miss in his work the systematic use of lags which we find in Kalecki and which must necessarily be an essential feature of a process analysis in economics. Thus the lag between investment decisions and investment is for Kalecki a reason why investment determines savings and not the other way round. Again one has to think of the decisive role of lags in the cobweb or in any other cycle. . . .
>
> Conspicuous by its absence from the *General Theory* is a theory of the trade cycle. (J. Steindl, 'J. M. Keynes: Society and the Economist', in F. Vicarelli (ed.), *Keynes's Relevance Today*, London, Macmillan, 1985, pp. 111–13. For a more comprehensive comparison of Kalecki and Keynes, see Sawyer, *The Economics of Michal Kalecki*, ch. 9.)

Development of Kalecki's stagnation hypothesis

As we have noted already, the *Theory of Economic Dynamics* advanced what was perhaps closer to a theory of stagnation than a theory of unhindered, steady development of a capitalist economy. This line of Kalecki's argument was systematically developed by Joseph Steindl; in the mid-1960s it was also taken up by Baran and Sweezy (on the relationship between Steindl's and Kalecki's work see p. 537 above). As Steindl himself admits, his model is really a variant of Kalecki's theory. According to Kalecki, the negative feedback between the stock of capital equipment and the volume of investment operates through changes in the rate of profit—according to Steindl, through changes in the rate of employment of capital equipment. Consequently, in Steindl's model, the boom ends because the accumulation of new capacity depresses the degree of capacity utilization.

> This view is, in fact, implicit in the theory contained in *Maturity and Stagnation*. It might seem that the problem of the trend—the question how the economy breaks out of the closed circle and sets on an upward path—takes a different form in this version: required is a steady stream of *additional demand* of a type which will not set the negative feed-back operating. Innovations will again fulfill the requirement, in so far as they destroy existing capacity. But will not also a steadily increasing stream of export surpluses, government deficits, or public expenditure financed by taxation . . . do the trick? (Steindl, 'On Maturity in Capitalist Economies', p. 432.)

In the same paper Steindl also shows that, although in comparison with the inter-war period budget deficit spending played a much smaller role in the USA (in 1951–61) and in Great Britain (in 1951–8), the impact of this factor was more than offset by increased government spending on arms (in the USA) and on public investments and arms (in Western Europe) financed by taxation. According to his estimates, only the direct net effect of government spending financed by taxation (i.e. excluding the multiplier effects) caused an increase in the national income of the USA of 9% (and employment of about 5.5 million persons) above what could have been achieved without this government intervention. In his opinion, the situation was similar in Great Britain, Sweden, Holland, and France (ibid. 423–5). Hence, he concludes, even if a long-run growth trend continued in the period considered in the developed capitalist countries, it was not because the inherent tendency towards stagnation had disappeared, but mainly on account of the continually increasing scope of government intervention.

This line of Steindl's argument was developed by Baran and Sweezy in their *Monopoly Capital*. Their study confirmed the importance of the military sector for total output and employment in the USA (pp. 151–4). Sweezy later showed that in 1970 the total number of the unemployed plus the military and military-dependent employment in the USA could be conservatively estimated at more than 25% of the total labour force, whereas the highest rate of unemployment during the Great Depression reached slightly less than 25% (see 'On the Theory of Monopoly Capitalism', pp. 2–3).

Like Kalecki and Steindl, Baran and Sweezy—and then Sweezy alone—conducted their study in the context of the process of capital accumulation, pointing out at the same time the close links between their enquiries and Marx's theory:

> If all went smoothly, this process [of capital accumulation] could go on for ever. But Marx argued that it couldn't proceed smoothly, that various kinds of obstacles and roadblocks would inevitably develop. One of these blockages, not fully worked out by Marx, was an inappropriately high rate of accumulation relative to the growth of consumption, which would cause a breakdown of the accumulation process. (Sweezy, 'On the Theory of Monopoly Capitalism', p. 14.)

While the above quotation seems to place Sweezy in the category of 'underconsumption' theorists, the same is not necessarily true of Kalecki or Steindl;

see M. F. Bleaney, *Under-Consumption Theories: A History and Critical Analysis*, London, Lawrence & Wishart, 1976, pp. 243–8.

Examining the process of capital accumulation, Baran and Sweezy concentrate on 2 aspects of Kalecki's theory and its development by Steindl: the monopolistic nature of contemporary capitalism, and its strong tendency towards stagnation (on their assessment of the importance of Kalecki's concept of the 'degree of monopoly' for the study of capital accumulation see p. 515 above). On the basis of a famous passage of vol. iii of *Capital* (New York, International Publishers, 1976, pp. 1003–4), Sweezy shows that, though Marx for understandable reasons did not systematically examine the influence of monopoly on the process of capital accumulation, he fairly closely outlined its consequences. In Marx's opinion, although monopoly cannot change the total volume of value produced, it redistributes it from competitive to monopolistic capitals, and from wages to surplus value (see P. M. Sweezy, 'Some Problems in the Theory of Capital Accumulation', in *Sozialismus, Geschichte und Wirtschaft, Festschrift für Eduard Marz*, Vienna, Europaverlag, 1973). Kalecki, in Sweezy's opinion,

went a step further, arguing that monopoly would not only *concentrate* surplus value but also *increase* the amount of surplus value at the expense of wages. This need not be interpreted to mean an actual *reduction* of wages; it can mean slower growth of wages than would have taken place in the absence of monopoly. And if monopoly is not only introduced as a once-and-for-all factor but as a secularly growing force, then the whole capital accumulation process can be permanently and increasingly biased toward overaccumulation and stagnation.

As usual with Kalecki, this line of thought was presented with utmost terseness, occupying altogether no more than a paragraph or two . . . But the theme was taken up by Steindl . . . . Steindl developed the theme into a powerful treatise entitled *Maturity and Stagnation in American Capitalism* . . . , which I think is both one of the most important and most neglected works of political economy of the last half century.

The question which Steindl set out to answer was why the American economy remained in a state of deep depression during the whole decade of the 1930s. Others attempted answers at the time, most notably Hansen and Schumpeter, but neither they nor Marxist writers of the period could propose an explanation which showed the Great Depression to be a logical outcome of the functioning of the capitalist system. This is just what Steindl did do. He demonstrated that the growth of monopoly, already fully anticipated and explained in Marx's theory of the concentration and centralization of capital, must have a powerful retarding effect on the capital accumulation process, and this in turn could only mean an ever-deepening tendency to stagnation. The 1930s saw these inherent forces and tendencies of capitalism finally rise to the surface to dominate the economic scene.

With this, it seems to me that the foundations of a sound and essentially Marxist theory of monopoly capitalism were firmly laid. The logic is beautiful in its unity and coherence: competition inevitably gives way to monopoly via the concentration and centralization of capital, and monopoly retards the accumulation process, giving rise to ever more powerful tendencies to stagnation. ('On the Theory of Monopoly Capitalism', pp. 14–15.)

Developing and testing the ideas of *Theory of Economic Dynamics* and of *Maturity and Stagnation*, Baran and Sweezy support Kalecki's and Steindl's conclusion on a chronic tendency towards stagnation in developed capitalism:

It follows that the *normal* state of the monopoly capitalist economy is stagnation. . . . And this means chronic underutilization of available human and material resources. . . . Left to itself—that is to say, in the absence of counteracting forces which are no part of what may be called the 'elementary logic' of the system—monopoly capitalism would sink deeper and deeper into a bog of chronic depression. (*Monopoly Capitalism*, p. 108.)

They also show that this tendency gives rise to a number of defensive measures by entrepreneurs and capitalist governments; the greater part of their book is devoted to the study of the nature of these measures and their effects.

Examining the 'problem of realization' of the 'surplus value', Sweezy later focused on the often-quoted passage of vol. iii of *Capital* which begins with the statement: 'The conditions of direct exploitation and those of the realization of surplus value are not identical. They are separated logically as well as by time and space' (p. 286).

According to Sweezy, Marx here concentrates on the contradiction between the productive potential of the capitalist economy and the possibilities of its realization in a capitalist society. In this context Sweezy writes:

This contradiction—but not the falling tendency of the rate of profit—is in fact already implicit in the concept of capital as self-expanding value. . . .

This contradiction between the power of production and the power of consumption, between self-expanding value and contracting use value, vents itself in crises and stagnation which capitalism seeks to overcome . . . by creating irrational and inhuman modes of consumption more in keeping with the spirit of capital. ('Some Problems in the Theory of Capital Accumulation', p. 82.)

Sweezy also believes that:

[Marx] regarded it as a significant and striking contradiction of capitalism that the increase in the productive power of labour should express itself in a manner tending to obstruct the unfettered development of the system. But he did not formulate a specific theory of crisis, let alone capitalist breakdown, on this basis; and he was careful to make the point that he was not *predicting* an actual fall in the rate of profit but was dealing only with a *tendency* which, like other tendencies, was opposed by various counteracting causes. For Marx, the falling tendency of the rate of profit was a manifestation of only one of capitalism's many contradictions, and I see no reason to believe that he would have considered the system to be any more viable had he foreseen that the future direction of technological change would mitigate or even eliminate this particular contradiction in the form which it assumed in the period of the transition from manufacture to modern industry. (Ibid. pp. 78–9.)

On this basis Sweezy criticizes the fetishization of Marx's idea about the falling tendency of the rate of profit in many debates on the Marxian analysis of the process of capital accumulation. He also points out that a fruitful analysis of this process above all requires the examining of the fundamental contradiction between the productive potential and the social capacity to absorb it in a capitalist system. This is wholly consistent with the position taken by the authors of *Monopoly Capital*, where the concept of 'economic surplus' is introduced, and where the rise of this surplus, both in absolute terms and in relation to total value added, is elevated to a low which under monopoly capitalism replaces the 'law of falling profit' and, at the same time, 'what is most essential about the structural change from competitive to monopoly capitalism finds its theoretical expression in this substitution' (*Monopoly Capitalism*, p. 72).

Baran and Sweezy consider the economic surplus to be a transformed surplus value. According to their most general definition of it, the surplus is equal to 'the difference between total output and the socially necessary costs of producing total output' (ibid. 76). It consists of three main parts: property income, waste in the business process, and government expenditure. 'Another element which might reasonably be incorporated in the surplus . . . is the output foregone owing to the existence of unemployment' (ibid. 370). The problem of the economic surplus as thus understood is the core of Baran's and Sweezy's enquiry. While their specific approach to the 'problem of realization' has encountered many objections and criticisms, their intention is clear. They believe that the theoretical trend, which starts in Marx's *Capital* and is continued in the work of Luxemburg, Lenin, Kalecki, and Steindl, makes it possible to lead the Marxian theory of capital accumulation out of the blind alley of debates on the falling tendency of the rate of profit. At the same time, this theoretical trend opens up the possibility of a Marxian analysis of contemporary capitalism.

The weakening of growth and the appearance of high rates of unemployment in the 1970s saw a rise of interest in stagnation theories and ideas, including those of Kalecki, Steindl, and Baran and Sweezy. For a summary of these most recent investigations, see J. Steindl, 'Stagnation' (in *The New Palgrave: A Dictionary of Economics*, London, Macmillan, 1987; see also, by the same author, 'Stagnation Theory and Stagnation Policy', *Cambridge Journal of Economics*, 3/1, 1979, and 'Ideas and Concepts of Long Run Growth', *Banca Nazionale del Lavoro Quarterly Review*, 136, 1981); for a modern approach to a combination of 'long waves' in economic development and the trade cycle, see C. Freeman, J. Clark, and L. Soete, *Unemployment and Technological Innovation: A Study of Long Waves and Economic Development*, London, Frances Pinter, 1982, and W. Gebauer, 'Kondratieff's Long Waves', *EUI Working Paper* No. 91, Apr. 1984; for a review and critique of Steindl's and Baran and Sweezy's stagnation theories, see B. Norton, 'Epochs and Essences: A Review of Marxist Long-Wave and Stagnation Theories', *Cambridge Journal of Economics*, 12/2, 1988.

[2]

Reproduced from the English-language MS, a copy of which is in Kalecki's papers.

[3]

For an earlier (1943) formulation of this version of Kalecki's theory of income distribution, see pp. 119–38 above and editorial comments, pp. 498 and ff., this volume. On the microeconomic assumptions underlying this version of Kalecki's theory of distribution Chilosi writes:

> [I]mplicitly he assumes the degree of monopoly, defined at enterprise level, as given in the short run since the competitive structure of industry and the way in which firms set prices are given. In particular, the degree of monopoly of firms and the average degree of monopoly of the industry are considered here too as independent of the overall level of demand for the product of the industry. As a consequence, entrepreneurs react to changes of demand by changing the level of production and not the way in which prices are set. . . .
>
> Truly speaking, even if the coefficients of the price equations are independent (in the short run, at least) of the level of demand for the product of industry, and average variable costs are independent of the level of output, there is still another condition which must be satisfied so that prices are set by firms independently of demand conditions: the shares in total output by the various firms of the industry must not change. ('Kalecki's Quest for Microeconomic Foundations of his Macroeconomic Theory', pp. 115–16.)

[4]

Although Kalecki does not consider the proof of the existence of a unique solution to his system of price equation (nor to that of the 1970 formulation of his theory of income distribution), this has been done in the paper by Basile and Salvadori, 'Kalecki's Pricing Theory', appendix.

[5]

In the 1954 edition of the book the subtitle which follows is accompanied by a footnote:

> The theory of profits given here was developed back in 1935 in my 'Essai d'une Théorie de Mouvement Cyclique des Affaires', *Revue d'Économie Politique*, Mars–Avril 1935, and my 'A Macrodynamic Theory of Business Cycles', *Econometrica*, July 1935.

In the 1971 Cambridge Univ. Press volume the reference in the heading of this chapter is to 1933, indicating the date of the first Polish publication of Kalecki's theory of profit determination.

From the 1970s onwards, Kalecki's theory of profit determination attracted new interest, especially that of A. Asimakopulos who in a number of papers examined both its logical consistency and its empirical applicability. He emphasized the 'double-sided' relationship between investments and profits in Kalecki's writings (current investment expenditures, which are based on investment decisions made in the past, are an important determinant of current profits, and current profits, which influence current investment decisions, thereby affect future investment expenditures), and noticed that, although the derivation of Kalecki's profits equation is based on national-income accounting identities and the implicit assumption of a short-period equilibrium, it is meant to be not merely an accounting identity, but a causal relationship (see A. Asimakopulos, 'Profits and Investment: A Kaleckian Approach', in G. C. Harcourt (ed.), *The Microeconomic Foundations of Macroeconomics*). According to Asimakopulos, the reason given by Kalecki for a one-way causation between current capitalist expenditures and current profits (in a well-known passage where he asks whether profits determine capitalist expenditure or vice versa) is insufficient, since decisions to spend may be a function of current profits; what is additionally needed to arrive at Kalecki's conclusion is that capitalist expenditures in a particular period are independent of profits in that period. This Kalecki achieves by an additional assumption that short-period equilibrium is achieved in the period considered. If the time-lags in the implementation of investment decisions (and in consumption decisions of capitalists) are incompatible with the time period of the short-period equilibrium, however, 'then profits in such a period cannot be fully explained by decisions made in the past. They would also be affected by unanticipated changes in inventories and disequilibrium savings of workers that reflect the incomplete working of the multiplier' (A. Asimakopulos, 'Kalecki on the Determinants of Profits', in Fink *et al.* (eds.), *Economic Theory, Political Power and Social Justice*, p. 24). Kregel disagrees with Asimakopulos on this and thinks that 'no "time" is required for Kalecki's multiplier to work, it is instantaneous within the defined period' (J. Kregel, 'Savings, Investment and Finance in Kalecki's Theory', in M. Sebastiani (ed.), *Kalecki's Relevance Today*, p. 197; for a more detailed account of the controversy, see *Collected Works*, vol. i, pp. 473–5).

