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DISTRIBUTION AND GROWTH AFTER KEYNES

A Post-Keynesian Guide

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Cheltenham, UK • Northampton, MA, USA

Published by
Edward Elgar Publishing Limited
The Lypiatts
15 Lansdown Road
Cheltenham
Glos GL50 2JA
UK

Edward Elgar Publishing, Inc.
William Pratt House
9 Dewey Court
Northampton
Massachusetts 01060
USA

A catalogue record for this book
is available from the British Library

Library of Congress Control Number: 2014938834

FSC www.fsc.org MIX Paper from responsible sources FSC® C013056

ISBN 978 1 78347 728 9 (cased)
ISBN 978 1 78347 730 2 (paperback)
ISBN 978 1 78347 729 6 (eBook)

Typeset by Servis Filmsetting Ltd, Stockport, Cheshire
Printed and bound in Great Britain by T.J. International Ltd, Padstow

Contents

Variables

If variables have more than one meaning, the more general use in this book is mentioned first. Variables are explained in the respective chapters.

ROMAN LETTERS

$(1-h)$	Share of wages in national income or in GDP
$(1-h)^T{}_W$	Target wage share of workers
$(1-h)_{LI}$	Labour income share, adjusted wage share
a	Labour–output ratio
a_{ij}	Input–output coefficient
A	Productivity of broad capital, Available knowledge in new growth theory
A_d	Net assets held by domestic economy
b	Net export–capital rate
B	Stock of bonds, credit or debt
B_w	Workers' households' debt
c	Propensity to consume
c_Π	Propensity to consume out of profits
c_R	Propensity to consume out of rentiers' income
c_W	Propensity to consume out of wages
C	Consumption
C_Π	Consumption out of profits
C_R	Consumption out of rentiers' income
C_W	Consumption out of wages
e	Exchange rate
e^r	Real exchange rate
E	Employment
E_F	Firms' accumulated retained earnings, equity held by firms/ owner-managers
E_R	Equity held by rentiers
E_S	Self-employed persons
f	Share issues as a proportion of investment

g	Accumulation rate, growth rate of capital stock, growth rate of output
g_n	Natural rate of growth
g_w	Warranted rate of growth
$g^T{}_F$	Target growth rate of the firm
$g^T{}_H$	Target growth rate of shareholders
$g^T{}_M$	Target growth rate of managers
G	Government expenditures
G_K	Capital gains
h	Profit share
h_0, h_1	Coefficients in firms' target profit share equation
$h^T{}_F$	Target profit share of firms
H	Human capital
i	Rate of interest
I	Investment
I_B	Broad investment in physical and human capital
k	Capital–labour ratio
k_W	Wage-cost mark-up in Weintraub's theory
K	Capital stock
K_B	Broad physical and human capital stock in new growth theory
K_C	Capital stock owned by the capitalists
K_{WH}	Capital stock owned by workers
L	Labour, number of employees
L_f	Net liabilities of the foreign economy
L_P	Labour employed in production
L_R	Labour employed in R&D
m	Mark-up
m_n	Mark-up at the target or normal output level
mc	Marginal costs
M	Imports, Material costs
NX	Net exports
p	Price, domestic prices
p_e	Entry-preventing price
p_f	Foreign price in foreign currency
p_m	Price of a unit of raw materials
p_C	Price of consumption goods
p_K	Price of capital goods
p_M	Price of imported goods
p_X	Price of exported goods
q	Kaldor's valuation ratio
r	Rate of profit, real interest rate in neoclassical theory

r_n	Normal rate of profit
r_C	Rate of profit of capitalists
r_F	Rate of profit of enterprise
r_{WH}	Rate of profit of workers' households
$r^T{}_F$	Target rate of profit of firms
$r^T{}_H$	Target rate of profit of shareholders
$r^T{}_M$	Target rate of profit of managers
$r^T{}_W$	Target rate of profit of workers
R	Rentiers' income, i.e. interest and dividends
s	Propensity to save
s_C	Retention ratio
s_Π	Propensity to save out of profits
s_R	Propensity to save out of rentiers' income
s_W	Propensity to save out of wages
S	Saving
S_C	Saving of capitalists
S_Π	Saving out of profits
S_R	Saving out of rentiers' income
S_W	Saving out of wages
S_{WH}	Saving of workers' households
t	Time
T	Taxes
TC	Technical change
u	Rate of capacity utilization
u_f	Foreign rate of capacity utilization
u_n	Normal or target rate of capacity utilization
ufc	Unit fixed costs
utc	Unit total costs
utc_n	Unit total costs at the target or normal output level
uvc	Unit variable costs
uvc_n	Unit variable costs at the target or normal output level
$u\Pi$	Unit profits
$u\Pi_n$	Unit profits at the target or normal output level
U	Utility
v	Capital–potential output ratio
w	Nominal wage rate
w^r	Real wage rate
$w_s{}^r$	Subsistence real wage rate
W	Wages
W^{net}	Wages net of taxes
W_{LI}	Labour income
W_S	Labour income of self-employed persons

X	Exports
y	Labour productivity
Y	Real output, domestic product, domestic income
Y_f	Foreign income
Y^n	Nominal income, nominal GPD
Y_n	Normal or target level of output
Y^{net}	Net private domestic income
Y^p	Productive capacity given by the capital stock, potential output
$\hat{Y}^b$	Balance-of-payments-constrained growth rate
z	Ratio of unit raw material costs to unit labour costs, Share of income of a specific factor of production, Share of existing human capital stock used in the production of human capital in the new growth theory
Z	Control variables in the estimations of demand regimes

GREEK LETTERS

$\alpha, \beta, \tau, \theta, \omega, \chi$	Coefficients in the investment functions
ψ, ϕ, ζ	Coefficients in the net export functions
$\eta, \rho, \theta, \varepsilon$	Coefficients in the productivity growth functions
ζ, ξ, υ	Adjustment coefficients of firms' assessment of the trend rate of growth or of the normal rate of capacity utilization
α	Partial elasticity of production of labour in a neoclassical production function
β	Partial elasticity of production of capital in a neoclassical production function
γ	Outside finance–capital ratio
δ	Dividend rate, Efficiency in the production of human capital in new growth theory
δ_1	Weight of shareholders' target profit rate
δ_2	Weight of the firms' target profit rate
ε	Income elasticity of demand for exports, Elasticity of substitution in a neoclassical production function
η	Price elasticity of demand for exports
θ	Efficiency of labour in R&D in new growth theory
ι	Effect of interest payments–capital stock ratio on the profit share
κ	Productivity of capital

λ	Debt–capital ratio, Harrod's dynamic foreign trade multiplier
λ_W	Workers' debt–capital ratio
μ	Relative capital intensities, Raw material–output ratio, Propensity to import
π	Share of rentiers' saving lent to workers, Income elasticity of demand for imports
Π	Profits
Π_C	Capitalists' profits
Π_F	Retained profits of firms
Π^{net}	Profits net of taxes
Π_{WH}	Workers' households' profits
ρ	Rentiers' rate of return on equity and bonds
σ	Saving rate
τ	Growth rate of technological progress in neoclassical growth theory
ϑ	Elasticity of production of technological knowledge in new growth theory
φ	Inside finance–capital ratio
Φ	Indicator of workers' bargaining power
ψ	Price elasticity of demand for imports, Elasticity of production of human capital in new neoclassical growth theory
Ψ	Indicator of firms' bargaining power
ω_0, ω_1	Coefficients in workers' target wage share equation
Ω	Indicator of financialization or the dominance of finance

GENERAL

dx	Total change or differential of x
∂x	Partial change or derivative of x
log x	Natural logarithm of x
x^*	Short-run equilibrium of x
x^{**}	Long-run equilibrium of x
x^e	Expected value of x
x^r	Real value of x
x^D	Demand for x
x^S	Supply of x
$\hat{x}$	Growth rate of x

Preface and acknowledgements

This book has had a long gestation period. In 2004, I published a German textbook presenting an introductory overview of the theories of distribution and growth, with chapters on Adam Smith and David Ricardo, Karl Marx, the neoclassical approach, post-Keynesian contributions, and some basic Kaleckian models in particular (Hein 2004a). All this was based on my research and teaching in the area of distribution and growth during the 1990s and early 2000s.