That the actual profits may indeed be only approximately determined by capitalist expenditures, export surplus, various propensities to consume, and government budgetary policy seems to follow from empirical investigations by P. Edrös and F. Molnár (see their *Prices and Profits in the US Economy of the Seventies*, Studies of the Institute of Economics of the Hungarian Academy of Sciences No. 14, Budapest, 1979, and 'Profit and Paper Profit: Some Kaleckian Evolution', *Journal of Post Keynesian Economics*, 3/1, 1980; for a criticism of their distinction between 'material profit' and 'paper profit' that has no basis in Kalecki's theory, see A. Asimakopulos, 'Profit and Paper Profit: Some Kaleckian Evolution: A Comment', *Journal of Post Keynesian Economics*, 6/1, 1983). Asimakopulos also uses Kalecki's profit equation for empirical examination of profits (see his 'Kalecki on the Determinants of Profits', and 'A Kaleckian Profits Equation and the United States Economy, 1950–82', *Metroeconomica*, 35/1-2, 1983). Notwithstanding his above-

mentioned methodological criticism of Kalecki's profit equation, however, Asimakopulos concludes in this latter study:

> The examination of the United States economy since 1950 has shown the key role of investment in determining the level of profits. The cyclical changes in investment tend to be followed by cyclical changes in profits. The counter-cyclical changes in the government deficit act to cushion profits against swings in investment, and in this way they possibly help set the stage for a reversal of the direction of change in investment. . . .
>
> The Kaleckian profits equation, and the examination of cyclical changes using such an equation, provides a useful way of summarizing important macroeconomic effects. It can also help indicate periods where a detailed study of possible structural changes is required. ('A Kaleckian Profit Equation', pp. 20–1.)

[6]

In a letter to Kalecki of 10 Oct. 1955, the Italian translator of the book, Sergio Steve, noted: 'In the discussion about taxes and transfers something should be added on transfers to capitalists. At least, it would be better to make explicit that they are not taken into consideration'. Kalecki replied:

> You are quite right. I omitted transfers to capitalists (interest on public debt) for the sake of simplicity. You may indicate this in a footnote and you may add that the inclusion of transfers to capitalists would change the left [hand] side of the equation . . . to:
>
> Gross profits net of taxes plus transfers to capitalists.
>
> (The fact that this would make for some complications in the argument in the subsequent chapters was the actual reason for the omission in question.) (Quoted after the draft of Kalecki's reply which survived in his papers together with Steve's letter.)

[7]

This and the following chapters are a revised version of ch. 2 of *Studies in Economic Dynamics* (see this volume). For a discussion of Kalecki's approach to the determination of interest rates, see Sawyer, *The Economics of Michal Kalecki*, pp. 96–101. Sawyer also notes that Kalecki's argument on the dependence of the velocity of circulation upon the short-term rate of interest was later formalized as the inventory approach to the demand for money, by W. J. Baumol and J. Tobin.

[8]

In relation to the above argument, in his review of the *Theory of Economic Dynamics* Chipman wrote:

> In the chapters on the interest rate . . . Kalecki adduces the association between the short-term rate of interest and the velocity of circulation between 1930 and 1938 as confirmation of a liquidity preference theory; in view of the strong possibility of spurious and serial correlation, this evidence is not convincing. He also presents an

ingenious model to explain movements in long-term rates on the basis of movements in short-term rates, from 1849 to 1938; this model results in a linear regression of average long rates on average short rates (the averaging based on an arbitrary division of the period into uneven intervals). He says [p. 274]: 'If the coefficient of ρ_e [average short rate] in the post-war period had been not 0.425 but, say, 0.25, we should, *ceteris paribus*, have obtained for ε [*the constant expressing the advantage of income certainty connected with long-term holdings*] the value 3.7, which would be obviously absurd and so would disprove our theory'. Kalecki does not quote a standard error for the regression coefficient referred to, but I computed it to be 0.09. Thus a range of 0.425 $\pm$ two standard errors covers the value which is 'absurd', and since there is only one degree of freedom, this range is still only significant at the 30% level; and even if we allowed eighteen degrees of freedom for the averaging process over the years 1919–1938, the regression coefficient would still not be significantly different from 0.25 at the 5% level. Moreover, the above estimate for the standard error is, if anything, too low, since Kalecki's average process (dividing the years 1919–1938 into blocks of three, ten, and seven years) accentuates the extreme values of the short-term interest rate (5.09 and 0.82). Thus, by his own criterion, Kalecki's theory does not stand up to the facts. (pp. 215–16)

Kalecki asked Klein for his opinion on Chipman's criticism, and in a letter of 10 Jan. 1957 L. R. Klein replied (Prof. Klein's permission to reproduce this letter is gratefully acknowledged; the letter is in Kalecki's papers):

On the specific problem of the sampling error for the equation

$$r = 0.425\,\rho_e + 2.90,$$

I have a few points to make. If we accept your sample as the period averages in Table [46], then the three points determining this equation in Fig. [25] lie practically on the line, with no apparent deviation. In a sample of 3, it is rather pointless to talk about sampling error. Moreover, if the points are all on the line, there is no sampling error.

Chipman, apparently, went through the formal mechanical procedures of estimating sampling errors for the least squares method of estimation. With two parameters in the equation and three observations he computes a value with one degree of freedom and enters the probability tables with this effective sample size. All this is quite ridiculous.

I have, however, taken a different approach to the estimation of sampling error which gives a value not much different from Chipman's. The trouble with the whole problem is the fact that observations on ρ_e are not directly available except as periodic averages of the discount rate. With more frequent observations on ρ_e directly, I could probably refine the estimates of sampling error.

Let us approach the problem in the following way: Since there are only 3 years in the period 1919–21 and since the 3 points all lie practically on the line, it is worth concentrating entirely on the 2 periods 1922–31 and 1932–38. A very simple method of estimation, known as the 'method of subgroup averages', when used for this period gives practically the same line as yours.

$$\begin{array}{ll} (1922\text{–}31) & 4.48 = a + 3.76b, \\ (1932\text{–}38) & 3.25 = a + 0.82b. \end{array}$$

These two equations imply

$$r = 2.91 + 0.418\,\rho_e.$$

This estimate hardly differs from yours. The estimated slope coefficient can be written as

$$b = (\bar{r}_1 - \bar{r}_2):[(\bar{\rho}_e)_1 - (\bar{\rho}_e)_2],$$

where the subscripts refer to the two different periods. In this form it is quite easy to compute a sampling error on the assumption that ρ_e is a predetermined variable. This is the sort of assumption that Chipman must use in his least-squares type estimate and can only be relaxed if there are annual observations on ρ_e. The problem is not worth considering for a sample of just two period averages with no underlying annual values.

$$\begin{aligned} \text{var}\, b &= [\text{var}(\bar{r}_1 - \bar{r}_2)]:[(\bar{\rho}_e)_1 - (\bar{\rho}_e)_2]^2 = \{\text{var}\, r[(1/7) + (1/10)]\}:(2.94)^2 \\ &= [0.48\ (0.24)]:(2.94)^2 = 0.0133; \end{aligned}$$

standard error $b = 0.11$.

In this derivation, it is assumed that r is a variable with different mean values in the two periods $(\bar{r}_1, \bar{r}_2)$ but from a population with homogeneous variance. I estimate this variance as 0.48 by going back to your original sources and computing the sample variance from annual data. It is also assumed that the annual values of r are mutually independent. These are fairly standard assumptions. Thus with the degree of annual variability involved, the sampling error is about as large as the figure Chipman has computed. In my computation there are $17 - 2 = 15$ degrees of freedom.

For my own tastes, I should say that you have 3 average points lying on the fitted line and that the question of sampling error is not of much interest. This is especially so since one of the variables is not observable except indirectly as a period average.

As a result, Kalecki introduced no changes to the above-mentioned argument in the later editions of his book.

[9]

These propositions of Kalecki differ significantly from those of the theory of 'managerial capitalism' which gained popularity especially in the 1970s. From a survey of many empirical tests of managerial theories it follows, however, that the rate of profit continues to be an increasing function of the own capital of the firm, and that (at least in the American manufacturing industry, in 1958–77) the ratio of 'ploughed back' profits to dividends on shares falls with the size of firms. Moreover, it appears that (i) top managers are nearly always shareholders of 'their' firms, (ii) as a rule their very large salaries are less than the value of shares they own, often less than the value of their dividends on shares plus capital gains, and (iii) an important part of their salaries is directly linked to the profitability of their firm or to the market value of its shares. These findings undermine the proposition of managerial capitalism theorists that the managers (including the top ones) are merely wage labour. (See J. Milewski, 'Empirical Tests of Managerial Concepts', conference paper, Łódź 1987, mimeo (in Polish); see also W. G. Lewellen, *The Ownership Income of Management*, New York, NBER, 1971.)

[10]

In the 1954 and 1965 edns. there followed the text: 'which determine cojointly changes in the rate of profit'; it was deleted in the 1971 Cambridge Univ. Press collection of Kalecki's essays.

[11]

The words 'in particular technical progress' were added in the 1971 Cambridge Univ. Press volume.

[12]
Serena Sordi has shown that this is an understatement, and the 'alteration' is of more profound nature. Having performed a mathematical analysis of the 'fundamental equation' of *Theory of Economic Dynamics* along the lines of what had been done by Frisch and Holme for the first version of Kalecki's theory of the business cycle (see *Collected Works*, vol. i, annex 1), she also examined Kalecki's estimation procedure, the empirical results of which, although only 'illustrative', have been always interpreted as reinforcing his theory. She was puzzled by the usefulness of the alteration, which at first sight appears to be doubtful, since estimating the 'altered' equation prevents identification of the coefficients *a*, *b*, and *c* of the original equation and therefore sheds no light on the relative importance of the factors which, according to Kalecki's theory, are the main determinants of investments. Hence Sordi estimated Kalecki's 'fundamental equation' in its original form.

> The result of this estimation . . . is a regression equation where the coefficients of total savings and of the lagged investment in fixed capital are not significant at all—i.e., the empirical evidence given by the estimation of the investment equation in its original form gives rise to important problems of Kalecki's investment theory. As none of these problems arise if we estimate the 'altered' equation, at first sight the role of Kalecki's estimation procedure might seem to be, to a large extent, that of ensuring support for his brilliant theoretical intuition rather than of submitting the theory to an empirical investigation. . . .
>
> However, even if Kalecki does not explain the reasons that induced him to perform the alteration, it is not difficult to identify the most important problem which makes it difficult to employ the original equation for an empirical application.
>
> As we have seen, on the basis of the analysis of the behaviour of a single firm, three factors are singled out by Kalecki as determining investment decisions: savings out of profits, change in profits, and change in the capital stock held by the firm. The latter, given the assumption of a constant depreciation, independent of the level of the capital stock, makes the investment in fixed capital of the firm depend on past investment.
>
> However, the model being a macro model, the investment equation is written by Kalecki in aggregate terms with total savings, change in total profits, and total investment in fixed capital as explanatory variables.
>
> The total saving series used for the estimation of the equation is obtained from the national accounting identities as the sum of private investment, export surplus, and budget deficit. . . . As a consequence, two of the explanatory variables—total savings and investment in fixed capital—are highly collinear and this suffices to account for the two coefficients not significantly different from zero in the regression equation. ('Some Notes on the Second Version of Kalecki's Business-cycle Theory', in Sebastiani (ed.), *Kalecki's Relevance Today*, p. 263.)

For a comparison of the successive versions of Kalecki's theory of business fluctuations, see annex 3 in this volume; see also R. C. Davis, S. Gomulka, and A. Ostaszewski, 'The Innovation Rate and Michał Kalecki's Theory of Trend, Unemployment and the Business Cycle', mimeo, London School of Economics, 1988. For a survey of some old and new business cycle theories, see V. Zarnowitz, 'Recent Work on Business Cycles in Historical Perspective: A Review of Theories and Evidence', *Journal of Economic Literature*, 23/2, 1985.

Kalecki's 'fundamental equation' of the business cycle was extended by Sylos-Labini, who thought that, while Kalecki's theory of effective demand included technical progress and changes in the distributive shares, nevertheless it did not push the analysis of the consequences of both these changes very far. Sylos-Labini set out to 'examine certain relations between the two types of change and the investment decisions, following the course that I deem to be consistent with the one traced by Kalecki, who rightly considered the theory of investment as the pillar of the theory of effective demand' (P. Sylos-Labini, 'On the Concept of the Optimum Rate of Profit', in N. Assorodobraj-Kula, *et al.* (eds.), *Studies in Economic Theory and Practice: Essays in Honor of Edward Lipiński*, Amsterdam, North-Holland, 1981; see also, by the same author, 'The *General Theory*: Critical Reflections Suggested by some Important Problems of our Time', in Vicarelli (ed.), *Keynes's Relevance Today*).

The theory of investment determination put forward in Kalecki's *Theory of Economic Dynamics*, as well as that of Keynes's *General Theory*, were empirically tested on a large sample of US manufacturing firm data from 1970 to 1982. The results proved 'consistent with three major empirical hypotheses identified with the post-Keynesian view: (1) capacity utilization or sales variables have a positive effect on investment; (2) variables measuring internally generated finance for firms have a strong positive and independent influence on firm investment expenditure; and (3) the larger the interest commitments of firms, *ceteris paribus*, the lower their investment. These results hold up in the full sample and in various subsamples' (S. M. Fazzari and T. L. Mott, 'The Investment Theories of Kalecki and Keynes: An Empirical Study of Firm Data, 1970–1982', *Journal of Post Keynesian Economics*, 9/2, 1987, p. 173). The authors find their results to 'reinforce the arguments of Kalecki, Keynes, Minsky, Davidson, and others that the availability of finance plays a basic role in the determination of macroeconomic performance' (p. 185).

[13]
See p. 175 and note [10], p. 548, this volume.

[14]
For a discussion of this approach to the question of a mechanism capable of continuously generating regular business fluctuations, see *Collected Works*, vol. i, pp. 475–6 and 526–8; see also Sawyer, *The Economics of Michał Kalecki*, pp. 57–8; for an alternative, non-linear, model of the business cycle, which is more likely to generate roughly constant business fluctuations, see e.g. R. Goodwin, *Essays in Economic Dynamics*, London, Macmillan, 1982.

Another source of concern arises from Kalecki's basic analytical point of reference, which is a regular business cycle generated by fluctuations of investment.

However, in contrast to the 1930s and the earlier periods, in the post-war development of the OECD countries, especially in the past 10–15 years, investments on the whole have not shown cyclical fluctuations which clearly dominated those in other component parts of the national income. Changes in the phases of the business cycle have been related more closely to changes in consumer spending on durables and to government spending than to changes in investment. If, however, the course of the cycle is determined by the former rather than by the latter changes (or if they are on an equal footing), then the advantages of an analytical structure which is erected on the concept of an *automatic and regular* business cycle may appear less certain.

Indeed, empirical data do not show regular business fluctuations in expenditures on consumer durables, and it would be difficult to prove theoretically that they should undergo any autonomous regular cycle. Now, if the same refers to government expenditures, and if those two types of expenditure are subject to changes which instead of a regular business cycle of a given periodicity generate alternately crises and recoveries of irregular intensity and duration, then a modified analytical structure might prove more useful for a study of the contemporary capitalist system. While the fundamental characteristic of Kalecki's approach would be maintained i.e. the assumption on an inherent instability of capitalist reproduction, such a modified structure would grant greater autonomy and importance to consumer and government spending, and it might also provide us with a crisis theory instead of a business cycle theory. (Osiatyński, 'Kalecki's *Theory of Economic Dynamics* after Thirty Years', p. 43.)

[15]

In relation to the above analysis of the factors of long-term trend, Steindl wrote to Kalecki on 5 May 1954:

Thank you for having your book sent to me. I got it ten days ago and it has given me very great pleasure. It is cast of one piece and more lucid even than the 'Essays'—of course, it is not a re-edition but a new book.

Of the many novelties, the most striking one, to my mind, is the effect of Trade Unions on the degree of monopoly. It occurs to me that the post-war Census of Manufactures (1947) seems to show an increase in share of wages in value added, at least as compared with 1939. That probably would mean also a decline in mark-up. I did not go into the matter, but if it is a real thing, it would be extremely puzzling, unless it is explained by your theory. That would mean that there is a grain of truth in the 'countervailing power'. It might, conceivably, explain the high level of activity of the last six years, in so far as it is not explained by other things (public spending, etc.).

Another of your improvements has filled a vacuum which used to bother me: you have taken care now to make sure that *over the pure trade cycle as a whole* there is really zero net investment! But it seems to me that you lost sight of the implication later on. As I understand you, $d' = (1-n)\delta$ is a determinant of investment which has to be introduced in order to offset the 'incomplete reinvestment' of depreciation quotas. A stationary state will result only if $d' = (1-n)\delta$, and as far as I can see, d must be either a development factor, or a budget deficit, or something like that. That means that as long as you assume incomplete reinvestment ($a < 1$, an assumption which you slightly favour), the economy will be static only with the support of such exogenous factors; without them, it will have a negative trend! (Alternatively, if $a > 1$, it would have a positive one, but this case you probably don't favour.) But you don't at all mention this, where one should expect it, namely in the Chapter on the trend. It is, after all, a very important implication of your model that it *may* mean (if $a < 1$!!) that development factors are necessary not only to create a positive trend, but also to prevent a negative one! Or have I got it all wrong?

Prof. Steindl's permission to reproduce this letter, which survived in Kalecki's papers, is gratefully acknowledged. Kalecki replied on 8 June 1954:

Thank you very much for your letter. I am very glad you like my book. I do not think that in stationary state there must be a development factor, or something equivalent to it, of the size $d' = (1-n)\delta$. Indeed if there are no rentiers' savings firms may be assumed in a stationary state to reinvest the full amount of depreciation. (This case is discussed on p. [333].) The not full reinvestment then applies only to *net* saving. If there is, however, rentiers' saving, it causes a negative trend (cf. p. [335]) and then development factors etc. are necessary for the maintenance of the static state. (Quoted from a copy of the letter in Kalecki's papers.)

After more than 20 years Steindl wrote:

With regard to my question concerning the meaning of the term $d' = (1-n)\delta$ (which certainly is not connected with the re-phrasing of pp. [327–31, *see below*]), the answer given by Kalecki is perfectly satisfactory: the term d' serves to insure that the depreciation quotas are completely re-invested, and the incomplete re-investment is confined to the net saving. The only thing that remains to be said is that the reader can't easily guess it. I, for one, completely misunderstood it, thinking that the incomplete re-investment was intended to apply to the gross saving, so that a compensating factor from outside would have been necessary to establish the stationary state. (Extract from a letter of J. Steindl to J. Osiatyński, of 18 Sept. 1975.)

[16]

In Kalecki's papers there are a few pages of undated typescript in English, which were meant to replace the original text of the book, starting with the sentence 'Moreover, denoting the ratio of depreciation . . . ', on p. 327, and ending here. It has proved impossible to establish in which edition of the book Kalecki intended to introduce this replacement, and why he did not do it. I asked Prof. Steindl for his opinion on the typescript. He replied on 18 Sept. 1975:

In my opinion, Kalecki's exposition in the relevant pages [327–31] of Economic Dynamics contains a flaw. He discusses the existence of real roots of the trend equation, using linear approximations, such as in particular $e^{\theta v} = 1 + \theta v$, which are valid only for small rates of growth v. His arguments, however, require that they should be valid for all values of v. In fact, if we go back to an exact formulation, using exponentials instead of the approximation, we find that the straight line in the graphs (representing the left side of equation 35) is in reality a curve which turns upwards for large values of v, so that there is *always* a real root! Moreover, in case II there are three roots instead of two, and the discussion of stability is inadequate to prove that the third root is ephemeral. My own solution to this difficulty would have been to admit only the case I as an economically relevant solution, i.e. to require $\theta > m$.

Now the typescript version of these pages does nothing decisive to remove these difficulties. In fact, the same approximations essentially are used again. If we use exponentials, then we get in place of the equation 35 of the typescript

$$ve^{\theta v} = nv + mv^2 e^{-\omega v} + \gamma$$

which shows again that the case III (no root) does not exist, and that in case II there will be three roots.

I think that the new version is an improvement only in relatively minor details of introducing the approximations etc. I think there is no reason why it should be introduced into the edition of the *Collected Works*.

A very puzzling question is of course, what Kalecki really thought when he wrote it. Unless I am wrong myself (which is never excluded) I find it surprising that, on re-working the text, he was not struck with the difficulties mentioned. He certainly felt unhappy about the argument; I think we can be pretty sure that he was not satisfied with the typescript version either. It is significant that he dropped the whole approach (I mean, a trend term dependent on the capital stock, γK_t) in his 1968 paper on the trend (regrettably, I think: the whole approach deserves to be pursued).

In the next letter, of 9 Oct. 1975, Prof. Steindl continued:

My reason for excluding case II and case III is precisely that they would produce unrealistically large growth rates. In this context it must be noted that Kalecki's model of the trend treats mainly the problem of effective demand. The restrictions which in reality are placed on growth by the conditions of supply are not discussed in any detail; they enter the mathematical formulation only *via* the lag θ, which limits the speed of accumulation. You may remember a paper of K[alecki] dealing with limitation of the speed of accumulation in Poland, especially in the coal mines: he showed that owing to lack of skilled manpower the attempt to increase the investment beyond a certain level may simply lead to an increase in the period required to execute projects, in other words, the lag θ. [*See ch. 6 of Kalecki's* Introduction to the Theory of Growth in a Socialist Economy, *in Collected Works, vol. iv.*] Thus you may say that if the investment response m would increase too much, the lag θ, for the reasons indicated, would increase even further—because the speed at which people can learn is limited.

2. The 1968 paper is not *materially* different from the earlier trend theory but rather in the mathematical approach; all or most of the trend generating forces appear now in form of a function of time, $F(t)$, i.e. on the face of it they are treated as exogenous. The verbal explanations, however, make it quite clear that Kalecki continued to believe in a long-term positive feedback effect of accumulation ('slowly changing function of time determined by past economic, social and technological developments', p. [443]). He merely regarded these relations as too complicated to be included explicitly in the endogenous mechanism. I think, however, that one should try to do it. . . .

To prevent misunderstanding: I think the 1968 paper is very important, even more perhaps for the business cycle theory than for the trend.

3. I don't see a crisis of Keynesian or Kaleckian economics. There is perhaps a crisis of a certain policy concept, of the growth optimism represented for example by Solow. A high rate of growth apparently solved the social problems and prevented the return of the conditions of the 1930s. The difference between Harrod's warranted rate of growth and the actual one was eliminated by increasing the latter. The growth and high employment brought very difficult problems: Migrations (the Negros in US, the foreign workers in Europe), urbanization, energy and raw materials, the environment, demands by the workers for participation and generally increased pressure from below, the unrest of the intellectuals and students, and inflation. In face of all that, the powers that be in the US have turned their backs on growth and begun to practice a conscious policy of stagnation. In Germany they have apparently their emulators. But here, maybe, the reduction of the growth rate enforced by the decreasing inflow of foreign workers has also been a source of difficulties. The chances are that we are in for a new era of stagnation.

Naturally, neither Kalecki nor Keynes could deal in detail with problems before they had in fact arisen. But the direct causes of unemployment and stagnation are to-day just the same as before.

Prof. Steindl's permission to reproduce this correspondence is gratefully acknowledged. For an elaboration of the thesis advanced in point 3 of the letter, see Steindl, 'Stagnation Theory and Stagnation Policy'.

[17]

In the 1954 edn., this paragraph reads:

The three cases considered above were obtained by varying m while the other coefficients were left unchanged. Case III corresponds to the highest m. It should also be recalled that m is the coefficient of the long-run effect of the rate of change in profits and output on the level of investment. Thus, it follows that equation (34) represents a uniform trend unless the effect of the rate of change in profits and output on investment is *ceteris paribus* too strong.

PART 4

The Business Cycle and Armaments after the Second World War

The Impact of Armaments on the Business Cycle after the Second World War

[1]

On 8 and 15 Nov. 1955 Kalecki gave 2 lectures at the Institute of Social Sciences at the Central Committee of the Polish United Workers' Party. Unedited minutes of the lectures were published in Dec. 1955 by the Institute in its series of lecture notes (see Lecture Notes Nos. 370 and 377, and an annex to Lecture Note No. 370, Warsaw, 1955). The version published in this volume is an edited text of Lecture Notes Nos. 370 and 377; the annex is given in n. [6] below.

Even in the 1930s Kalecki devoted much attention to the impact of armaments on the business cycle. He examined the theoretical aspects of the role of armaments in stimulating the upswing in 1935 (see his 'Business Cycle and Armaments', *Collected Works*, vol. i). This was preceded by empirical enquiry into the subject (see 'On the Margin of German Events', 'The Fate of Experiments', and 'Stimulating the Upswing in Nazi Germany', *Collected Works*, vol. vi; also: 'Grounds of the Manchurian Conflict', *PS*, 2, 1932, pp. 6–8 (in Polish), and 'War in the East', *PS*, 5, 1932, pp. 1–3 (in Polish)). In the pre-war studies, however, the political implications and limitations of counter-cyclical expenditure on armaments were not stressed as much as in his post-war studies on the impact of militarization on the business cycle, and on the militarization of Germany in the 1950s. Kalecki returned to the role of armaments in stimulating the business upswing in 1967, examining the impact of American intervention in Vietnam on the business cycle in the USA (see 'Vietnam and US Big Business', *Collected Works*, vol. vii).

The lectures on the impact of militarization on the business cycle are also a continuation of the studies that Kalecki started in an article of 1945, 'The Maintenance of Full Employment after the Transition Period' (*Collected Works*, vol. i). There he foresaw that, after the post-war reconstruction of capital equipment, the maintenance of full employment would require considerable budget deficits and a rather unorthodox financial policy in the USA; he also pointed out the doctrinal and political difficulties of achieving this goal. In the lectures he observes that cyclical fluctuations have only become less severe, and that the main instrument of counter-cyclical intervention has been armaments. The possibilities of making use of this instrument, however, were seriously limited by domestic and international political

considerations, whereas ideological–doctrinal factors limited the use of other tools of anti-crisis intervention. Kalecki continued these investigations in 'The Economic Situation of the United States in Comparison with the Pre-war Period' (*Collected Works*, vol. vii) and 'Development of the Economic Situation in the United States in 1956–1959' (*Sprawy Międzynarodowe*, 11–12, 1959, pp. 3–12 (in Polish)), and in 2 articles—on the business cycle in the USA in 1956–61, and on the effects of the rearmament of West Germany—which are reprinted here, along with his lectures on the impact of militarization.

For a discussion of some Marxist literature on the importance of military production for capitalist development in the context of Marx's own ideas on this subject, see F. M. Gottheil, 'Marx versus Marxists on the Role of Military Production in Capitalist Economies', *Journal of Post Keynesian Economics*, 8/4, 1986; see also the ensuing debate in the same issue of the journal, and in its issue 10/2 of 1988.

The 3 articles which follow his lectures on militarization in Part 4 of this volume were written in 1955–61, when Kalecki was in charge of studies on contemporary capitalism in the Institute of Economics of the Polish Academy of Sciences (see p. 561 above), and their subject-matter is closely connected with the impact of militarization on the business cycle. Except for the article on automation of production, Kalecki deals primarily with armaments, which he regards as really the only effective large-scale instrument of government anti-crisis policy. In the article on automation of production, on the other hand, he shows that even this semi-exogenous factor cannot contribute to a steady long-run growth and the reduction of unemployment. In these studies he also develops his earlier thesis on the tendency for stagnation of the capitalist economy: without government intervention, it goes through cyclical fluctuations around simple reproduction; on the other hand, practically speaking, the only way to steady growth is through constantly increasing expenditure on armaments (cf. pp. 562–6 above).

All these articles by Kalecki are closely connected with his early studies of full employment policies, especially with his 'Political Aspects of Full Employment' (*Collected Works*, vol. i). They too emphasize the class nature of the government and its economic policy. Kalecki's suggestion, in his lectures on the impact of militarization on the business cycle, that the scope of organization and the political consciousness of the working class make it impossible to put the entire financial burden of armaments on workers alone, as well as his observations on the impact of the social consciousness of the American working class on economic policy, are linked with his 'degree of monopoly' theory of income distribution, and its proposition that the greater the degree of organization and political strength of the working class and its trade unions, the greater the share of wages in the national income.

[2]
It is implicitly assumed here that workers do not save.

[3]
See also 'The Marxian Equations of Reproduction and Modern Economics', this volume.

[4]
For the sake of simplicity, Kalecki implicitly assumes here that additional taxes on capitalists not only reduce their profits but also their spending, by the same amount. In fact, in the article 'The Economic Situation in the USA, 1956–1961' (see above), Kalecki demonstrates that only part of the taxed-away profits reduces the effective demand of capitalists, while part of them reduces their savings. The demand of capitalists is therefore reduced less than the volume of government expenditure financed through taxes on profits. Hence this expenditure can increase aggregate demand and capitalist profits. It is clear that, for this way of stimulating the upswing to be successful, much greater government expenditure (and hence also additional taxes) are required than when this expenditure is financed through a budget deficit. This is confirmed by Steindl, who shows that the pre-war technique of stimulating the upswing by financing government expenditure through a budget deficit was replaced after the war by financing them with additional taxes, a procedure practised on a much wider scale than before the war (see Steindl, 'On Maturity in Capitalist Economies', pp. 424–5).