Since the early 2000s, Kaleckian models of distribution and growth have become increasingly popular as 'workhorse' models in post-Keynesian macroeconomics and in research in the areas of distribution and growth in particular. Since then, these models have been developed and refined to a considerable degree, they have been applied to a variety of research areas and questions and they have increasingly been used as theoretical foundations for empirical research. I am quite happy to have contributed a bit to this development. Therefore, about five years after the publication of the first edition, I felt that my German book would need an update. Furthermore, my teaching of distribution and growth classes, which had been in German since the early 1990s, switched to English when I joined the Berlin School of Economics and Law in 2009. This gave the final impetus and made me plan to publish a revised English translation of my German book. However, when I started on the realization of this plan at the beginning of my sabbatical semester 2012/13, I had to acknowledge that given the available material this was unfeasible. Therefore, I decided to skip the presentation of classical as well as Marx's and Marxian contributions in particular, because I had not followed the development of these approaches closely enough since the early 2000s and because there were other eminent books on the market covering these approaches. I chose to write a new book on distribution and growth after Keynes, which would focus on an in-depth study and presentation of the main contributions to distribution and growth theories after Keynes in the early chapters and on the gradual development of Kaleckian distribution and growth models, including an overview of the results of empirical applications, in the later chapters. This change in plan meant a delay in final publication of roughly 12 months, which was also due to other teaching and research commitments after the six months' sabbatical. I hope that it was worthwhile.

In preparing the later chapters of this book, I could draw and build on several of my publications in journals and books to different degrees, although without reproducing any of them in full or in detail:

- Chapter 7
  With Lena Vogel (now Dräger), 'Distribution and growth reconsidered – empirical results for six OECD countries', *Cambridge Journal of Economics*, 2008, **32**, 479–511.
  With Lena Vogel (now Dräger), 'Distribution and growth in France and Germany – single equation estimations and model simulations based on the Bhaduri/Marglin model', *Review of Political Economy*, 2009, **21**, 245–271.
  With Engelbert Stockhammer and Lucas Grafl, 'Globalization and the effects of changes in functional income distribution on aggregate demand in Germany', *International Review of Applied Economics*, 2011, **25**, 1–23.

- Chapter 8
  With Artur Tarassow, 'Distribution, aggregate demand and productivity growth – theory and empirical results for six OECD countries based on a post-Kaleckian model', *Cambridge Journal of Economics*, 2010, **34**, 727–754.

- Chapter 9
  'Interest, debt and capital accumulation – a Kaleckian approach', *International Review of Applied Economics*, 2006, **20**, 337–352.
  'Interest rate, debt, distribution and capital accumulation in a post-Kaleckian model', *Metroeconomica*, 2007, **58**, 310–339.
  With Christian Schoder, 'Interest rates, distribution and capital accumulation – a post-Kaleckian perspective on the US and Germany', *International Review of Applied Economics*, 2011, **25**, 693–723.
  'The rate of interest as a macroeconomic distribution parameter: Horizontalism and post-Keynesian models of distribution and growth', *Bulletin of Political Economy*, 2012, **6** (2), 107–132.

- Chapter 10
  'A Keynesian perspective on "financialisation"', in P. Arestis and M. Sawyer (eds), *21st Century Keynesian Economics*, International Papers in Political Economy, Basingstoke, UK: Palgrave Macmillan, 2010.

'Shareholder value orientation, distribution and growth – short- and medium-run effects in a Kaleckian model', *Metroeconomica*, 2010, **61**, 302–332.
'Financialisation, re-distribution, household debt and financial fragility in a Kaleckian model', *PSL Quarterly Review*, 2012, **65**, 11–51.
'Finance-dominated capitalism and re-distribution of income – a Kaleckian perspective', *Cambridge Journal of Economics*, forthcoming, advance access, 2014, doi:10.1093/cje/bet038.

- Chapter 11
  With Marc Lavoie and Till van Treeck, 'Some instability puzzles in Kaleckian models of growth and distribution: A critical survey', *Cambridge Journal of Economics*, 2011, **35**, 587–612.
  With Marc Lavoie and Till van Treeck, 'Harrodian instability and the "normal rate" of capacity utilisation in Kaleckian models of distribution and growth – a survey', *Metroeconomica*, 2012, **63**, 139–169.

I am most grateful to the referees, editors and publishers of these journals and books. Most importantly, however, I would like to thank my co-authors Lena Vogel (now Dräger), Engelbert Stockhammer, Lucas Grafl, Artur Tarassow, Christian Schoder, Marc Lavoie and Till van Treeck for fruitful collaborations in producing our joint papers and for comments and discussions on some of the other papers mentioned above. I am also grateful for comments and suggestions on some of the works listed above to Philip Arestis, Giorgos Argitis, Amit Bhaduri, Laurent Cordonnier, Thomas Dallery, Amitava Dutt, Stefan Ederer, Trevor Evans, Hansjörg Herr, Hagen Krämer, Dany Lang, Camille Logeay, Markus Marterbauer, Özlem Onaran, Thomas Palley, Jan Priewe, Claudio Sardoni, Malcolm Sawyer, Mark Setterfield, Peter Skott, Andranik Tangian, Achim Truger, Robert Vergeer and Rudolf Zwiener. Furthermore, I have benefited from the discussions of some of the works at conferences and seminars in Amsterdam, Berlin, Bilbao, Bremen, Cambridge (UK), Chemnitz, Dijon, Düsseldorf, Hohenheim, Kansas City, Lille, London, Oldenburg, Ottawa, Paris, Pisa, Rome, Roskilde, Salt Lake City and Vienna in the course of recent years, and I would like to thank the participants in these events, too.

When I was writing and preparing this book for publication, several colleagues and friends were ready and available for reading draft chapters and commenting on them. For this I would like to thank Giorgos Argitis, Daniel Detzer, Petra Dünhaupt, Steven Fazzari, Fritz Helmedag, Milka Kazandziska, Engelbert Stockhammer, Achim Truger and Till van Treeck. Most of all, I am grateful and indebted to Marc Lavoie, who read most

of the chapters, provided insightful comments and patiently prevented me from making silly mistakes in the presentation of simple models. I am also most grateful to Henriette Heinze and Matthias Mundt, who assisted me in the editing process, read the whole manuscript, compiled the list of variables and checked the references and quotations. Furthermore, I am grateful to the staff of Edward Elgar for their reliable support throughout this project, and to the Berlin School of Economics and Law for providing the required resources. It goes without saying that none of the people mentioned should be held responsible for any remaining errors in this book. For these I am alone responsible.

Finally, I would like to express my thanks and gratitude to the students who have attended my seminars on distribution and growth during the last two decades – at the Free University of Berlin, at Carl von Ossietzky University Oldenburg, at the University of Hamburg, at the Berlin School of Economics and Law and at the summer schools of the Research Network Macroeconomics and Macroeconomic Policies (FMM). I am most grateful for the comments and discussions in class, which have forced me to clarify my thoughts and the presentations which have gone into this book. I hope that the final product will be a useful *Post-Keynesian Guide* for present and future generations of students, as well as for colleagues and researchers interested in the issues of *Distribution and Growth after Keynes*.

Eckhard Hein
Berlin, March 2014

1. Introduction

1.1 DISTRIBUTION IS BACK ON THE RESEARCH AGENDA – ON THE SUBJECT OF THE BOOK

Issues of income distribution, economic development and growth are back on the economics research agenda, at least since the Great Recession (2008–09) and the difficulties of recovery of the world economy, in particular in the Euro area. This is true not only for research output based on heterodox approaches, as for example more recently Galbraith (2012), Hein (2012a), Palley (2012a, 2013a), Stockhammer (2012a, 2012b) and Stockhammer and Onaran (2013), as well as the contributions in Niechoj et al. (2011) and Lavoie and Stockhammer (2013a), have shown. It is also true for contributions rooted in mainstream research methods and approaches, as for example Rajan (2010) and Stiglitz (2012) have demonstrated. Furthermore, international institutions, for example the OECD (2008, 2011, 2012a, chap. 3), the ILO (2012) and the UNCTAD (2012), as well as authors based at the IMF, for example Berg et al. (2008), Kumhof and Rancière (2010), Berg and Ostry (2011), Kumhof et al. (2012) and Ostry et al. (2014), have stressed the issue and the importance of income distribution recently.