[5]
For a discussion of Kalecki's thesis on the tendency towards stagnation of a capitalist economy, see pp. 551 and 562–6.

[6]
After the 1st lecture, Kalecki answered questions. Selected answers were then published as an annex to Lecture Note No. 370. The edited text of these answers follows below.

1. Armaments and public works

This is a very good question [*on whether other public expenditure could substitute for armament spending*], which gives an opportunity to explain the essence of the problem. If one could devise public works equally as unprofitable as armaments, they would have similar consequences. It is obvious, however, that the construction of schools, hospitals, and even roads is of limited scale. The situation is entirely different as regards productive investments, however, since such investments compete with the private sector and reduce the rate of capitalist profits, which obviously has a negative impact on private

investments. Consequently, the economic effect of such public works will be weaker in the long run, and besides this they give rise to immediate political opposition from the damaged monopolies. For instance, to this day attacks continue in the USA on the dams and power plants built during the New Deal under the public works programme. Armaments play a specific role here because they are unproductive. I believe that—except for armaments in the strict sense of the word—at this moment only works of a paramilitary nature come into consideration on a larger scale.

2. The importance of government debt for potential inflation

Such a possibility [*of causing inflation by putting into circulation new issues of bonds in connection with increased government debt*] exists only if there have been large price rises already. I must say, though, that the government debt is not the only factor contributing to this. In the modern capitalist economy there are enormous numbers of liquid assets of various kinds (private bonds, mortgages, etc.). If the government runs up debts in the banking system, which are reflected in the accumulation of deposits, the situation is not basically different. The existence of considerable amounts of liquid funds contributes to inflation only when a further increase in prices is expected in connection with a previous sharp and lasting increase in prices caused by other factors. Then there will be a general tendency to get rid of liquid funds and to make speculative purchases of goods. These situations of the general flight from money can be called hyper-inflation.

Why does such a situation arise? First of all, let us note when high inflation took place. It always occurred during or after a war. For then there are inadequate reserves of productive capacity, and the considerable increase in demand which usually occurs in these periods, especially on account of financing government expenditure through a budget deficit, causes a considerable rise in prices. The working class then receives wage increases, but with uncontrolled prices this leads to a further rise in prices. If this process lasts a long time and the price rise is rapid enough, then there will be a speculative flight from money to goods in anticipation of further price rises.

It should also be mentioned that if the government debt continually stimulated demand, it would act not only on prices but also on increasing production. Indeed, before a sharp increase in prices took place, there would be full employment of productive capacity. Is a large government debt really a guarantee of high employment? No, it isn't; but were it to cause continual inflation, it would also have to cause a high rate of employment.

3. The increase of prices since 1950 and its causes

The increase in prices in the USA was not small. The official index of the cost of living shows an increase of 12% since 1950. But this was not a high enough rise to start up hyper-inflation. In order to determine the reasons for this rise, we must first check when it happened. It occurred mainly from 1950 to 1951 (8%) and then, to a much lesser extent, from 1951 to 1952 (about 3%), after which prices more or less stabilized. What was the reason for the rise of prices in 1950, i.e. when there was a very considerable increase in the prices of raw materials even before a large-scale armaments programme began?

When the big armaments programmes were already advanced, it was believed that the production of raw materials would fall behind demand and that there would follow a sharp rise in prices, or that prices would be controlled and there would be a shortage of some raw materials. Consequently, there were speculative purchases which in a short time raised the prices of raw materials. As it turned out later, these anticipations were exaggerated, for prices began to fall in 1951. In the meantime, however, there was a rise in the prices of finished products and in the cost of living on account of the earlier rise in prices of raw materials. This again caused an increase in money wages. That is why, despite the fall in prices of raw materials, the general level of prices of finished products was much higher than in 1950. I see no connection here with the government debt, since even leaving aside the government debt I cannot understand how an increase in prices would not have taken place.

4. Stabilization of prices from 1952 despite the increase in labour productivity and the fall in prices of raw materials

In fact, from 1952 the prices of finished products stayed on a more or less constant level, despite the rise in labour productivity and the fall in prices of raw materials. This can be explained by two factors: (i) there was an increase in money wages and so, despite the increase in labour productivity, costs tended to rise rather than to fall; (ii) the profit margin of monopolies increased.

5. Money and real wages

From 1950 to 1954 money wages increased. According to official statistics, money wages before taxation in 1951 were about the same as in 1950, and then up until 1954 increased by about 10%. This is explained by the fact that labour productivity was constantly increasing. In 1951 this offset the negative impact on real wages of the increases in the ratio of prices of raw materials to money wages; from 1951, however, there was a fall in the ratio of prices of raw materials (including food) to money wages, which manifested itself in an increase in real wages and in a fall in farmers' incomes.

Real wages after taxation fell in 1951, and then they rose much less than gross real wages. If we eliminate from the change in real wages the impact of the fall of prices received by farmers, real wages after taxation in 1951 would probably be more or less the same as in 1950.

6. The movement of prices and bank deposits

The increase in deposits accompanying a rise in prices is not a confirmation of the quantitative theory of money, since one should remember that there is an opposite relationship. If for any reason there is a rise in prices, bank deposits increase because sales volume expands. Indeed, with greater sales volume there is a greater demand for money, which is obtained through bank credits.

[7]

See 'The Maintenance of Full Employment after the Transition Period', *Collected Works*, vol. i.

[8]

This must be a reference to the conference in Geneva of the foreign ministers of France, the USA, Great Britain, and the USSR (27 Oct.–16 Nov. 1955), which was called in accordance with directives of the conference of heads of state of the same countries held in Geneva in July 1955. Both conferences dealt mainly with Germany, security in Europe, disarmament, and banning nuclear weapons. Whereas the July conference of heads of state, although it reached no specific agreement, contributed to a reduction in international tension and halted the cold war, the conference of foreign ministers—owing to the lack of agreement on the German question and a hardening of positions on European security and disarmament—resulted in a long impasse.

[9]
See 'Three Ways to Full Employment' and 'Full Employment by Stimulating Private Investment?' (*Collected Works*, vol. i), where Kalecki takes up these questions more systematically.

[10]
These predictions of Kalecki were in agreement with the course of events in the USA at the end of the 1950s, when the financing of government expenditure through a budget deficit gave rise to strong opposition from conservative financial circles, which demanded a check on expenditure and the achievement of a budget surplus (see A. H. Hansen, *The Postwar American Economy*, New York, Norton, 1964, pp. 11–12, and Feiwel, *The Intellectual Capital of Michał Kalecki*, pp. 222–3).

Economic Problems of Production Automation in Capitalist Countries

[1]
First published in *Ekonomista*, 3, 1957, pp. 105–15.

The automation of production during the Second World War and in the years following was fairly limited in scope, and in *Theory of Economic Dynamics* Kalecki did not separately consider the impact of this factor on the course of the business cycle or on long-term development. The mass automation from the mid-1950s, as well as hope expressed at that time that this would solve the basic problems of capitalist reproduction, prompted Kalecki to investigate more closely the impact of this particular kind of technical progress on the course of the business cycle and changes in employment in the short and long run in the developed capitalist countries. The analysis made here did not lead Kalecki to revise his earlier conclusions with respect to the tendency for stagnation of the capitalist economy and the inherent contradictions of capitalist reproduction.

In the early 1960s the problems of automation in a capitalist economy were further investigated by Oskar Lange and his students (see Lange, *Dzieła*, vol. viii, Warsaw, PWE, 1986, p. 816 (in Polish)).

The Economic Situation in the USA, 1956–1961

[1]
First published in a collection of Kalecki's articles, *Sketches on the Functioning of Modern Capitalism*, Warsaw, PWN, 1962, pp. 20–42 (in Polish). The Italian translation, 'La congiuntura economica negli Stati Uniti nell periodo 1956–1961', was published in Kalecki, *Sul capitalismo contemporaneo*, pp. 59–79, and the Spanish translation, 'La coyuntura económica en los Estados Unidos durante el período 1956–1961', in Kalecki, *Sobre el capitalismo contemporáneo*, pp. 55–80.

This study is a considerably expanded and revised version of the article 'Development of the Economic Situation in the United States in 1956–1959', which was subsequently reprinted in Kalecki (ed.), *Studies on the Business Conditions in Modern Capitalism*, vol. iv, Warsaw, PWN, 1960, pp. 5–19 (in Polish).

In his Preface to *Sketches* Kalecki wrote:

> In the study 'The Economic Situation in the USA, 1956–1961' I examine the course of the business cycle in the past 6 years; from this analysis I draw general conclusions on the nature of American capitalism, elucidating the special role of armaments in the US economy. . . . Of all the papers in this booklet this one in its subject-matter is most closely linked with my 'Political Aspects of Full Employment'. (p. 8)

[2]
In Table 55 printing errors were corrected in the following indices: (i) the 'surplus of government revenue over government expenditure on compensations to employees and transfers' in the 1st quarter of 1956 should be 26.3 (instead of 26.9, as in the original version), and then entries 5 + 6 + II add up to 39.6; (ii) the 'national income inclusive of consumer services' in the 1st quarter of 1956 should be 366.6, i.e. the sum of entries I, II, and III (in the original version it is 336.6).

[3]
See 'Economic Problems of Production Automation in Capitalist Countries', this volume.

[4]
In Table 56 a printing error was corrected in the index of 'national income inclusive of consumer services' in the 1st quarter of 1961, which should be 398.1, i.e. the sum of entries I, II, and III (in the original version it is 398.9).

[5]
Certain aspects of the changes in socio-political relations and in the conditions and forms of the class struggle in the developed capitalist countries after the Second World War, connected with the working class and the masses becoming more conformist, were taken up by Kalecki later, in 'Observations on the "Crucial Reform"', this volume.

Economic Aspects of West German Rearmament

[1]
First published in *Ekonomista*, 6, 1961, pp. 1245–50. A revised version of this article was subsequently included in Kalecki's *Sketches on the Functioning of Modern Capitalism*, pp. 43–52. This version has had several translations: the

French, 'Les Aspects économiques de la remilitarisation de l'Allemagne Occidentale', appeared in *Annuaire Polonais des Affaires Internationaux*, 1962, pp. 73–82; the English, 'Economic Aspects of West German Rearmament', was published in *Economic Weekly* (India), 12 May 1962, pp. 775–80; the Italian, 'Aspetti economici della militarizzazione nella Germania occidentale', appeared in Kalecki's *Sul capitalismo contemporaneo*, pp. 81–9; the Spanish, 'Aspectos económicos de la militarización en la Alemania occidental', was published in Kalecki's *Sobre el capitalism contemporáneo*, pp. 81–92. According to a private communication of A. Szeworski to the editor of Kalecki's *Collected Works*, a German translation of this article probably also appeared in the FRG. Kalecki asked Szeworski to translate it into German and sent a typescript to one of the German trade union organizers with a request to publish it; neither the addressee nor the journal in which the article might have appeared have been established, however.

The permission of *Economic Weekly* to reproduce the English translation of this article is gratefully acknowledged.

In the Preface to the *Sketches* Kalecki wrote:

> The subject-matter of the next study, on 'Economic Aspects of West German Rearmament' ... is already somewhat different, owing to the specific position of the FRG in the capitalist camp. We try to answer the question of what economic interest West Germany has in a rapid increase of armaments which does not serve, at least directly, the stimulation of the business upswing. (p. 8)

PART 5
Further Developments of the Theory of Economic Dynamics

Observations on the Theory of Growth

[1]

First published in *Economic Journal*, 72/2, 1962, pp. 134–53. A slightly revised Polish translation appeared in J. Zawadzki and A. Łukaszewicz (eds.), *Theories of Economic Growth and Modern Capitalism*, Warsaw, KiW, 1962, pp. 49–76 (in Polish). The publishers' permission to reproduce this article is gratefully acknowledged.

The great depression of 1929–33 seemed to have undermined the foundations of neo-classical economics. Kalecki's and Keynes's theories were also directed against this doctrine. Yet after the Second World War there was a return to it. Keynes himself partly contributed to this by asserting that once the government assured full employment, the old doctrine would regain its validity. Nearly full employment of labour and capital equipment during the war and in the following years also contributed to the doctrine's revival.

The returning wave of neo-classical economics brought dozens of models of growth of the capitalist economy in which full employment was always assumed. These models differed from the old orthodoxy mainly in that the analysis of static equilibria was replaced by analysis of steady, full-employment growth paths. A new branch of economics appeared: the 'neo-neo-classical' theory of growth of the capitalist economy (for a thorough discussion of its output up to 1964, see F. H. Hahn and R. C. O. Matthews, 'The Theory of Economic Growth: A Survey', in *Surveys of Economic Theory*, vol. ii, London, Macmillan, 1965, pp. 1–124). It is against this background that Harrod's paper should be examined. In contrast to the main trend of this model-building, he pointed out that the long-term growth of the capitalist economy is unstable by nature, and hence cyclical fluctuations must take place around a positive trend line.

Kalecki was always very critical of the neo-neo-classical theory of growth. He emphasized its detachment from reality and especially the unrealistic assumptions about the nature of capitalist society which underpinned it (see especially his 'Theories of Growth in Different Social Systems', *Collected Works*, vol. iv). He regarded attempts made by the neo-neo-classical economists to provide Harrod's growth equation with stability as pointless, and as misrepresenting the basic problem of capitalist reproduction. The core of this problem was, in his opinion, whether or not there are in the capitalist system some endogenous factors that could make cyclical fluctuations take place around a positive growth trend. For the cyclical nature of capitalist reproduction was for Kalecki undebatable, and resulted from the very essence of the capitalist mode of production. While the watershed between the neo-neo-classical theories of growth and Harrod's theory was whether the capitalist economy could or could not develop altogether without cyclical fluctuations, the major difference between Harrod's and Kalecki's theories was whether—in the absence of exogenous factors—cyclical fluctuations took place around the trend line, or around a static position.

A careful examination of Harrod's theory, which included Harrod's earlier paper, 'An Essay in Dynamic Theory' (*Economic Journal*, Mar. 1939) and his later article 'Domar and Dynamic Economics' (*Economic Journal*, Sept. 1959) gave rise to doubts as to the correctness of Kalecki's criticism of Harrod's theory, however.

Kalecki's argument is based on the assumption that in Harrod's model 'investments were assumed to be determined by purely endogenous factors' (the acceleration principle). But Harrod limited the role of the accelerator primarily to investments induced by changes in income, and in his theory the latter do not exhaust the total investments of the system. In other words, the accelerator 'does not imply that there are no other forces governing [the] current level of orders'. 'In my original *Essay* [*in Dynamic Theory*] I distinguished between those orders governed by the acceleration principle, those that are dependent rather on current level of income ... and those unrelated to either .... Professor Hicks has developed the distinction between the first and the last mentioned, calling the former "induced" and the latter "autonomous" investment. For the instability principle to be valid, all that is required is that *some* current orders should be dependent on the acceleration principle.' (E. Domańska, *Problems of Economic Growth*, Warsaw, PWE, 1968, pp. 63–4 (in Polish); her quotations are from Harrod, 'Domar and Dynamic Economics', p. 461.)