Whereas data on functional income distribution, that is on wage and profit shares, are directly available from the national accounts, reliable data on the personal or household distribution of income are more difficult to obtain, because they are usually based on household and consumer surveys. However, recent research on top income shares based on tax data by Atkinson and Piketty (2007, 2010), Atkinson et al. (2011) and Piketty (2014), as well as the dataset now publically available in the *World Top Incomes Database* provided by Alvaredo et al. (2014), have attracted and facilitated studies in this area as well.

Therefore it seems that relevant parts of the economics discipline are now willing to contribute to an attempt at 'bringing income distribution in from the cold', as demanded by Atkinson (1997) almost 20 years ago in his presidential address to the Royal Economic Society. This means returning to the starting point of economics as an academic discipline, when issues of income distribution were considered to be at the very core of this social science. A famous quotation from David Ricardo reminds us of this:

> The produce of the earth – all that is derived from its surface by the united application of labour, machinery, and capital, is divided among three classes of the community; namely, the proprietor of the land, the owner of the stock or capital necessary for its cultivation, and the labourers by whose industry it is cultivated.
>
> But in different stages of society, the proportions of the whole produce of the earth which will be allotted to each of these classes, under the names of rent, profit and wages, will be essentially different; depending mainly on the actual fertility of the soil, on the accumulation of capital and population, and on the skill, ingenuity, and instruments employed in agriculture.
>
> *To determine the laws that regulate this distribution, is the principal problem in Political Economy*. (Ricardo 1817, p. 5, emphasis added)

Determining the laws which govern functional income distribution was by no means an end in itself for Ricardo and the classical political economy, but it was a necessary step from the viewpoint of this economic school, because it was held that the development of functional income distribution directly affects economic development and growth and thus 'the wealth of nations', to use Adam Smith's (1776) terminology. The specific classical perception of the link between functional income distribution and economic growth was challenged, rejected or reversed by the successive economic paradigms, the Marxian, the neoclassical and the Keynesian and post-Keynesian paradigms.[1]

In this book we will deal with theories of distribution and growth after Keynes. Excluding the discussion of classical theories (Smith, Ricardo, Malthus) and in particular Marx's and Marxian distribution and growth theories could be considered to be a serious shortcoming. On the one hand, this is dictated by the limitation of space and by the intention to focus on the latest developments of post-Keynesian and in particular Kaleckian–Steindlian distribution and growth theories and their empirical applications in this book. On the other hand, there are several books available covering classical or Marxian approaches together with neoclassical and post-Keynesian models, but without any detailed treatment of the latest developments of Kaleckian–Steindlian approaches, for example Harris (1978), Marglin (1984a), Dutt (1990a) and Foley and Michl (1999).[2] It would have been almost impossible to add anything of substance regarding the classical and Marxian approaches to these eminent contributions.[3]

The focus of the present book is on the link between 'functional income distribution' and growth or economic development in the theories of distribution and growth after Keynes. Questions concerning 'personal income distribution' and also 'wealth distribution' are only touched on the margin. However, this does not mean that personal distribution and wealth distribution are unimportant or do not matter for economic development. As is well known, the functional income distribution describes the distribution of income between social classes (workers, capitalists, landowners) and/or between different types of income (wages, profits, rents), whereas the personal or household distribution looks at the distribution between households and individuals regardless of the functional source of the income. If economic and financial wealth and hence capital income and wages are not equally distributed over households, a change in functional income distribution will also affect the personal or household distribution of income. And it will also feed back on the distribution of wealth, because it will affect the ability to accumulate wealth out of current income.

A closer examination of the transition from 'primary distribution' to 'secondary distribution' is also beyond the scope of this book. While the primary distribution refers to the distribution of income derived from market activity, the secondary distribution is affected by redistribution of the state by means of taxes and social security contributions as well as by subsidies and social transfers. The result of this redistribution process is the distribution of disposable income. Although government redistribution of income takes place to a considerable degree in developed capitalist economies, we will not study this in any detail, because the focus in the present book will be on the paradigmatic differences regarding the nexus between distribution and growth. The implications for distribution policies, however, will be spelt out where appropriate.

When approaching the issue of distribution and growth we are interested in the relationship between functional income distribution, aggregate demand and real GDP growth, as indicator of current economic activity, on the one hand, and between distribution and capital stock growth, as a main determinant of future potential output and economic activity, on the other hand. Reviewing distribution and growth theories after Keynes, the first question to be raised is whether the respective paradigms or theories to be studied see any connection between income distribution, output and growth at all. If such an interdependence is considered, the second question refers to the specific nature of the relationship between distribution and growth: Is there a certain impact running from capital accumulation and growth to income distribution, or is the latter determined by other factors or rather impacts on the long-run growth trend of an economy? Or are distribution and growth mutually dependent?

The neoclassical approach, discussed in Chapter 3 of this book, explains both income distribution and growth in a unified and integrated framework taken from its foundations in allocation theory starting from 'first principles'. These are given production technologies, and hence production functions, given utility functions, given initial endowments of economic agents, and the assumption of strictly utility and profit maximizing behaviour of economic agents in perfectly competitive markets. In this approach, the technology of production determines the income shares of the factors of production. Adding initial endowments to the story, the personal or household distribution of income is also fully determined. Factor price relations, established by supply and demand processes in factor markets, are taken to represent relative scarcities. Flexible factor prices guarantee the adjustment towards an exogenously given full employment equilibrium growth rate, the 'natural rate of growth', determined by non-explained rates of population growth and technological progress. Capital stock growth is determined by saving and has no effect on the natural rate of growth, but only on the long-run equilibrium growth path. Saving is thus beneficial because it increases the capital intensity of production and the level of productivity, but not the growth rate of productivity or output. In the modern version of neoclassical growth theory, that is in the new or endogenous growth theory, productivity growth and hence the natural rate of growth are determined endogenously in a way which is consistent with neoclassical first principles. In this approach it is technical progress which is determined by technology, applied in generating growth enhancing human capital or R&D, and preferences, in particular the time preference of households regarding present and future consumption. Unlike the case in old neoclassical growth theory, saving and (broad) investment have a permanent effect on the equilibrium growth rate and thus on the natural rate of growth. Saving, determining investment, is thus beneficial for the steady growth rate, and not only for the growth path.

In contrast to the neoclassical approaches, post-Keynesian distribution and growth theories, discussed extensively in this book, as well as the approaches based on classical and Marx's contributions, start off with one degree of freedom in the determination of relative prices and thus in functional income distribution, which can be closed by different hypotheses. Therefore, income distribution cannot be explained by simple and generally valid assumptions about production technologies, utility functions and strictly utility and profit maximizing behaviours in perfectly competitive markets. Instead, an independent theory of distribution is required in order to determine equilibrium relative prices, which are prices of production and reproduction in these approaches. Since these approaches cannot be based on first principles they are open to and indeed require the integration of specific historical, institutional and societal considerations. Furthermore, income distribution, capital accumulation and growth are interrelated, albeit in different ways.

The classical authors, such as Adam Smith and David Ricardo, as well as Karl Marx, assume that functional income distribution is determined by socio-institutional factors, in particular by a subsistence real wage rate. For a given production technology the rate of profit then becomes a residual variable. The subsistence real wage rate is given by the necessary means of reproduction of workers and their families, which themselves are affected by the prevailing historical and institutional circumstances, and by the power relations between the social classes, in particular for Marx. With functional income distribution determined in this way, the rate of profit (r), together with capitalists' propensity to save and to accumulate (s_{Π}), determines the rate of capital accumulation and growth (g):

$$g = s_{\Pi}r. \tag{1.1}$$

In this approach the validity of Say's law in Ricardo's version is assumed:[4] Profits saved are completely used for investment and accumulation, so that no problems of effective demand for the economy as a whole arise in long-run growth.[5] However, for the classical authors and Marx this does not mean that the growth path is characterized by full employment. On the contrary, unemployment is considered to be a persistent feature of capitalism constraining distribution claims of workers and thus providing the conditions for positive profits, capital accumulation and growth. Furthermore, in this perspective, capital accumulation feeds back on the rate of profit in the long run, and causes a tendency of the rate of profit to fall. This is either due to the specific nature of technological progress causing a falling productivity of capital (Marx) or to the falling marginal productivity of land (Ricardo). Finally, a deep crisis of capitalism (Marx) or a stationary state of the economy (Ricardo) is supposed to emerge.

In the first generation of post-Keynesian distribution and growth theories put forward by Nicholas Kaldor and Joan Robinson, relying on Keynes's and Kalecki's 'principle of effective demand' and extending it to the long period, it is investment decisions of firms and hence capital accumulation, financed independently of prior saving in the economy, which determine functional income distribution. The causality known from the classicals and Marx is reversed: The rate of profit is determined by the rate of accumulation and growth and by the propensity to save out of profits; income distribution is a result of capital accumulation and not a precondition:

$$r = \frac{g}{s_{\Pi}}. \tag{1.2}$$

In the second generation post-Keynesian models based on Michal Kalecki's and Josef Steindl's works, the independence of capital accumulation of firms from prior saving is connected with a determination of income distribution by relative economic powers, mainly through firms' mark-up pricing on unit labour costs in incompletely competitive goods markets. At first sight, the system now seems to be overdetermined. However, the long-run endogeneity of the rate of capacity utilization allows for a reconciliation: Functional income distribution, and hence the profit share (h), is explained by relative economic powers of capital and labour affecting the mark-up in firms' pricing, and the rate of capacity utilization (u) is determined by aggregate demand and hence by capital accumulation and consumption. In the Kalecki-Steindl approach, the rate of capital accumulation still determines the rate of profit, as in equation (1.2), but now through variations in the rate of capacity utilisation:

$$r = \frac{\Pi}{pK} = \frac{\Pi}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = hu\frac{1}{v}, \tag{1.3}$$

with Π representing the sum of profits, K the real capital stock, p the price level, Y real output, Y^p potential output given by the capital stock, h the profit share, u the rate of capacity utilization, and v the capital–potential output ratio.

What all the post-Keynesian distribution and growth models have in common is the adherence to Keynes's and Kalecki's principle of effective demand. Investment by firms is independent of prior saving and is the driving force of the growth process, which determines not only the utilization of existing capacities, but also the creation of additional productive capacities. The identification of the determinants of investment and capital accumulation is thus a key challenge and plays a key role in these models. Generally, the expected rate of profit and the interest rate or the interest payments as monetary categories are of significance, as will be shown in detail in the chapters to follow.

1.2 DISTRIBUTION AND GROWTH TRENDS SINCE THE 1960s – SOME STYLIZED FACTS

We do not attempt a detailed empirical analysis of the relationship between functional income distribution and economic development in this introduction, but we would like to present a brief overview of the trends of important indicators for the period starting in the 1960s until the Great Recession in 2008/09. The focus will be on a sample of developed capitalist economies.

Looking at functional income distribution first, we can start with the wage share (1−h) from the national accounts. This is the share of compensation of employees (W) in nominal GDP at market prices or at factor costs, or in national income (pY):

$$(1 - h) = \frac{W}{pY}. \tag{1.4}$$

The profit share (h) as the share of profits (Π), including income of self-employed persons, retained profits, dividends, interest and rents, in nominal GDP at market prices or at factor costs, or as a share in national income, is given as:

$$h = \frac{\Pi}{pY}. \tag{1.5}$$

Since nominal GDP or national income is only divided between wages and profits in a broad sense,

$$pY = W + \Pi, \tag{1.6}$$

we have:

$$\frac{W}{pY} + \frac{\Pi}{pY} = 1. \tag{1.7}$$

The development of the unadjusted wage share taken from the national accounts may be insufficient to assess the distribution position of the average wage income earner in comparison with the average profit income earner. This is so because the wage share is significantly affected by the development of the share of employees (L) in total employment (E), including employees and self-employed persons (E_S):

$$E = L + E_S. \tag{1.8}$$

When formerly self-employed persons, earning profits in a broad sense according to the national accounts, give up their business and become employed workers and thus wage and salary earners, *ceteris paribus* the wage share rises and the profit share falls, without any improvement of the distribution position of the average wage income earner relative to the average profit income earner. Such a change in the employment structure is often associated with structural change in the economy, for example from agriculture dominated by self-employment to industrial production dominated by dependent employment and wage labour.

In order to correct for the effect of this structural change on the functional income distribution measure, we can calculate a 'labour income share', which is called an 'adjusted wage share' in the AMECO database of the European Commission (2013) widely used in the empirical research referred to in this book. When calculating a labour income share, it is assumed that the average labour income of a self-employed person is equal to the average labour income of an employee. With this assumption the transition from self-employment to dependent employment has no effect on the functional income shares in the economy. This can be shown as follows. The total labour income (W_{LI}) is given as the sum of wages of employees (W) plus the labour income of the self-employed persons (W_S), and therefore we obtain:

$$W_{LI} = W + W_S = \frac{W}{L}L + \frac{W}{L}E_S = \frac{W}{L}(L + E_S) = \frac{W}{L}E. \tag{1.9}$$

Dividing total labour income from equation (1.9) by national income or GDP at market prices or factor costs, we obtain the respective labour income share:

$$(1 - h)_{LI} = \frac{W_{LI}}{pY} = \frac{\frac{W}{L}E}{pY} = \frac{W}{pY}\frac{E}{L} = \frac{\frac{W}{L}}{\frac{pY}{E}} = \frac{w}{py}. \tag{1.10}$$

As can be seen from equation (1.10), the labour income share can easily be calculated by multiplying the unadjusted wage share from the national accounts with the ratio of total employment to employees. It is also given by dividing the nominal wage rate ($w = W/L$) by the product of the price level (p) and the real productivity of total employment ($y = Y/E$). Writing equation (1.10) in growth rates, we obtain the determinants of a change in functional income distribution:

$$(1 - h)_{LI} = \hat{w} - \hat{p} - \hat{y}. \tag{1.11}$$

Therefore, by definition, the labour income share will rise (fall) whenever the rate of change of the nominal wage rate exceeds (falls short of) the sum of the rate of change of the price index (inflation) and of labour productivity growth:

$$(1 - h)_{LI} > 0, \quad \text{if:} \; \hat{w} > \hat{p} + \hat{y}, \tag{1.11a}$$

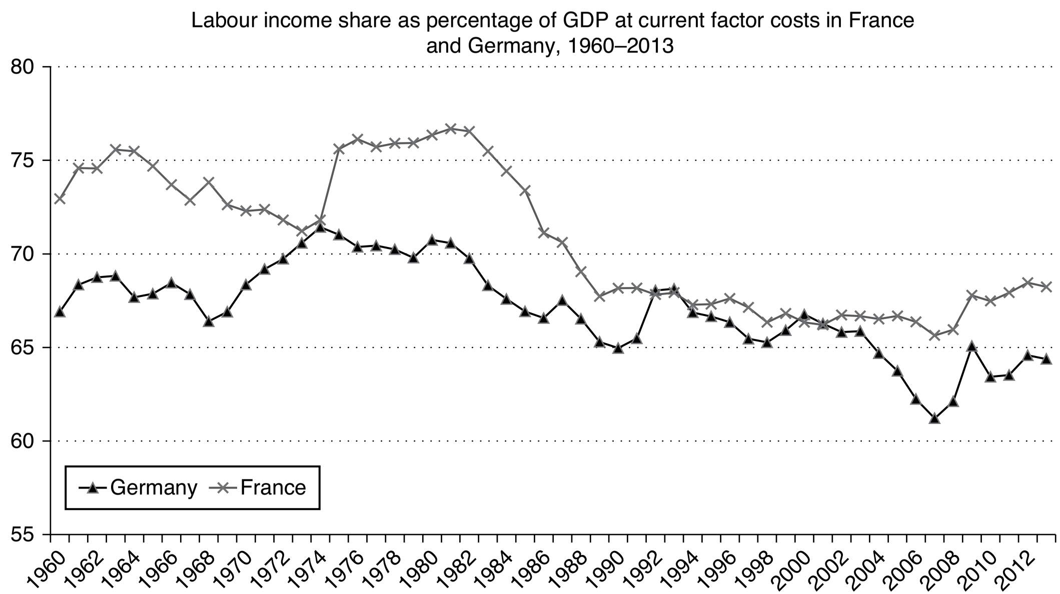
$$(1 - h)_{LI} < 0, \quad \text{if:} \; \hat{w} < \hat{p} + \hat{y}, \tag{1.11b}$$

Figures 1.1 to 1.3 show the development of the labour income shares in selected developed capitalist economies from 1960 until 2013. As can be seen the labour income share is usually characterized by significant short-run fluctuations during a trade cycle, on the one hand, and by long-run trends beyond the trade cycle, on the other hand. Therefore, functional income distribution does not seem to be constant over time, neither in the short nor in the long run. In a short-run perspective, labour income shares seem to reach local maxima during cyclical recession periods, as in the mid-1970s, the early 1980s, the early 1990s, the early 2000s and around 2008/09, and local minima during cyclical recoveries and booms after these recessions. However, there are some exceptions to this pattern. As can be easily explained with the help of equation (1.11), this counter-cyclical pattern in the labour income share will be observed if in a recession nominal wage growth does not fall to the same extent as the sum of inflation and productivity growth, and if in a cyclical recovery and boom period nominal wage growth does not rise in step with the sum of inflation and productivity growth.