Hence one might argue that if Kalecki allowed for Harrod's category of 'autonomous' investments, which in a sense correspond to investments caused by 'semi-exogenous' factors in his own approach, this would lead to a similar solution of the problem of the long-term growth rate: in Harrod's model the 'autonomous' factors, and in Kalecki's theory the 'semi-exogenous' factors, would be responsible for the positive long-term growth rate. Harrod, however, who usually distinguished induced from autonomous investments, did not introduce the latter into his formal analysis of the determinants of investments in the study which Kalecki criticized; he dealt there only with induced investments (see his 'Notes on the Trade Cycle Theory', p. 272). His basic, modified theorem on the determinants of investment decisions of an individual entrepreneur also allows for induced investments only (ibid. 274), and Kalecki showed the consequences of such an approach (for a detailed examination of Kalecki's criticism of Harrod's approach, see Nasiłowski, *On the Theory of Growth of Developed Capitalism*, pp. 67–106). It was only other economists, among others Sir John Hicks, who began to construct more developed models of business fluctuations superimposed on the long-term growth trend, based on the distinction between induced and autonomous investments (for Kalecki's position on these attempts and on his own approach in the 'Observations on the Theory of Growth', see his 'Trend and the Business Cycle', this volume).

[2]
In the revised Polish edition there follows a footnote:

If we ignore foreign trade, changes in inventories and government expenditures and incomes, then the national income equals investments in fixed capital and consumption. On the income side the national income is split between wages and profits. According to our assumptions, wages are wholly spent on consumption and profits are divided between capitalist consumption and savings. Thus the national income equals the sum of expenditures of capitalists and workers on consumption, plus savings. It follows that savings are equal to investments in fixed capital. Of course, the capitalists who invest need not be the same as those who save, since the former may contract debts with the latter.

[3]
The quotation is from *Theory of Economic Dynamics*, p. 281 above.

[4]
In the Polish edition Kalecki writes here of 'the rate of profit in the whole economy'.

[5]
In the Polish edition Kalecki added here: 'i.e. the correction will not be greater than the value of the disproportion itself'.

[6]
One can easily see, however, that—as in the case of unstable growth examined by Kalecki—the condition for the existence of positive solutions is $\alpha + \delta < 1$. For the inclination of the tangent at the point where the parabola intersects the ordinate axis is $\alpha + \delta$; if $\alpha + \delta \geqslant 1$, the parabola will not have common points with the straight line $0M$. In fact, for equation (40) to have positive solutions an even more stringent condition than $\alpha + \delta < 1$ must be met, since for sufficiently large values of ε, equation (40), despite the fact that $\alpha + \delta < 1$, may not have positive solutions. For instance, assuming with Kalecki the values $\alpha + \delta = 0.7$ and $\beta + \gamma = 4$, we have: $\phi_{t+1} = 0.7\phi_t + 4\phi_t\psi_t + \varepsilon$. Since, for stable growth, $\phi_{t+1} = \phi_t = \psi_t$, we have:

$$4\varphi^2 - 0.3\varphi + \varepsilon = 0$$

This equation will have real solutions only for $\varepsilon \leqslant 0.0056$ (for $\varepsilon = 0.0056$ both solutions are the same and equal to 0.00375). Kalecki mentions the existence of such a 'critical' value of ε later on (see p. 431).

Trend and the Business Cycle

[1]
First published as 'Trend and Business Cycle Reconsidered', *Economic Journal*, 78/2, 1968, pp. 263–76; repr. with minor changes in Kalecki, *Selected Essays on the Dynamics of the Capitalist Economy, 1933–1970*, pp. 165–83 (for translations of this collection, see pp. 528). A Spanish translation of its original version, 'Tendencia y ciclos económicos: una reconsideratión', appeared in *Economía y Administración*, 16, 1970, pp. 39–55 (Special number in honour of Kalecki, Chile, University of Concepción). A Swedish translation, 'Trend och koniunkturcykel', appeared in Kalecki, *Tillväxt och Stagnation i Modern Kapitalism*, pp. 187–205. A German translation, 'Trend und Konjunkturzyklus', appeared in Kalecki, *Werkauswahl*, pp. 129–31, and in Kalecki, *Krise und Prosperität im Kapitalismus*, pp. 193–211. A Portuguese translation, 'Tendência e Ciclo Econômico', appeared in Kalecki, *Crescimento e Ciclo das Economias Capitalistas*, pp. 105–22.

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In the often-quoted passage of his introduction to the 1971 Cambridge Univ. Press collection of his essays, Kalecki writes:

It is interesting to notice that the theory of effective demand, already clearly formulated in the first papers, remains unchanged in all the relevant writings, as do my views on the distribution of national income. However, there is a continuous search for new solutions in the theory of investment decisions, where even the last paper represents—for better or for worse—a novel approach. (p. viii; see also 'Why Economics Is Not an Exact Science', *Collected Works*, vol. v.)

This search strongly intensified in the 1960s, possibly in connection with the publication of his 'Observations on the Theory of Growth'. As may be guessed from whatever little survived of their correspondence, Joan Robinson was much involved in Kalecki's revision of his approach to the question of determinants of the trend and the cycle. In a letter of 15 Feb. 1964, Kalecki wrote:

Dear Joan,

Thank you for your letter which I found after my return from Prague at the end of January (I attended a conference there). I wished to answer your point concerning long run growth in detail (I think that your golden-age may but need not exist, and if it exists it is unstable). This, however, would take some time and I have been recently busy in connection with my resignation from the Planning Commission. I am leaving it in the middle of the year retaining of course my professorship at the School of Planning and Statistics. Hence the delay in my reply.

In a few days time I shall [send] you the translation of the last part of my Polish book: *Money and Real Wages*. You may like to have a glance at it before you will have written [*sic*] the preface ....

Before long I shall write to you as well on the point of our dispute.

Yours
Michał

(Joan Robinson's papers, King's College Library, Cambridge. The 'Preface' mentioned in the second paragraph is to Kalecki's *Studies in the Theory of Business Cycles, 1933–1939*.) Then, on 16 Oct. 1964, Kalecki wrote:

Dear Joan,

Thank you for your letters from China of 25 and 27 September. In your second letter I have not discovered any trace of having read my paper except that you denote by A the accumulated entrepreneurial savings. In fact this letter is nothing but a repetition of that of 8 January. Now, as to particular points you make:

(a) In the paper I sent you I do not start from the business cycle but from the trend.

(b) I did not say ever that the 'firms invest all finance they can get'. The principle of increasing risk was to show that they may not be willing to borrow as much as they could.

(c) Nevertheless it is true that commitments (i.e. volume of capital equipment plus pending investment orders) are an increasing function of P/K and this is just a starting point of my paper.

(d) As a result of the subsequent discussion I arrive at the Fig. 1 [of the MS] which determines the rate of growth of your 'golden age'. (The point of intersection A.) However, from the argument developed in my *EJ* [1962] paper it follows that this rate of growth is ephemeral because a small downward deviation from this rate leads to the reversal of the trend.

(e) The effect of technical progress on the path, physically possible, to which you refer is obvious but there is *in addition* an effect upon investment decisions. As a result of the continuous stream of innovations the rate of investment decisions is higher than it would be otherwise. This leads to a situation represented on Fig. 2 [of the MS], where the rate of growth determined by the point of intersection B is stable.

(f) However, around this steady growth fluctuations take place which I show in the last part of my present paper. As contrasted with my *EJ* paper, I start from trend here and construct the business cycle equation on the basis of the stable trend. The mechanism of the business cycle is the same as in the 'Theory of Economic Dynamics'. ...

(Extract from a copy which survived in Kalecki's papers. The paper referred to in this letter must have perished.) In the next letter, of 17 Nov. 1964, no more mention is made of this subject, the letter being wholly devoted to Joan Robinson's preface to Kalecki's *Studies*:

Dear Joan,

Thank you for your letter. You mention the problem of wages in Keynesian theory for the first time on the appended p. 4 [of the MS] of the Preface without referring to the problem of employment. However, to meet your wishes I suggest drafting the paragraph in question as follows:

'The second theme of the General Theory—the interaction between money wage rates, prices and employment, was no less important than the first. This theme is clearly sounded in the third essay and elaborated in the fifth.'

You may find it queer that I pester you so much with this passage. But what you advocate in it by implication is in fact a wage-stop in a capitalist system without even commenting on the political and economic problems involved.

If your Chinese friends after having read this passage in the original version did not call you a fascist it would only show how deeply they appreciate your benevolence.

Let me know, please, whether you accept my present proposal.

Yours,
Michał

In 1971 Joan Robinson commented on her dispute with Kalecki (with reference also to the above-quoted passage of his introduction to the 1971 Cambridge Univ. Press edition of his essays, and noting at the same time that she 'learned far more, over thirty-five years, from the arguments with Kalecki that [she] lost than from those that [she] won'):

This was the subject about which I was arguing with him, on and off, for many years. He maintained that inventions (technical progress) raise the prospects of profit for capitalist firms and so encourage investment. I followed Keynes and Marx regarding the desire of capitalists to expand their operations as an inherent characteristic of the system. I expressed this view in Keynes' phrase about 'animal spirits' which caused Kalecki to regard it as somehow irrational. I pointed out that technical progress *permits* accumulation to go on faster than the labour force is growing but it cannot cause high profits, for if accumulation is actually going on steadily, Kalecki's own theory shows that the rate of profit on capital will be constant. In the paper referred to in the Introduction, 'Trend and the Business Cycle', he compromised with me, pointing out that at any particular moment some go-ahead firms are installing equipment embodying the latest inventions in the hope of gaining a higher rate of profit than the average at the expense of their rivals. Thus it can be true that inventions may stimulate investment and that the overall rate of profit may be constant over the long run.

The problem of accumulation in the long run comes up again in the essay on Tugan-Baranovsky and Rosa Luxemburg which, in Kalecki's usual terse style, opens up a huge field of speculation in a few paragraphs. Here my dispute with him comes up again. I do not think he does justice to Rosa Luxemburg's vision of the long-run problem of investment opportunities drying up when the geographical expansion of capitalism comes to an end. (Robinson, *Collected Economic Papers*, vol. iv, pp. 90–1.)

In Poland Kalecki discussed his paper with Joanna Gomułka, Stanisław Gomułka, Cezary Józefiak, Kazimierz Łaski, and Władysław Sadowski. Their common memory of these debates is that he was not wholly satisfied with the solution to the problem of combining the trend and the cycle factors which he put forward in the earlier draft of this paper, or in its published version. In 1967 Kalecki read this paper at a meeting of the Polish Economic Society, in Warsaw; records of this meeting have not survived, however.

After the article was published, a former student of Kalecki wrote to him:

I have been deeply attracted by your last article in the 'Economic Journal', June 1968. I think on the basis of the theory of investment decisions you develop there, it is possible to analyze the influence that an increase in the degree of industrial concentration may exert upon the process of investment—and long-run growth of capitalist economies.

With this purpose in mind, I write to you since presently I cannot any more disturb you personally—in order to present my interpretation of your theory; how I think concentration may affect the various parameters involved and—what is for me the most important—to consult you on some specific points which are not very clear to me.

Your general formula of investment decisions (10) (p. 442), reads:

$$D_t = eI_t + r[(n\Delta P_t + \delta P_t)/\pi - I_t] + B(t)$$

I think e can be assumed to be determined by the policy of the firms in regards to distribution of profits. Therefore, it would depend on how the firms visualize future investment outlay, and indebtedness possibilities in the capital and money market. So an increase in concentration would affect D_t and e in the same direction, and nothing can be concluded in respect to e before the overall effect upon D_t is ascertained.

r you define as a coefficient measuring the intensity of the reaction of entrepreneurs to the difference $i(\pi) - I$ (p. 441). This coefficient of responsiveness, I believe, depends on how entrepreneurs evaluate the persistence of a certain situation; i.e. if they think that a boom will persist, r will have a certain value, if they think it is an ephemeral phenomenon, r will be smaller. In order to make their evaluation, two factors are likely to be considered: the tendency of profits p and utilization of equipment u, during some previous years. Therefore:

$$r = f(p, u)$$

Here again no conclusion in regard to p may be advanced before analyzing the overall effect upon D_t and y, which is the aim of the inquiry. However, if we agreed with Dr Steindl in that an increase in concentration leads to a decrease in utilization of equipment, we have a first negative influence upon D_t and y.

P_t, the part of the increment in 'real' profits captured by new investments, may be assumed to be also determined by the degree of utilization of equipment. This is at least what I understand when you state: 'Since ample unused productive capacities are postulated to be in existence, new investments will capture only a part of profits ... ' (p. 439). Does that mean that if the degree of unused capacity increases, n decreases? I do not see very clearly the relationship between P_t and u, and I would like to ask you [for] a brief explanation about it.

As to δP_t, I think it depends on the rate at which technical progress is incorporated into new investments. If so, it cannot be studied 'independently of $B(t)$, ... which is a direct outcome of innovations'. Innovations I interpreted in a broad sense, including both new products and new methods for producing the same output—and also reductions in the price of inputs of old methods.

The effects of industrial concentration upon $B(t)$ are apparently two, with opposite directions. In the first place, there is a positive impact, in as much as a large part of the research programs are conducted mainly by big firms, and they seem to be subjected to increasing returns in relation to size.

But on the other hand, since in more oligopolistic industries price competition is somewhat avoided—the place being taken by quality competition and sales efforts—the prices of inputs do not fall in accordance with technical progress.

If my interpretation of your theory is correct, it would therefore follow that no outright conclusion as to the overall effect of industrial concentration upon the dynamism of the system for developed capitalist economies can be adduced. In fact, the upward push produced upon technical progress—via multiplication of Research Programs in large concerns—by concentration, may more than compensate the depressing influence upon the remaining variables. Moreover, in the case of underdeveloped capitalist countries, it appears to me that it is possible to say that concentration has a depressing effect, since, as technical progress is imported, the positive impact upon $B(t)$ is absent. (Extract from a letter from Julio López Gallardo dated 2 Jan. 1969; the author's permission to reproduce it is gratefully acknowledged.)

Kalecki replied on 4 Feb. 1969:

Dear Mr López,

Thank you for your letter which I am sorry to answer so late. Your general conclusions may be right but your argument is somewhat loose. I shall consider it point by point.

(1) According to my definition e is the relative share of entrepreneurial savings in total savings. Thus it depends on the distribution of savings between entrepreneurs (their savings are undistributed profits plus savings out of dividends of controlling shareholders) and rentiers. This distribution is really determined by past development; for the sake of simplicity I assume it constant and I agree with you that it is difficult to relate it to concentration.

(2) I do not agree with you that r depends necessarily on the degree of utilization of equipment. The change in this degree is already reflected in $I(\pi) - I$ (see p. 441). In fact r shows to what extent the entrepreneurs react in their investment policy to how are doing [*sic*] these entrepreneurs whose establishments started to work in the period considered. Also in this case there is no clear-cut relation of the parameter in question r and concentration.