In a long-run perspective, the labour income share seems to have a constant (Italy, the US) or slightly rising trend (France, Germany, Spain, the UK, Japan) from the early 1960s until the recession of the early 1980s, and then a falling trend until the Great Recession of 2008/09. Therefore, the recession of the early 1980s seems to mark a structural break in the development of income distribution. Such a structural break is visible not only for functional income distribution but also for the trend of other macroeconomic variables, as can be seen in Table 1.1, where we have calculated cyclical average values for the labour income share, real GDP growth, labour productivity growth, the real long-term interest rate, that is the nominal interest rate corrected for inflation, and the rate of inflation.

Since there are difficulties in identifying a clear common pattern of trade cycles for the seven economies during the period 1961–73/74, we have calculated the average values for this whole period. This first period covers a major part of the post Second World War 'golden age' of capitalism from the 1950s until the late 1960s/mid-1970s with stable or slightly rising labour income shares, high real GDP, capital stock and productivity growth, low real interest rates falling short of real GDP growth, and moderate rates of inflation. The latter is particularly true for the 1960s; in the late 1960s/early 1970s inflation rates started to rise significantly, thus raising the average for the period 1961–74/75.

The cycle of the second half of the 1970s saw a further increase in labour income shares, except for Italy, higher inflation rates, lower real interest rates, which even became negative in France, Italy, Spain and the UK, and lower real GDP, capital stock and productivity growth than in the period before. Therefore, the turbulent 1970s meant the end of the

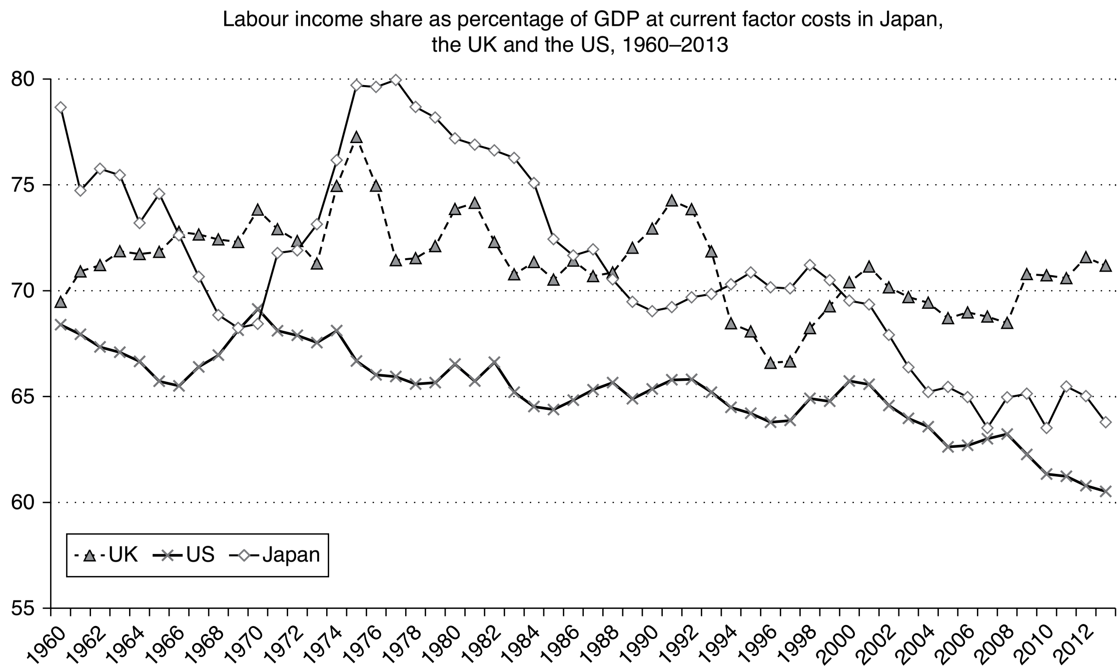


Source: European Commission (2013).

Figure 1.1 Labour income share in France and Germany

Source: European Commission (2013).

Figure 1.2 Labour income share in Italy and Spain



Source: European Commission (2013).

Figure 1.3 Labour income share in Japan, the UK and the US

Table 1.1 Labour income shares, real GDP growth, real capital stock growth, labour productivity growth, and real long-term interest rates on average over the trade cycle in France, Germany, Italy, Spain, the UK, the US and Japan, 1961–2008

France	1961–74	1975–80	1981–92	1993–2002	2003–08
Labour income share	73.39	75.94	71.60	66.97	66.30
Real GDP growth	5.58	2.62	2.19	1.99	1.65
Real net capital stock growth	4.68	3.65	2.47	2.05	2.39
Growth of real GDP per person employed	5.00	2.17	1.92	1.13	1.01
Real long-term interest rate	1.56	−0.27	4.96	4.53	1.81
Inflation (consumer price index)	5.25	10.60	5.72	1.52	1.99
Germany[1]	1961–74	1975–81	1982–92	1993–2002	2003–08
Labour income share	68.60	70.46	67.13	66.35	63.31
Real GDP growth	4.10	2.34	2.72	1.39	1.58
Real net capital stock growth	4.13	2.47	1.93	2.09	1.10
Growth of real GDP per person employed	3.87	2.06	1.63	1.11	1.11
Real long-term interest rate	3.52	3.21	4.96	4.09	2.44
Inflation (consumer price index)	3.62	4.63	2.59	1.85	1.79
Italy	1961–74	1975–81	1982–92	1993–2002	2003–08
Labour income share	72.61	71.86	68.46	63.21	62.11
Real GDP growth	5.37	2.97	2.33	1.60	0.88
Real net capital stock growth	4.67	3.42	2.62	1.75	1.83
Growth of real GDP per person employed	5.45	2.00	1.75	1.32	0.33
Real long-term interest rate	0.23	−2.55	4.95	3.88	1.59
Inflation (consumer price index)	5.63	16.84	8.20	3.11	2.36
Spain	1961–74	1975–80	1981–92	1993–2001	2002–08
Labour income share	71.03	72.79	68.40	66.20	62.51
Real GDP growth	7.11	1.58	2.73	3.13	3.01
Real net capital stock growth	5.38	4.56	3.40	3.63	4.59
Growth of real GDP per person employed	6.37	3.28	1.88	0.84	0.50
Real long-term interest rate	–	−2.83	4.68	3.70	0.77
Inflation (consumer price index)	7.38	18.35	8.75	3.40	3.33

Table 1.1 (continued)

UK	1961–73	1974–79	1980–90	1991–2000	2001–08
Labour income share	72.16	73.71	71.90	69.76	69.42
Real GDP growth	3.16	1.48	2.31	2.52	2.52
Real net capital stock growth	2.75	2.00	1.69	1.83	2.46
Growth of real GDP per person employed	2.86	1.07	1.74	2.27	1.64
Real long-term interest rate	2.52	−1.61	3.98	4.19	2.68
Inflation (consumer price index)	5.09	15.63	7.09	2.67	1.93
US	**1961–73**	**1974–81**	**1982–90**	**1991–2000**	**2001–08**
Labour income share	67.26	66.28	65.20	64.86	63.66
Real GDP growth	4.34	2.52	3.42	3.46	2.10
Real net capital stock growth	3.07	2.70	2.66	2.73	2.95
Growth of real GDP per person employed	2.36	0.62	1.45	1.84	1.64
Real long-term interest rate	2.09	0.24	5.76	4.30	2.01
Inflation (consumer price index)	3.17	9.37	4.12	2.81	2.83
Japan[2]	**1961–73**	**1974–82**	**1983–92**	**1993–2001**	**2002–08**
Labour income share	72.26	78.11	71.53	70.20	65.49
Real GDP growth	9.39	3.47	4.29	0.83	1.21
Real net capital stock growth	6.72	6.24	4.74	2.46	0.62
Growth of real GDP per person employed	7.95	2.83	3.18	1.10	1.12
Real long-term interest rate	−1.36	0.20	4.42	2.56	2.11
Inflation (consumer price index)	6.17	8.28	1.78	0.30	0.03

Notes:
In percentages.
The local minimum of real GDP growth is taken as the beginning of a trade cycle. The period 1961–73/74 shows no clear pattern of trade cycles for the countries under consideration.
[1] West Germany from 1960 to 1991.
[2] For Japan the trade cycle pattern for the period 1974–2008 has been adjusted to fit the pattern of the other countries.

Source: European Commission (2013); author's calculations.

golden age period. Full employment, rising labour income shares, high inflation and low, partly negative real interest rates triggered 'the revenge of the rentiers' (Smithin 1996) and the rise of 'monetarism as a social doctrine' (Bhaduri and Steindl 1985). As a consequence, in the course of the 1970s governments moved away from targeting full employment by means of active aggregate demand management towards targeting price stability, using higher rates of unemployment as an instrument. This change in policy priorities included the deregulation and liberalization of labour markets, as well as national and international financial markets in particular. All this caused a shift of power from labour to capital, and to financial capital in particular, and finally gave rise to 'finance-dominated capitalism' (Hein 2012a), as has been analysed in detail in Glyn (2006), for example.[6] The macroeconomic dimension and implications of this shift from the golden age period of capitalism towards finance-dominated capitalism or 'financialization' will be explored in Chapter 10 of this book.

The economic effects of this shift can be seen in Table 1.1. Starting with the trade cycle of the 1980s, labour income shares were falling over the consecutive cycles in all the countries until the Great Recession. Inflation rates started to fall as well, and in the cycles of the 1990s and the early 2000s they reached levels below those in the golden age period, with Japan even being shattered by severe deflationary pressures. Real interest rates rose considerably during the cycles of the 1980s and the 1990s, and only in the cycle of the early 2000s did they fall back to the levels of the golden age, with Japan being an exception. In some countries real GDP growth recovered somewhat compared to the cycle of the second half of the 1970s, however, without reaching the high growth rates of the golden age period again. Most importantly, real GDP remained below the real long-term interest rate during the cycles of the 1980s, 1990s and early 2000s, thus reversing the golden age constellation. The only exceptions to this were Italy, Spain and the US during the cycle of the early 2000s, the former two benefiting from the convergence of nominal interest rates towards the lower German level associated with the establishment of the European Monetary Union and the euro. Real capital stock growth remained weak during the three cycles of 'finance-dominated capitalism' and no longer reached the growth rates of the golden age period. Finally, the trend of productivity growth continually declined in all of the countries, except the UK and the US, where a rise during the cycles of the 1980s and 1990s could be observed.

This broad overview will suffice for the introduction. We shall come back to the explanation of some of these facts and trends in Chapters 7 to 10 of this book, which contain empirical applications of the Kaleckian models developed in those chapters.

1.3 OVERVIEW OF CHAPTERS AND METHODS

The following chapters of this book can be broadly divided into two parts. First, Chapters 2 to 5 give an overview of the development of distribution and growth theories after Keynes, focusing on the main strands and contributing authors. The presentations of the contributions of different authors may sometimes deviate from the original sources in order to make the approaches more accessible and comparable. But, of course, the content should be faithful to the original contributions. Second, Chapters 6 to 11 introduce and develop in more detail different versions of the Kaleckian–Steindlian distribution and growth models, which have become workhorse models in post-Keynesian research during the last two decades or so.

We start in Chapter 2 with the transition from Keynes's short-period macroeconomics to the contributions by Evsey D. Domar and Roy F. Harrod. The latter two were the first explicitly to treat the capacity effect of investment, which had been omitted by Keynes and in short-run macroeconomic theory after Keynes. Domar merely formulated the conditions for a growth equilibrium in which capacity effects of investments are taken into consideration. Harrod also studied the out-of-equilibrium dynamics in an attempt at formulating a dynamic theory, and he considered these dynamics to be unstable. The determinants of the long-period growth processes, however, have not been treated by these two authors. We also show that the well-known textbook post-Keynesian 'Harrod–Domar growth model' is a misinterpretation of the intentions and the contributions of Domar and Harrod, which then gave rise to neoclassical growth theory.

Chapter 3 deals with the neoclassical distribution and growth theory. We start by reiterating that neoclassical general equilibrium microeconomics already contains a theory of distribution determining the remuneration of the factors of production by technology and utility, and the household distribution of income furthermore by initial endowments. At the macroeconomic level, the aggregate marginal productivity theory of income distribution determines factor income shares by production technology. Next in this chapter we discuss the 'old neoclassical growth model' put forward by Robert M. Solow and Trevor Swan in the 1950s. The properties of the Solow model, which is a full employment growth model with exogenous technological progress, are outlined and the implications of this approach with regard to productivity convergence are discussed. The treatment of technological progress as an exogenous and thus unexplained variable in the model gave rise to a second generation of neoclassical growth models, the so-called 'new growth theory' or 'endogenous growth models', starting in the 1980s with the works of Paul M. Romer and Robert E. Lucas. We discuss basic versions of these models and focus, among other things, on the role of income distribution. Finally, we deal with fundamental critiques of the neoclassical distribution and growth theories, old and new, and focus on the 'Cambridge controversies in the theory of capital' or the 'Cambridge–Cambridge controversy' of the 1950s and 1960s questioning the logical consistency of the neoclassical approach outside a one-good barter economy.

In Chapter 4 we turn to the first generation post-Keynesian distribution and growth approaches put forward by Nicholas Kaldor and Joan Robinson in the 1950s and early 1960s. First, we start by presenting Kaldor's full utilization–full employment equilibrium growth models, together with extensions and further developments suggested by Luigi L. Pasinetti. In these models, capital accumulation and full employment growth determine the rate of profit and thus functional income distribution. Productivity growth and hence the natural rate of growth become endogenous through Kaldor's technical progress function and the notion of capital-embodied technical change. Second, we address Kaldor's applied economics of growth, considerably deviating from his full utilization–full employment equilibrium growth models. We deal with the export-led growth model based on Kaldor's growth laws and finally with Anthony P. Thirlwall's model of a 'balance-of-payments-constrained' growth rate. Then we turn to Joan Robinson's contributions, her rejection of steady state equilibrium growth models, her analysis of the relationship between the rate of profit and the rate of growth, and her distinctions between different accumulation scenarios or 'ages'. Finally in this chapter, we present a textbook 'Kaldor–Robinson' or 'post-Keynesian' distribution and growth model, capturing some of the main characteristics of this approach.

Chapter 5 deals with Michal Kalecki's and Josef Steindl's contributions. As already mentioned above, the major differences of the Kalecki–Steindl approach as compared to the post-Keynesian Kaldor–Robinson approach are that active cost-plus price setting of firms in the industrial sector of the economy is assumed, which becomes a major determinant of functional income distribution. And, furthermore, in the Kalecki–Steindl approach the economy is characterized by unemployment and excess capacity beyond the short run. Therefore, the rate of utilization of productive capacities given by the capital stock is considered to be endogenous in the medium to long run, too. We start the overview with Kalecki's pricing and distribution theory, which is followed by his determination of national income and the level of profits. In this chapter we also touch on some of the debates of Kalecki's theory of pricing and distribution, and we deal with some further developments of mark-up pricing and distribution theories, as proposed by Alfred S. Eichner, G.C. Harcourt and Peter Kenyon, Adrian Wood, Josef Steindl and Paolo Sylos-Labini. Next, we outline Kalecki's views on the determination of investment and on economic dynamics and growth. Finally, we turn to Josef Steindl's theory of stagnation in mature capitalist economies and some further developments.