(3) n shows the impact of the increment of profits on that investment which will fetch the rate of profit π if we abstract from technical progress. As long as the capacities of existing firms are not exhausted, n to my mind may be taken as a first approximation as constant if there is an increasing tendency of concentration.

(4) On the other hand you do not make use of my indications as to the direct relation between δ and the degree of monopoly (pp. 439, 449, 450) from which you may conclude that the tendency for the progressing concentration causes through this channel a declining tendency in δ.

(5) δ depends also on the increase in productivity resulting from technical progress (p. 440). This rate, as also that of $B(t)$, will be affected positively by monopolistic practices, as you say.

Thus (4) and (5) taken together confirm your final conclusions, although I am not sure about your pronouncement on underdeveloped countries since big firms adopt more quickly foreign technical progress.

Personally, I think that the tendency for concentration has on balance a negative influence on change in δ and the rate of growth of $B(t)$. This was fairly certainly the case until the relatively recent phase where a rapid development of systematic research started. Thus rising concentration would impede growth, especially that of national income (see pp. 440–1, 449–50). (Extract from correspondence which has survived in Kalecki's papers.)

The problem of interpretation of Kalecki's equation of trend and business cycle was taken up in the mid-1970s by Stanisław Gomułka, in his unpublished paper 'Trend and Business Cycle: A Note on Kalecki's Theory of Growth under Pure Capitalism'. This paper led to a correspondence between the author and J. Steindl on the question of interpretation of Gomułka's results concerning the conditions for stability of the solution to Kalecki's equation. Since some formal results about the equation and the conditions for stability are of more general interest, Prof. Steindl agreed to write a short comment on this subject.

Kalecki's trade cycle theory in its first version (*Econometrica* 1935) has been represented by a mixed difference–differential equation with a backward argument:

$$I(t-\theta) = aI(t) - b\dot{I}(t) \tag{1}$$

This equation has been thoroughly investigated by Frisch and Holme (*Econometrica* 1935) and holds no surprises.

All the later versions of Kalecki's theory have been represented by an equation of the type

$$I(t+\theta) = aI(t) + b\Delta I(t) \tag{2}$$

where

$$\Delta I(t) = I(t) - I(t-1)$$

This was always written with a finite Δ. None the less, many readers have tended to regard it as an approximation to the mixed difference–differential equation:

$$I(t+\theta) = aI(t) + b\dot{I}(t) \tag{3}$$

which in contrast to (1) has a forward argument. Equations (2) and (3) have not been analyzed in the same way as (1).

From an unpublished work of Dr Stanisław Gomułka, London School of Economics, it appears that the equation (3) yields explosive cycles with a period smaller than the lag θ. As a result the initial conditions do not fade out in the solution and the process is not ergodic.

This speaks against using equation (3). It appears that Kalecki knew very well why he wrote finite differences and that he did it on purpose. This can also be explained in economic terms. The last term in (2) and (3) indirectly relates to the influence of a change in profits on investment. Now, business executives would hardly observe the change in profits from one second to the next, but much rather from one year to the next, when they decide about investment. The equation (3), in other words, implies unreasonable economic assumptions as well as absurd results and is not a proper interpretation of Kalecki's theory.

Intuitively, it would seem that if the time unit in equation (2) is sufficiently small, the same troubles as in equation (3) would arise also here. There exists a certain critical value of the time unit in (2), which must be exceeded if explosive solutions are to be avoided. Dr Gomułka has obtained results on this which are as yet unpublished. In Kalecki's practical examples a time unit of one year is assumed and it appears that this is sufficient to avoid unsuitable solutions of the equation. (Comment by J. Steindl, attached to his letter to J. Osiatyński dated 20 Jan. 1978.)

Further discussions led to 2 papers: J. Steindl's comparison of the 3 successive versions of Kalecki's theory of the business cycle, and the previously mentioned study by R. C. Davis, S. Gomułka, and A. Ostaszewski. While the latter is still a work in progress (it demonstrates, among other things, that, starting with the 1943 version of Kalecki's theory, solutions to his business cycle-cum-trend equations are in fact unstable), the former follows below as Annex 3 (see also Sordi, 'Some Notes on the Second Version of Kalecki's Business Cycle Theory').

ANNEX 3

Some Comments on the Three Versions of Kalecki's Theory of the Trade Cycle[1]

JOSEF STEINDL

1. Kalecki has given us three versions of his theory of the trade cycle, dating respectively from 1933,[1] 1943,[2] and 1968.[3] The difference between these versions concerns almost entirely the investment function (the equation explaining investment or investment decisions).

The first version received a certain amount of comment, especially a thorough mathematical analysis by Frisch and Holme;[4] the later versions much less so, which may justify the rudimentary comments of these pages, inadequate though they are.

The *first version* (of 1933) explains the rate of investment decisions D as a linear function of the current rate of profit P/K.[5]

$$D(t)/K(t) = mP(t)/K(t) - n \tag{1}$$

$$P(t) = C_1 + A(t) \tag{2}$$

$$D(t) = m[C_1 + A(t)] - nK(t) \tag{3}$$

where K is capital stock; $P(t)$, the volume of profits, in Kalecki's closed model equals capitalist consumption C_1 (assumed constant) plus the production of investment goods $A(t)$. The latter is obtained as a moving average of

[1] First published in N. Assorodobraj-Kula *et al.* (eds.), *Studies in Economic Theory and Practice: Essays in Honor of Edward Lipinski*, Amsterdam, North-Holland, 1981, pp. 125–33. The publishers' permission to reproduce this article is gratefully acknowledged.

[1] *Essay on the Business Cycle Theory*; see also 'A Macrodynamic Theory of the Business Cycle' (1935); 'A Theory of the Business Cycle' (1937).

[2] *Studies in Economic Dynamics*; see also *Theory of Economic Dynamics* (1954).

[3] 'Trend and the Business Cycle'.

[4] 'The Characteristic Solutions of a Mixed Difference and Differential Equations Occurring in Economic Dynamics', *Econometrica*, 3/2, 1935; see also *Collected Works*, vol. i.

[5] I follow Kalecki's notation except where it changes from one version to the other.

investment orders $D(t)$ over the period of gestation of investment goods:

$$A(t) = 1/\theta \int_{t-\theta}^{t} D(\tau)d\tau \tag{4}$$

The deliveries of finished investment goods $L(t)$ (plant and equipment) follow the investment orders with a lag θ (the gestation period):

$$L(t) = D(t - \theta) \tag{5}$$

Differentiating equation (3) with respect to time, we obtain

$$\dot{D}(t) = m\dot{A}(t) - n\dot{K}(t) \tag{6}$$

$\dot{A}(t)$ can be obtained from equation (4) by differentiation:

$$\dot{A}(t) = 1/\theta[D(t) - D(t - \theta)] \tag{4a}$$

and $\dot{K}(t)$ equals deliveries of investment goods minus depreciation U (assumed constant):

$$\dot{K}(t) = L(t) - U = D(t - \theta) - U \tag{7}$$

We have, then, from equations (6), (4), and (7) an equation explaining investment decisions (and therefore, indirectly, deliveries of investment goods):

$$\dot{D}(t) = m/\theta D(t) - (m/\theta + n)D(t - \theta) + nU \tag{8}$$

Over the cycle as a whole, the accumulation of capital is assumed to be zero: the cycle is viewed against the background of a stationary long-term development, simply to facilitate the analysis ('pure business cycle').

Crucial for an explanation of the cycle are the turning-points. In this version they occur because the accumulating (or shrinking) capital stock reacts back on the rate of profit. A high (low) rate of profit, via the accumulation of capital, sets up a negative feedback which lowers (increases) the rate of profit again.

In the *second version* (of 1943), the profit rate as the unique determinant of investment decisions is replaced by two separate sets of determinants: financial resources available to the firm on the one hand and its marketing prospects on the other.

Financial resources are represented by the current saving of the business. This will seek an outlet and therefore will normally induce new investment decisions. The volume of investment decisions is, however, in general smaller than the volume of saving which induces it ('incomplete reinvestment'). This is the more true if we consider, as happens in Kalecki's equation (below), not only business saving but all saving: the saving outside business offers no inducement to invest, as business saving does; therefore total saving is even more subject to 'incomplete reinvestment' than business saving is.

The marketing prospects of firms are represented by the increase in sales in the current period, more precisely by the increase in profits which are the reflection of the increase in sales. On the other hand, the marketing prospects

are adversely affected by the increase in capital which means more competition, and more claims for the available volume of profits.

Thus we have the following equation for investment decisions:

$$D(t) = aS(t) + b\Delta P(t)/\Delta t - c\Delta K(t)/\Delta t + d \tag{9}$$

The parameter $a < 1$ (incomplete reinvestment).

Unlike version 1, this version does not distinguish between the production of investment goods and the delivery of the finished plant and equipment. Both follow the investment decisions with the same lag:

$$I(t + \theta) = D(t)$$

The increase in profits $\Delta P/\Delta t$ (reflecting the increase in sales) represents an accelerator, although Kalecki interprets it in a way slightly different from the usual one: the increase in profits (or sales) makes it possible to overcome the barriers of imperfect competition and thus makes room for new investment.

2. It is worth noting that in version 2 Kalecki has in fact downgraded an idea which was prominent in the first version: the negative feedback from capital accumulation acting back on profit rate and investment decisions. He argues (defending his assumption of a constant depreciation term) that the capital stock fluctuates only moderately during the cycle, at most 4% up or down.[6] He is aware of the damaging effect of this for his earlier theory[7] and seems to rely more on the incomplete reinvestment of savings for an explanation of the turning of the cycle. Yet in another place[8] he insists again on the importance of the negative feedback of capital accumulation. This is hardly surprising in view of the large role of this factor in version 1 ('the tragedy of investment is that it causes a crisis because it is useful' were the concluding words of the 1937 essay).

3. Version 3, which offers many new aspects, has something relevant to say about the above question, although this is never explicitly mentioned.

In this version, innovations and technical progress are introduced into the model of the business cycle. Each year there is an increment of capital, the new investment (embodying new and efficient methods), and there is an increment (positive or negative) in profits (reflecting an increment in sales). The yearly increment in demand and in profits divides itself in a certain way between the old capital and the new investment. The old capital, owing to imperfect competition, tends to retain the markets and profits it had before, but it is forced to give up some of them to the more efficient new investment. The extent of this shift in demand from the old to the new investment depends on the size of the productivity advantage which the new investment has over the old one. This advantage—a measure of the speed of technical progress—is assumed to remain constant over the course of the cycle.

[6] See p. 311 above. [7] See p. 288 n. 53. [8] See above, pp. 305–6.

The new investment depends for its remuneration (i) on the increment in total profits, and (ii) on the extent to which it can siphon off profits from the old capital. If this shift is a constant element during the cycle, then the profitability of the new investment depends on its relation to the increment in total profits.

Thus if the rate of investment in the course of the boom ceases to grow, and the increment of profits, consequently, disappears, the new investment will get no profits apart from what it can gain from the old capital by competition.

Basically, we have here the same story of the turning-point as in version 1, with one difference only: while formerly the average rate of profit was considered, it is now a marginal profit rate—the profit rate on the new investment only. In version 1 the continuing but no longer increasing investment led to a decline of the average profit rate on the total capital stock. In version 3 the basic situation is the same, but the profit rate on the new investment declines more sharply than the average on the capital as a whole. By attributing to the old capital a considerable power to retain its profits (modified only to the extent of the shift induced by the productivity differential), Kalecki demonstrates that the greater part of the change in profitability in the course of the cycle is thrown on the new investment. And it is the profit rate on the new investment which accounts for the further investment decisions.

It appears that Kalecki, without wasting a single word on it, has here got rid of the dilemma discussed in the previous paragraph: in spite of moderate fluctuations in the capital stock, the feedback of accumulation does operate, because the changes in profitability are concentrated on the new investment—and it is that which matters.

It will be noted that by concentrating on the marginal quantities—the increment in profits—this version (at least in a formal sense) again uses the acceleration principle, which explains why the equation in version 3 is essentially of the same form as in version 2.

4. I am switching now to a different topic. In presenting version 2, Kalecki at one point maintains that his version 1 is a special case of version 2.[9] This is puzzling, because the equation of the business cycle is really very different in the two versions.

To begin with, the equation in 2 is in terms of finite differences, whereas in 1 it is a mixed difference and differential equation:

$$\text{Version 1:} \quad y(t-\theta) = my(t) - n\dot{y}(t) \tag{10}$$

$$\text{Version 2:} \quad y(t+\theta) = my(t) + n\Delta y(t)/\Delta t \tag{11}$$

If we let Δt shrink and replace the last term $\Delta y/\Delta t$ in equation (11) by a differential $\dot{y}(t)$, we can see what dissimilarities still remain in the two

[9] See p. 286 above.

equations. One has a backward argument $(t-\theta)$, the other a forward argument $(t+\theta)$. The difference is crucial. Stanisław Gomułka (London School of Economics) has shown in an unpublished paper that the difference–differential equation with the forward argument $(t+\theta)$, unlike the old equation (10) analysed by Frisch and Holme, yields explosive cycles with periods less than θ for all positive m, n, and θ. That means that the initial conditions (given by the function $y(t)$ in a period of length θ) will not disappear. The equation in this form (with a differential instead of the difference) would be useless. This can also be seen in economic terms. It would be senseless to suppose that businessmen observe the course of profits every second, and respond to every momentary jerk with new investment decisions. If they did, the chance movements (shocks) of the initial period would be continually magnified and would quickly explode.

These difficulties may even persist in the difference equation (11) if the time unit Δt is sufficiently short. As S. Gomułka showed, Δt must have a certain minimum length if explosive behaviour is to be avoided. Kalecki seems to have thought of a period of one year,[10] and it can be easily shown that then these difficulties do not exist.

The claim that version 1 is a special case of version 2 must not, however, be taken literally. The special thing about version 1 is that it assumes complete reinvestment, instead of incomplete, as in version 2. Here Kalecki really only wants to explain his motive for producing version 2: from the earlier theory it would seem to follow that a constant profit rate calls forth a constant rate of investment. That, in reality, is not possible because of the incomplete reinvestment.[11]

The dissimilarity between the two versions can, however, be seen in another feature, as I shall show now.

5. What is the economic substance behind the difference in equations (10) and (11)?

There are two alternative approaches to the explanation of investment decisions. We may confine ourselves to the recent changes in the relevant circumstances (variables), that is, for example, for the last year the rate of business savings, the increase in sales or in profits, and the increase in plant and equipment. This is the approach of version 2 (and 3)—the marginal determination, we might call it. This brings out the most essential features, but it does leave out others: the financial resources of the firm depend not only on recent saving, but also on that of preceding years. The indebtedness in relation to the firm's risk capital will be relevant. And the current saving will be judged differently if there are already large investment projects under

[10] See Kalecki, 'Observations on the Theory of Growth', this volume, and statistical illustrations in his *Theory of Economic Dynamics*, p. 313 above.

[11] See pp. 287–8 above.

construction. Equally, not only the recent increase in sales (or profits) is relevant, but also the level of sales in relation to the level of productive capacity: it is the weakness of the acceleration principle that it pays no attention to how much unused capacity there is.