Starting with Chapter 6, we develop Kaleckian models of distribution and growth in a gradual manner. These models have in common the three main distinguishing features of the Kalecki–Steindl approach, that is active cost-plus price setting of firms as a major determinant of functional income distribution, excess labour supply and hence unemployment beyond the short run, and the notion of a medium- to long-run endogenous rate of utilization of productive capacities given by the capital stock. In Chapter 6 we begin by developing two baseline models, the 'neo-Kaleckian' distribution and growth model based on the contributions by Amitava K. Dutt and Robert Rowthorn, and the 'post-Kaleckian' model based on the work of Amit Bhaduri and Stephen Marglin, as well as on a paper by Heinz D. Kurz. The neo-Kaleckian model in its basic version generates uniquely wage-led results – a higher wage share is beneficial for the rates of capacity utilization, capital accumulation and profit. The post-Kaleckian model, however, allows for wage- or profit-led regimes depending on the values of the model parameters and coefficients.

In Chapter 7 we extend the different versions of the basic Kaleckian models with the final purpose of assessing the empirical work which has been done on the basis of the post-Kaleckian model. We start by introducing saving out of wages into the closed economy versions of the neo-Kaleckian and the post-Kaleckian model. Since with this extension the neo-Kaleckian model is no longer uniquely wage-led, we then move on with the post-Kaleckian model and integrate international trade into this model. This provides us with the version of the theoretical model which has been used in empirical research on wage- and profit-led demand and growth regimes since the early to mid-1990s. The main results of these empirical studies are finally reviewed and summarized.

In Chapter 8 we integrate productivity growth into the post-Kaleckian model. We distinguish between the demand regime and the productivity regime of our model, and we discuss the separate effects of changes in the profit share on each of these regimes. Finally, we analyse the overall effects of changes in distribution on aggregate demand, capital accumulation and productivity growth. Extending the post-Kaleckian model in this way contributes to an understanding of the long-run effects of redistribution on capital accumulation, productivity growth and hence the potential or the 'natural' rate of growth. We show that, with the endogeneity of productivity growth, potential GDP growth becomes endogenous with respect to distributional changes and to actual GDP growth, and economic policies thus have long-lasting effects through these channels. In this chapter we also provide an overview of empirical results on the estimations of the productivity growth regime of the model.

Chapter 9 explicitly integrates monetary variables and a rentiers' class into the post-Kaleckian distribution and growth model. For this purpose, we rely on the post-Keynesian horizontalist approach towards interest rates, credit and money. Therefore, we treat the monetary rate of interest as an exogenous variable, mainly determined by central bank policies and by the liquidity and risk considerations of commercial banks supplying credit to the productive sectors of the economy. The volumes of credit and money are considered as endogenous variables, determined by economic activity and payment conventions. In the first step, the short-run effects of changes in the rate of interest on income distribution, saving and investment are discussed and the effects on the equilibrium rates of capacity utilization, capital accumulation and profit are derived, holding the degree of indebtedness of the firm sector constant. This allows deriving different potential regimes depending on the behavioural coefficients of the model. In the second step, we treat the firms' debt–capital ratio as a long-run endogenous variable and we discuss its stability properties in the different regimes. Finally, empirical studies on the channels of transmission of changes in the interest rate on distribution, consumption and investment and on the respective overall regime are reviewed.

In Chapter 10 the 'macroeconomics of finance-dominated capitalism' are reviewed, based on different versions of the Kaleckian distribution and growth model. From a macroeconomic perspective four channels of transmission of financialization, or the dominance of finance, to the macroeconomy can be distinguished: first, the effect on income distribution; second, the effects on investment in capital stock; third, the effects on household debt and consumption; and, fourth, the effects on net exports and current account balances. We start by reviewing and interpreting the effects of financialization on income distribution against the background of Kalecki's theory of distribution. Then we integrate the distribution effects of financialization with the effects on investment in capital stock and derive implications for capital accumulation and growth, as well as for the stability of the financial structure of the firm sector. Next, we turn to the effects on consumption and household debt, and we discuss the implications for accumulation and growth as well as for the sustainability of household debt. Finally, we introduce an open economy dimension and present a Kaleckian model of growth driven by net exports and current account surpluses, and we discuss the sustainability of such a regime as well.

Chapter 11 is devoted to the critique of the Kaleckian distribution and growth models put forward by Harrodian and Marxian authors. The main point of this critique is addressing the Kaleckian treatment of the rate of capacity utilization as an endogenous variable in the medium to long run, which may deviate from the 'normal' rate of utilization. If the latter is considered as a definite target of the firm, deviations from this target will trigger reactions of firms' investment, thus causing 'Harrodian instability', according to the critics. In order to review this critique and to examine the implications we start with a basic neo-Kaleckian model, include a normal rate of capacity utilization into the model and define medium- to long-run Harrodian instability. Then we discuss several mechanisms to contain and tame Harrodian instability with an exogenous normal rate of capacity utilization, as suggested by the critics of the Kaleckian models, and find them to be far from convincing. Next, we outline Kaleckian responses to the critique. These include those Kaleckian approaches which question the notion of a normal rate of utilization in general or its uniqueness, as well as a recent approach accepting the idea of a unique normal rate of utilization but arguing that firms may have other, potentially more important, medium- to long-run targets so that neither an adjustment towards the utilization target nor Harrodian instability should be expected. Furthermore, we discuss approaches which accept the equality of actual and normal rates of capacity utilization in long-run equilibrium, but argue that the normal rate may become endogenous to the actual rate. Finally, we discuss the effects of applying monetary policies as a stabilizer in the face of Harrodian instability, and we show that this may also generate an endogenous normal rate of capacity utilization.

In Chapter 12, we summarize our main results and findings, touch on those issues in post-Keynesian distribution and growth theories which have not been dealt with in detail in this book, and outline areas of future research.

Before we start with the discussion of the theories of distribution and growth after Keynes, a few words on the methods and concepts used in presenting the models seem to be appropriate. In the chapters that follow we will mainly make use of comparative dynamic models based on linear equations. This means that we will derive equilibrium growth rates from our models, together with equilibrium distribution and equilibrium utilization rates of growing productive capacities where appropriate. Changes in model parameters, in coefficients in the behavioural equations of the model, or in initial conditions will generate a new dynamic equilibrium. The most we can do with this method is checking the stability of the respective equilibria. However, a detailed analysis of the transition from one equilibrium growth path to another, provided the equilibrium is stable, and thus tracing the disequilibrium or out-of-equilibrium processes, is well beyond the scope of this method. In this sense comparative dynamics in distribution and growth theory is similar to the use of comparative statics in short-run macroeconomics focusing on the determination of income and employment.[7]

In particular post-Keynesians might object that comparative dynamics based on linear equations is too simple an approach, either because it incorporates the notion of equilibrium growth which should be rejected and/or because detailed analyses of the out-of-equilibrium dynamics as well as non-linearities are missing, which are considered to be most important in the 'real world'. However, in our book we follow Dutt's (2011a, p. 143) justification of the use of equilibrium analysis in Kaleckian models:

> [I]t should be pointed out that equilibrium should be thought of not as an actual state of rest, or a tranquil state, but rather as a theoretical tool of analysis . . . [T]he equilibrium in a model does not imply a position of rest for actual economies, since in the model many things which can actually change over time are held constant in order to abstract from their influences. If these things change erratically, they need not be modelled formally. But if they do change systematically, the equilibrium model can be the basis of examining the results of the endogenous dynamics of these state variables.

Therefore, the method of comparative dynamics can be considered as a useful first step in modelling distribution and growth issues. It provides important insights, in particular when it comes to the comparison of different approaches and paradigms towards distribution and growth. Further developments can then include the explicit considerations of out-of-equilibrium dynamics based on linear or non-linear equations, and the generation of cyclical growth models, for example.

Considering equilibrium as a theoretical tool of analysis – and not as an actual state of the economy or a point of rest towards which the economy will tend in 'historical time' – also means that we will use 'periods' or 'runs' as theoretical and modelling concepts, which do not necessarily refer to historical episodes.[8] A 'short-run' – or a 'short-period' – equilibrium is thus an equilibrium in which certain variables are held constant or are taken to be exogenous. These variables may then vary and are determined endogenously within the model when it comes to the 'medium-run' or 'long-run' equilibrium. Further explanations regarding the modelling concepts will be provided in the respective chapters.