Thus a full account of the influences on investment decisions would list not only recent changes, but the integral values which result from earlier changes: volume of sales, profits, etc. We might call it the integral determination. This corresponds to the approach of version 1.

An important reason for the dissimilarity between the two versions is, therefore, the contrast between the marginal and the integral approach. This explains the dissimilarity of equations (10) and (11). In equation (11) investment depends on the change in profits, and therefore on the change in investment, in the past. The 'forward lag' is due to the acceleration principle.

In version 1 the investment decisions are determined by profit and capital, which are obtained by integration of investment over certain periods of the past. This gives in the first place an integral equation

$$D(t) = m/\theta \int_{t-\theta}^{t} D(\tau)\,d\tau - nK(t) \qquad (12)$$

from which, by differentiation, equation (8) results, which is already identical with the equation of the business cycle, equation (10).

The 'marginal' approach tends to yield more unstable solutions than the alternative approach. Which of the two is more realistic depends largely on how well simulations of either model will be able to mimic the empirically observed patterns of the cycle.

6. All this does not mean that the 'marginal' approach and the acceleration principle is the essence of version 2. Its essence, rather, is the separation of the two sets of influences, financial resources and demand for the firm's products. It will be shown that these undoubted advantages of version 2 can be retained also if the acceleration principle is discarded.

It would be natural, it seems, to introduce demand more directly, in the form of the degree of utilization of capacity. The investment decisions could be determined as follows:

$$D(t)/\mathrm{K}(t) = aS(t)/\mathrm{K}(t) + b[y(t)/\mathrm{K}(t) - u_0] \qquad (13)$$

where K is the capacity, y gross product, $y(t)/\mathrm{K}(t)$ is the actual utilization, and u_0 is a normal or desired utilization. In other words, the capital stock of version 1 is here replaced by capacity, and the profit rate by utilization. Clearly this resembles a 'stock adjustment' which replaces the 'accelerator' of version 2. It will be shown that, using equation (13), we get back to the old form of the equation of version 1. We have only to reintroduce the distinction, made in version 1, between (i) investment decisions D, (ii) output of investment goods A, and (iii) deliveries of investment goods L.

From equation (13) we have

$$D(t) = aS(t) + by(t) - bu_0\mathrm{K}(t) \qquad (14)$$

With the same simplifications as used in version 1 (budget deficit and foreign balance nil and no change in inventories), we can again put

$$S(t) = A(t)$$

The gross national product is obtained from a multiplier relation

$$y(t) = \mu A(t) + y_0$$

The investment output results from an integration of unfulfilled orders over the uniform gestation period θ (see equation (4)).

We write equation (14) in the form

$$D(t) = (a + b\mu)A(t) + by_0 - bu_0\mathrm{K}(t) \qquad (15)$$

and after differentiation we obtain, also using equations (4a), (5), and (7)

$$\dot{D}(t) = [(a + \mu b)/\theta][D(t) - D(t-\theta)] - bu_0[D(t-\theta) - U] \qquad (16)$$

This is, in fact, the old equation (8) analysed by Frisch and Holme.

We have here again to face the objection, made above in the case of the capital stock, that capacity fluctuates only moderately in the course of the cycle. This might be modified if we consider that retirement of capacity is often deferred in the boom and 'forced' in the recession. But apart from this there is a consideration inherent in the stock adjustment: a relatively small excess of capacity over the desired level will mean a much greater change in the volume of net investment, if it were to bring capacity back to the desired level. (If capacity, for example, is too large by 2%, and net investment is 6% of capacity by value, then it would have to be reduced by a third to adjust the capacity to the desired level. Of course, the adjustment will only be partial, but it may still be substantial.)

It must be stressed that the discussion of this paragraph does not follow Kalecki's own line of reasoning. He explicitly rejected the capacity concept,[12] because it was doubtful whether obsolete equipment should be counted as capacity or not.

7. I am switching again to a different subject. The problem of the trend is, for Kalecki, not separable from that of the cycle. He deals with them together, in their interrelations, and with the same methods: functional equations describing a dynamic process which evolves in time from one period to the next, in contrast to the methods of moving equilibrium or 'growth paths' which almost exclusively dominate contemporary growth theory.

[12] 'Trend and the Business Cycle', this volume.

In the first version the trend is absent, but this absence itself already signifies a theory, namely that it needs exogenous influences to generate a trend. Perhaps an appeal to systems theory may help some readers to appreciate this view. The closed systems of physics always tend to come to a rest (an equilibrium) owing to the second law of thermodynamics. To evolve a system and keep it moving, it must be stimulated from outside.[13] The pure business cycle, if it is damped, and as long as no shocks are introduced, does indeed come to rest in a stationary state in the same way as the closed systems of physics. To keep up the cycle, random shocks have to be introduced. To get evolution (a trend) in addition to the latter, more systematic influences from outside have to be brought in. Kalecki introduces the trend factors gradually in versions 2 and 3.

But why should the ordinary incentives to invest and the accumulation of saving in business not be capable by themselves of creating a trend? The essential thing to note is that equation (10) of version 1 (and, provided Δt is of the order of a year, also equation (11) of version 2) yields *alternatively* either a cycle or a trend, depending on the value of the parameters. If we opt for the cyclical solution, (i) because realistic values of the parameters involve this case, and (ii) because this is a plausible and good explanation of the cycle for which there is hardly a satisfactory substitute, then we must conclude that no trend can be generated by the relations included in this model. That is, the profits, the business saving, and the expansion of the markets created by the investment, contrary to our intuition, do not engender a durable upward movement of the national product. This requires an opening of the system. To be concrete, investment decisions must appear which are not motivated by the actual profits, savings, and sales experience of the past which, according to the above argument, would only lead to frustrated investment; they must be investment decisions out of the blue, based on factors outside the model of equations (10) or (11)—based, that is, on anticipation. The plausible reason for such anticipations not based on actual sales and profits Kalecki sees in innovations which promise extraordinary profits to those who first introduce them.

Thus Kalecki agrees to a large extent with Rosa Luxemburg, who could not see any motive for expansion in a capitalist economy unless it came from outside; but, unlike her, he included in these outside influences not only foreign expansion, war, and armament, but also the stream of innovations.

This stream has to continue to provide the demand for expansion. Formally its effect is represented by a function of time $F(t)$ in the complete equation of trend and cycle. The trend is represented by a particular solution of this complete equation, and the pure business cycle by the deviations from this trend.[14] This is an elegant solution, but it does not fully reflect Kalecki's ideas. He views technological progress as influenced by economic development itself, and speaks of $F(t)$ as a 'semi-autonomous term'. (In particular, the effect of an innovation is seen to depend on the size of the economy.)

[13] See L. von Bertalanffy, 'The Theory of Open Systems in Physics and Biology', *Science*, 111, 1950.

[14] See 'Trend and the Business Cycle', this volume.

It may be remarked in conclusion that Kalecki's analysis of the trend is purely in terms of demand. The only parameter in his equation through which an influence of supply could enter is the lag between decision and investment. He implicitly recognized the importance of supply as a constraint on growth (if booms hit the ceiling, the trend would be influenced too), but the stream of demand appears as the primary mover, the *sine qua non* of growth.

Although 'Trend and the Business Cycle' is Kalecki's last published study in the theory of dynamics of the capitalist economy, it was not his last scholarly effort in this field. At the end of the 1960s he decided to write his first textbook, to be published in the series 'Penguin Modern Economics Readings'. The book's outline and extracts from the correspondence which preceded it (which survived in Kalecki's papers) are given in Annex 4. We are grateful to Professor K. J. W. Alexander for permission to publish his letters concerning this venture in Kalecki's *Collected Works*.

ANNEX 4
Kalecki's '12 Lectures on Dynamics of Capitalist Economy'

In the middle of May 1968, in reply to Kalecki's letter, K. J. W. Alexander wrote that he was exploring with Penguin Books the possibility of publishing a short series entitled 'Essays on Marxian and Modern Economics', and asked Kalecki to suggest which of his publications should be taken into account, or to put forward some other ideas. Kalecki replied on 8 June:

Dear Professor Alexander,

Thank you very much for your letter and your efforts on my behalf with Penguin Books. However, I still think that neither the type of stuff nor its volume would fit this kind of publication. I think the following suggestion would be rather more suitable.

I have been giving for a number of years a course on [the] economic dynamics of [the] capitalist system at the Central [Main] School of Planning and Statistics here, consisting of about ten lectures. It includes the problems of government intervention and in the last two years my new ideas on investment decisions and trend. I may try to write it up which, however, will take some time because I lecture without notes.

I have to say in advance that this would be less precise than my other writings, because the purpose of the course is to give to the student a general idea of the functioning of the *laissez faire* and the present capitalist system. It is therefore necessary to skip over some intricate points.

Professor Alexander replied on 19 June:

I am very attracted to your suggestion about preparing your lectures on the 'Dynamics of Capitalist Economies' for publication. The fact that the purpose of the course is to give a *general* idea rather than to spell out the intricacies may well be a positive advantage. We want these text books to be suitable for second year students.

If you could let me have an outline of chapter headings, ideally with a few explanatory lines on the content of each chapter I could put this before our Advisory Board. I am sure that the proposal would interest them and I would expect to be able to let you have a contract fairly quickly.

At the time Kalecki had fallen ill and did not reply for a long time. On 16 Sept. 1969, Prof. Alexander wrote again:

You will remember that I wrote to you last summer welcoming your suggestion that you could prepare your lectures on the *Dynamics of Capitalist Economies* for publication by Penguin Books.

Could you let me know whether this is still a possibility? Penguin Books remain extremely enthusiastic about it and would like to reach a firm decision. It may be that you have proceeded with the preparation of the text. I certainly hope so.

Kalecki wrote back:

I am very sorry not to have written to you for so long. In part it was due to my prolonged illness from which I have only recently recovered. However, the project of publication of my lectures on the *Dynamics of Capitalist Economies* involves some problems. At present there are two books on the subject in circulation: the paperback edition of *Theory of Economic Dynamics* and also *Studies in the Theory of Business Cycles, 1933–1939*. In addition there is to be published by Cambridge University Press in 1971 a volume of my selected essays on the same subject (partly overlapping with the above two books). Although the lectures on the *Dynamics of Capitalist Economies* would be quite a different book from the other three items it is obviously unavoidable that the basic ideas would be the same only presented in a more systematic and rather simplified fashion.

Let me, please, know whether in the circumstances you will still consider the publication of such a book a worthwhile undertaking. (extract from a draft of Kalecki's letter of 29 Sept. 1969)

On 2 Dec. 1969 Mr Charles Clark, a director of the 'Penguin Education' series, informed Kalecki that, provided his *Dynamics of Capitalist Economies* was genuinely a straightforward introduction and therefore had a more systematic framework than the selections of Kalecki's essays mentioned in his letter to J. K. W. Alexander, Penguin Books would be very happy to publish the book in their series. Emphasizing that the publishers were in full agreement that the book should represent a more 'systematic and simple' approach, he encouraged Kalecki to go ahead with the project and asked for a short outline of the book and a short, two-page statement on what the chapters would contain. Kalecki replied:

Dear Mr Clark,

Thank you for your letter of 2 December 1969. After having considered your letter and thought over the matter I think that I shall be able to write a booklet for your series entitled *12 Lectures on Dynamics of Capitalist Economy*. I enclose two pages which give, I believe, a fairly good idea of what the booklet will be like. (Excerpt from a draft of Kalecki's letter of 12 Feb. 1970.)

Other correspondence deals with the terms of the contract and the delivery date of the typescript, which Kalecki hoped would be at the latest in the middle of 1971. The outline which Kalecki sent Penguin Books is as follows:

12 Lectures on Dynamics of Capitalist Economy

Lect. 1–2. In these lectures we abstract from foreign trade and government revenue and expenditure. The existing capital equipment and labour do not determine the level of national income but set only its upper limit. Prior to the period considered decisions have been taken by capitalists as to their consumption and gross investment. The 'realized gross national income', i.e. the gross national product which may be sold, is established at such a level that profits P (gross of depreciation) out of it are equal to the sum of capitalists' consumption and investment which is given (workers are assumed not to save). This level may be below that corresponding to full utilization of resources. Division of the economy into three departments; (I) investment goods, (II) consumption goods for capitalists, (III) wage goods; explaining how investment and capitalists' consumption determine through purchases of workers of I and II profits (gross of depreciation) and national income. Why in a socialist economy the problem of underutilization of resources because of inadequate effective demand does not arise.

Lect. 3–4. The capitalist system works under conditions of widespread imperfect competition and differential oligopoly. The equipment is in general not used up to capacity. Prices are fixed by firms by marking up average prime costs, the mark-up depending on 'competition' with other firms. The average prime costs depend little on the degree of utilization of equipment. Under these assumptions, unaltered ways of marking up and stable wage costs, the changes in output (resulting from those of effective demand) would not affect price levels. If wage costs throughout the economy changed in the same proportion, the prices would change in this proportion as well. Technical progress does not interfere with this approximation to reality: the elimination of highest cost producers and the birth of lowest cost producers is roughly equivalent to proportionate fall in wage costs. What, however, has to be taken into account is the influence of short period changes in output upon prices of basic raw materials which do not fit into the above model. This influence is, however, likely to be to some extent offset by the influence of short period changes in output upon the way of marking up, which works in the opposite direction. Both influences being rather small in each of the three departments mentioned above, it is assumed as a first approximation that the ratio of the value of product to the prime labour cost is stable in each of them. The difference between the former and the latter are profits (gross of depreciation) plus overheads (mainly salaries). On the basis of interrelation between departments discussed in Lect. 1–2, it is now possible to determine national income by investment and capitalists' consumption.

Lect. 5. Introducing the relation between capitalists' consumption and profits in which we neglect the time-lag, we can express profits and national income in terms of investment.

Lect. 6–7. The influence of export surplus upon profits and national income is examined. Likewise the influence of budget deficit and direct taxation of capitalists. This is a starting point to the discussion of the role of government expenditure financed by loans or by taxation of capitalists in contemporary capitalism.

Lect. 8–9. These lectures and the following are concerned with determinants of investment decisions which together with the relations between investment and profits as well as national income permit to examine the dynamic processes of the capitalist system consisting of trend and the business cycle. This is a much more difficult

subject than the stuff discussed in lectures 1–7. To simplify problems the same assumptions are made as in my EJ paper of 1968: closed system, no government revenue and expenditure, no overhead costs, abstracting from changes in inventories. I start from a theory of investment decisions patterned on Harrod's approach. By amending gradually this theory I pass to my approach of the EJ 1968 paper.

Lect. 10. I obtain and discuss the equation of dynamics of investment. I split it into trend and the business cycle. From this it is easy to pass to the respective dynamics of profits and national income.

Lect. 11. The mechanism of the business cycle.

Lect. 12. The problem of trend. Why it cannot be resolved (in the *laissez faire* economy considered) without a theory of investment decisions by an argument based on Harrod–Domar approach?

The Problem of Effective Demand with Tugan-Baranovsky and Rosa Luxemburg

[1]

First published as 'Zagadnienie realizacji u Tugana-Baranowskiego i Róży Luksemburg', *Ekonomista*, 2, 1967, pp. 241–9, and in *On Economic Theories of 'Capital'* (Warsaw, KiW, 1967, pp. 7–21 (in Polish)). A Spanish translation, 'El problema de la realizacion según Tugán-Baranovsky y Rosa Luxemburg', was published in *Economía y Administración*, 16, 1970, pp. 15–22 (special number in honour of Kalecki; Chile, University of Concepción). The English translation appeared in Kalecki, *Selected Essays on the Dynamics of the Capitalist Economy, 1933–1970*, pp. 146–55 (for translations of this collection, see p. 528); repr. in Foster and Szlajfer (eds.) *The Faltering Economy*, pp. 151–8. A Swedish translation, 'Problemet med effectiv efterfrågen hos Tugan-Baranovsky och Rosa Luxemburg', appeared in Kalecki, *Tillväxt och Stagnation i Modern Kapitalism*, pp. 19–27. A German translation, 'Das Problem der effektiven Nachfrage bei Tugan-Baranovski und Rosa Luxemburg', was included in Kalecki, *Werkauswahl*, pp. 191–202; repr. in Kalecki, *Krise und Prosperität im Kapitalismus*, pp. 282–90. A Portuguese translation, 'O Problema da Demanda Efetiva em Tugan-Baranovski e Rosa Luxemburgo' appeared in Kalecki, *Crescimento e Ciclo das Economias Capitalistas*, pp. 10–18.

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For references to the discussions on the broader issue of links between Marx's theory and its later developments on the one hand and Kalecki's theory on the other, see pp. 515, 560 and 562–6 above; see also Dobb, *Theories of Value and Distribution since Adam Smith.* For Joan Robinson's rejoinder to Kalecki's treatment of Tugan-Baranovsky and Rosa Luxemburg, see p. 593 above; see also W. A. Darity, Jr., 'Kalecki, Luxemburg, and Imperialism' *Journal of Post Keynesian Economics*, 2/2, 1979–80.

[2]
For a more detailed analysis of this question, see 'Impact of Armaments on the Business Cycle after World War II', this volume.

The Marxian Equations of Reproduction and Modern Economics

[1]
First published in *Social Sciences Information*, 6/7, 1968, pp. 73–9 (also in French, in the French-language edn. of this journal). The 2nd English edn. appeared in Foster and Szlajfer (eds.), *The Faltering Economy*, pp. 159–66. A Spanish translation, 'Las ecuaciones marxistas de reproduction y la economia moderna', appeared in *Economia y Administración*, 16, 1970, pp. 7–13; repr. in *Investigación económica—revista de la Facultad de Economia de la Universidad Nacional Autónoma de México*, 166, Oct.–Dec. 1983, pp. 71–9. A Polish translation, 'Marksowskie równania reprodukcji a współczesna ekonomia', appeared in *Zycie Gospodarcze*, 26, 1974. A Portuguese translation, 'As Equações Marxistas de Reprodução e Economia Moderna', appeared in Kalecki, *Crescimento e Ciclo das Economias Capitalistas*, pp. 1–9.

[2]
The original text reads here: 'If I and/or C_k decrease . . . '. In his letter to Mr F. Combin of *Social Science Information* of 7 Mar. 1969, Kalecki corrects this mistake, substituting 'increase'.

Observations on the 'Crucial Reform'

[1]
First published as 'Osservazioni sulla "riforma cruciale"', in *Politica ed Economia*, 2–3, 1971, pp. 190–6. A Spanish translation, 'Observaciones sobre la "Reforma Crucial"', was published in *Investigación económica—revista de la Facultad de Economia de la Universidad Nacional Autónoma de México*, 166, Oct.–Dec. 1983, pp. 89–99. A German translation, 'Beobachtungen über die "entscheidende Reform"', appeared in Kalecki, *Krise und Prosperität im Kapitalismus*, pp. 251–61.

At the end of the 1960s, Kalecki in many private conversations raised the problem of crucial reforms in various social systems. He went back to the history of feudalism, which owing to certain reforms was able to overcome its early serious crises, and which in many countries had even extended its existence by a few centuries. He believed that between the beginning of the First World War and the end of the Second, capitalism had gone through a

deep crisis which threatened its very existence. He pondered on what enabled capitalism to survive this crisis and even to ensure itself another, rather long, period of relative, though certainly not everlasting, stability.

In connection with the commentary on the Italian publication of the article (see Annex 5, below), it should be noted that Kalecki did not believe that the 'crucial reform' dashes the hopes of the socialist cause. Moreover, he did not associate such a reform with the end-phase of a given social system. For instance, he believed that after the bourgeois revolution in France and England capitalism must have already passed through something like a 'crucial reform'. He examined in similar terms the need for 'reforming' and 'stabilizing' the existing socialist system; indeed, he intended to write a paper on this problem too.

In sending the article to the theoretical journal of the Italian Communist party, Kalecki was aware that the picture of relative and temporary stability presented here applied least to Italian capitalism at that time. He believed, though, that his thesis had the best chance of an objective and undogmatic discussion there.

The article was preceded by a comment by the late Antonio Pesenti, one of the leading Italian Marxists (see *Politica ed Economia*, 2–3, 1971, pp. 189–90). At the request of the editor of Kalecki's *Collected Works*, the co-author of the article, Tadeusz Kowalik, wrote a rejoinder to Pesenti's criticism. Both Pesenti's and Kowalik's comments follow in Annex 5.

ANNEX 5
A. Pesenti and T. Kowalik on the 'Crucial Reform'

A Comment by Antonio Pesenti

The article which follows below [*i.e. 'Observations on the "Crucial Reform"'*] was sent to me by Professor Kalecki shortly before his death, along with the following letter:

Warsaw, 3 April 1970

Dear Professor Pesenti,

I am taking the liberty of sending you Dr Kowalik's and my article, which we would like to publish in *Critica Marxista*.

At my request one of my Italian friends translated the article into Italian, nevertheless the text may require some stylistic improvements.

In case your journal would not want to take full responsibility for the views expressed in this article, especially that the problem is rather important [*sic*], we have no objections to an editorial note preceding the article (at the bottom of the page or in some other place), which would explain your position. Please let me know whether you think that the article is suitable for your journal.

Yours sincerely,
M. Kalecki

Kalecki's death and the fact that the major theses of the article seemed unclear—perhaps because of linguistic errors, now corrected by Professor Sylos-Labini—caused a delay in publication. Still, as there was a desire to publish this article, it was decided that the most suitable place would be *Politica ed Economia*.

If I have understood the idea of the authors correctly, then, starting from an analysis of the changes that have taken place in the structure of the capitalist system, and hence in the mechanism of its development and cyclical fluctuations, and especially having examined increasing government intervention—that is, what, since Lenin, Marxists call state monopoly capitalism—they tend to maintain, obviously considering only the economic aspect, that 'reformed' capitalism has attained a high level of stabilization and acceptance by the masses. In effect, such a high level of economic stability would be naturally followed—at least at the level of the structure—by an increase in social stability so that a possible break with 'conformism', that is, with the accepted domination of the bourgeois apparatus, could come out only—as, in their opinion, the student movement shows—from the new, not yet integrated generations.

Perhaps I wanted to overemphasize a little their theses, and therefore my interpretation is not precise enough; readers will form their own opinions. It seems obvious to me that—briefly speaking—there is an underestimation here of internal contradictions, especially economic ones, which are continually developing in every stage of capitalism, whether as the intensifications of contradictions of the old type, or as the new ones. Consequently, I believe that we have to do here with an inadequate understanding of the dialectic links between objective changes and various subjective contradictions of a higher rank. Let us take the class struggle, for instance. At least in Italy the Communist party, thanks to a thorough analysis of objective changes, has been able to set the goals of the struggle for a socialist transformation of society. This struggle has broken the hegemony of the bourgeois ideology and apparatus, and defeated all forms of conformism. Naturally, this struggle creates new situations every day, new equilibria, which prevent it from being locked into a 'schema' or—as it is usually called—a 'model'. I have written about this—mainly considering the economic aspect—in a paper in honour of M. Dobb, 'On the Possibility of Constructing a Model of the Transition to Socialism in Italy'. It is this faith in the creative possibilities of the class

struggle, and its capacity to take advantage of the continually reappearing contradictions of capitalism, that allows me to exclude the possibility of speaking about some 'crucial reform' leading to a 'stabilization of the system'. Naturally, the ruling class is fully aware of the changes taking place in the processes of production, using them for its own purposes and even trying to counter all blows that it receives in the course of the struggle of the masses. The historically progressive function of the working class is linked with this struggle, even where it is not in power; a similar role was played at one time by the bourgeoisie.

Moreover, it is clear that monopoly capitalism—especially in its more mature form, which involves programming the operation of the economy as a whole—is an instrument consciously used by the ruling class to overcome, or at least to soften and control, the most serious contradictions of capitalist production. The result is the opening up of a new area in which the class struggle is developing today. However, one cannot say that this has solved the real contradictions of capitalism, or that it has not created new ones; consequently, one cannot claim that it has given the system any relative 'stability'. The concept of this stability should not be confused with the post-war abatement of business fluctuations or with a more rapid growth of income. Even less can one argue that this would constitute some 'crucial reform' that would shake the revolutionary potential of the movement of the masses and make socialism superfluous. For socialism does not mean to us merely that the state becomes the owner of the means of production, with the power to control the process of economic reproduction. For us, socialism is a new social order in which—owing to the development of all forms of democratic participation—the masses really have control over all spheres of social life, obviously starting from the process of production and including the democratic setting of goals, obligations, and rules of action. In this way the masses could overthrow the present society and state, replacing them with an entirely different society and state.

It is clear that such a process of change cannot take place without a continual renewal of the struggle of the masses, in which the working class is a vanguard that is always ever more conscious of its obligations and ever better equipped with the appropriate instruments of struggle.

Kowalik's Rejoinder to Pesenti

I am pleased to use this chance of responding to Antonio Pesenti's comments on Kalecki's and my article on the crucial reform, though I am well aware that this will be only an imperfect substitute for what could have been said by the main author of the article.

There is no question that the theory of capitalism developed by Michał Kalecki is an extremely pessimistic one. It is based on the hypothesis of the strong tendency of developed capitalism toward stagnation, on the theory of the political business cycle, emphasizing the limited effectiveness of the interventionary policy of the bourgeois state, etc. To the end of his life Kalecki liked to stress that in its criticism his theory of developed capitalism went even further than Marx's theory. It is not by chance that the popularity of Kalecki's theory and his publications are in inverse relationship to the economic performance of modern capitalism.

On the other hand, if one agrees with Pesenti's argument, the concept of the crucial reform would have to be regarded as a difficult-to-understand deviation in Kalecki's views, some glaring inconsistency that requires explanation. I believe, however, that Pesenti's comment is mainly the result of a misunderstanding, which happen easily in the social sciences and especially in publications on topical subjects.

Before I try to explain this misunderstanding, let me recall the circumstances in which this article was written. This dispenses with the possibility that it was written in haste, which could have led to the expression of views that would not be supported after further reflection.

This article was written between September 1969 and January 1970. Furthermore, when we began to discuss the details, Kalecki already had in his mind a ready concept of the crucial reform. The co-authorship resulted from reasons that were incidental to the major thesis. In a talk with Kalecki I made some critical observations on his article 'An Econometric Model and Historical Materialism' [*Collected Works*, vol. v]. I had in mind his interpretation of the basic dependency between productive forces and the economic base, which is regarded as the fundamental relationship of historical materialism. After a discussion on this subject, Kalecki suggested that we write an article together on the unintended effects of the pressure of the working masses on the bourgeois state during periods when the very existence of the system is threatened. I remember exactly how Kalecki justified this suggestion, since I was clearly aware that in what he said ('You know so well who said what on a given subject') there was at least as much irony as praise. Kalecki wanted to present a problem, which he had already well thought out, in terms of historical materialism and with reference to the polemics among theorists of socialism at the beginning of the century on the prospects of socialism. Ultimately, my contribution was limited to presenting the great hypotheses of R. Hilferding, R. Luxemburg, L. Krzywicki, and others. In the other part of the article my role was clearly limited. Moreover, on the first question Kalecki had his own opinion too. For he was quite familiar with all these hypotheses, except perhaps for Krzywicki's. But he did not want to go back to the sources again to check his memory.

The entire concept of what Kalecki initially called the 'revolutionary reform' and, finally, the 'crucial reform' results from the fact that what happened in modern capitalism was more than a reform, although it did not go beyond capitalism. He had in mind something between a social revolution and a reform in the common sense. He believed that, within the limits of its relative efficiency, government intervention necessitates a revision of the classic theory of socialist revolution.

The latter was based on two pillars: the first is the link of the revolution with imperialist wars resulting from the fight for markets, supplies of raw materials, and colonial reservoirs of cheap labour; the second is the tendency for economic crises to deepen, giving rise to the desperate poverty of the unemployed masses. Thus, when Kalecki wrote and spoke about a relative economic and social stabilization of capitalism, he had in mind only a comparison with capitalism between the First World War and the great crisis of the 1930s. Antonio Pesenti does not question Kalecki's view that in this sense capitalism has undergone certain transformations, nor does he claim that these pillars can still support a realistic theory of revolution. However, leaving out an entire complex of these problems, which—I believe—are clearly presented in our article, Pesenti suggests to the reader that Kalecki professes the astonishing view that capitalism has solved all its contradictions, which would make socialism unnecessary. In this sense, Pesenti's criticism is based on a misunderstanding.

It is another matter that, in the light of the experiences of the 1970s, Kalecki (and the undersigned as well) failed to perceive, or underestimated, certain phenomena which limited the effectiveness of intervention even more than he had once foreseen. I refer here primarily to the destructive role of powerful multinational corporations, which can paralyse the economic policies of individual 'national' governments, and to the scale of influence of the policies of Third World countries on the developed capitalist countries. I believe that this is why Kalecki did not anticipate as severe a crisis as one we are witnessing in the 1970s. On the other hand, however, this deepest crisis since the 1930s validates the correction which Kalecki introduced into the classic theory of revolution. Though severe, this crisis has not put the socialist revolution or the socialist system on the agenda. This fact has been clearly recognized—for some Marxists all too clearly—mainly by the Western Communist parties, who made revisions in their programmes accordingly. The notion of the 'historical compromise' of the Italian Communist party would have been unthinkable in the light of traditional theory.

In a recent paper, 'M. Kalecki's Concept of a "Crucial Reform"' (in E. Domańska (ed.), *Capitalist Economics: Essays in Contemporary Macroeconomics*, SGPiS, forthcoming (in Polish)), P. Czajka argues that Pesenti's interpretation of Kalecki's views resulted from the former's rather dogmatic faith in the prognosis that imperialism was the final stage of capitalism, which Pesenti had already advanced in his *Lezioni di Economia Politica* (and which in this respect closely followed J. Salin's *Economic Problems of Socialism in the USSR*); this prognosis, unrestrained by any time boundary, Czajka finds incompatible with the respect for facts which pervades Kalecki's study.

Index of Names

Index of Subjects

Index compiled by Frank Pert