NOTES

1. Following Kuhn (1962), a paradigm is here understood as a specific view of the world, which determines the object of investigation, the relevant research questions and the research methodology. See also Dow (2001).
2. Of course, Dutt (1990a) includes a detailed introduction into and development of the Kaleckian–Steindlian approach to distribution and growth, going well beyond the scope of the present book by including two-sector models and uneven development issues.
3. However, classical and Marx's theories are covered in my German book on distribution and growth at an introductory level (Hein 2004a, chaps 2–3). For an introduction to the classical approach to distribution and growth see also Pasinetti (1974, chap. 1), Harris (1987) and Kurz and Salvadori (2003). On Marx's and Marxian theories of distribution and capital accumulation see also, for example, Shaikh (1978a, 1978b), Levine (1988) and Catephores (1989).
4. The validity of Say's law, however, is not accepted by all classical economists. During the 'general glut' controversy, in which the possibility of a general crisis of overproduction was discussed, Ricardo, Say and James Mill advocated that demand is only limited by production and that a general overproduction crisis is therefore impossible. Malthus and Sismondi, however, stressed the possibility of overproduction and a general stagnation due to a lack of effective demand (Sowell 1972).
5. Marx's theory, however, also allows for another interpretation, in which the assumption of Say's law does not follow conclusively, and in which aggregate demand, finance, credit and interest rates matter for the determination of accumulation and growth (Argitis 2001, 2008; Hein 2004b, 2006a, 2008, chap. 5).
6. The analysis of different stages or regimes of capitalism is at the core of the French Regulation School and the US-based Social Structure of Accumulation approach. Several post-Keynesian authors, like Steindl (1979, 1989), Bhaduri and Steindl (1985), Smithin (1996) and Cornwall and Cornwall (2001), have contributed as well. See Hein et al. (2014) for an overview of these approaches.
7. For further details, see Gandolfo (1997, chap. 20).
8. In the models to be presented, we do not follow the distinction frequently made in the literature, according to which 'periods' are analytical concepts whereas 'runs' refer to historical episodes, as for example Harcourt (2011, pp. 3–4) explains: '"Period" is a theoretical concept where what is and what is not confined to the *cet. par*. pound is decided by the theorist in question (and the issue being examined); whereas "run" refers to actual historical episodes where what relevant determining factors change or do not change are products of that particular historical episode and are not decided by the theorist and/or historian analyzing it.'

2. From Keynes to Domar and Harrod: considering the capacity effect of investment and an attempt at dynamic theory

2.1 INTRODUCTION: THE TRANSITION FROM KEYNES'S SHORT-PERIOD MACROECONOMICS TO THE POST-KEYNESIAN DISTRIBUTION AND GROWTH THEORY

In *The General Theory of Employment, Interest, and Money*, John Maynard Keynes (1936) provided a general theory for the determination of the level of activity in a monetary production economy based on the principle of effective demand.[1] For this purpose, he took as given

> the existing skill and quantity of labour, the existing quality and quantity of available equipment, the existing technique, the degree of competition, the tastes and habits of the consumer, the disutility of different intensities of labour and of the activities of supervision and organisation, as well as the social structure including the forces . . . which determine the distribution of national income. (Keynes 1936, p. 245)

Neither growth nor distribution issues were thus in the focus of the *General Theory*. However, although not explicitly integrating distribution issues into his theory of effective demand, Keynes (1936, p. 262) was well aware that a transfer of income away from wage earners will have a dampening impact on the economy's propensity to consume, and thus on aggregate demand, output and employment. Therefore, considering the aggregate demand effects of income and wealth distribution in Chapter 24, the final chapter, of the *General Theory*, he argues that '[t]he outstanding faults of the economic society in which we live are its failure to provide for full employment and its arbitrary and inequitable distribution of wealth and incomes' (Keynes 1936, p. 372).

But in the *General Theory* we also find an inclination to accept the neoclassical marginalist microeconomic framework for the determination of income distribution.[2] In Chapter 24 of the *General Theory* we can read as well:

> If we suppose the volume of output to be given, *i.e.* to be determined by forces outside the classical scheme of thought, then there is no objection to be raised against the classical analysis of the manner in which private self-interest will determine what in particular is produced, in what proportions the factors of production will be combined to produce it, and how the value of the final product will be distributed between them. (Keynes 1936, pp. 378–379)

Of course, Keynes did not consider the neoclassical theory of income distribution to be very meaningful on the macroeconomic level, because factor demand and factor income shares cannot be determined by scarcity and marginal productivities as long as overcapacities and underemployment prevail owing to a lack of effective demand. Overall, therefore, the *General Theory* does not serve as a good starting point for the search for the foundations of post-Keynesian theories of distribution as an alternative to the neoclassical approach.

However, in his earlier *A Treatise on Money*, Keynes (1930a) provided some important foundations for distribution theory, which later fed into Nicholas Kaldor's approach, to be discussed in Chapter 4 of this book. In the 'fundamental equations for the value of money' (Keynes 1930a, chap. 10), investment spending, being independent from saving, has essentially price and distribution effects and not pure quantity effects, as in the *General Theory*. Keynes paraphrases this connection with the metaphor of the 'widow's cruse', according to which capitalists' spending determines their profits (and their share of national income):

> Thus profits, as a source of capital increment for entrepreneurs, are a widow's cruse which remains undepleted however much of them may be devoted to riotous living. When, on the other hand, entrepreneurs are making losses, and seek to recoup these losses by curtailing their normal expenditure on consumption, *i.e.* by saving more, the cruse becomes a Danaid jar which can never be filled up; for the effect of this reduced expenditure is to inflict on the producers of consumption-goods a loss of an equal amount. (Keynes 1930a, p. 139)

Therefore, even in an economy running at full capacity output, investment determines saving, and capitalist expenditures for investment and consumption purposes determine the profits of the capitalist class as a whole. The adjustment of saving to investment here takes place via changes in prices and distribution and not via changes in real output and income, as in the *General Theory*, where output was assumed to be usually below the full capacity and full employment level. The principle of the independence of investment from saving can thus be found, regardless of all other differences, in the post-Keynesian theories of distribution and growth put forward after or even simultaneously with Keynes, and to be discussed in this book.[3]

The further development of the Keynesian or rather post-Keynesian theories of distribution is mainly associated with the names of Nicholas Kaldor and Michal Kalecki.[4] Kaldor, following Keynes's approach in the *Treatise on Money*, analysed the role of income distribution in connection with the theory of growth at full employment levels. Kalecki's theory of distribution and effective demand, which was developed simultaneously with or even before Keynes's approach, was strongly influenced by his study of the Marxian theory of distribution, aggregate demand and capital accumulation, in which power struggles and the class specific income distribution play major roles.

As already mentioned above, the issues of capital accumulation and economic growth were not analysed in any detail in Keynes's *General Theory* either, because of the focus of the theory on income and employment determination. As is well known, the core finding of the theory of effective demand is that, in a monetary production economy, investment demand is independent from prior saving and that investment generates the appropriate amount of saving via the multiplier, originally developed by Richard Kahn (1931). However, investment not only is the most important part of aggregate demand, determining the level of output and employment in the short period, but also means the creation of additional productive capacities. But the analysis in the *General Theory* is short period in the sense that the existence of a given capital stock is assumed. Thus, Keynes does not explicitly include the effects of capacity creation through investment into the model provided by the *General Theory*. But this does not mean that he considered his own theory to generate just short-period deviations from the long-run neoclassical full employment equilibrium growth path, caused by rigidities or expectation errors.[5] Nor does it imply that he was not concerned with long-run growth and development issues. On the contrary, regarding the former he claimed that the theory provided in the *General Theory* is meant to 'explain the outstanding features of our actual experience; – namely, that we oscillate, avoiding the gravest extremes of fluctuation in employment and prices in both directions, round an intermediate position appreciably below full employment and appreciably above the minimum employment a decline below which would endanger life' (Keynes 1936, p. 254).[6]

Regarding the latter, Keynes has shown in his papers 'Economic possibilities for our grandchildren' (1930b) and 'The long-term problem of full employment' (1943) that he was very much concerned with the long-run development prospects of modern monetary production economies. However, he did not present any formal growth theory.

The development of post-Keynesian growth theory starts with considering the capacity effects of investments explicitly, taking saving as the adjusting variable also in the long period. Here, the initial attempts of Evsey David Domar, Roy Forbes Harrod, Nicholas Kaldor and Joan Robinson have to be mentioned, as well as the works of Michal Kalecki and Josef Steindl, in particular.[7] All these attempts share the assumption of investment decisions by firms being independent of prior saving decisions in the economy. As Joan Robinson famously put it:

> The Keynesian models (including our own) are designed to project into the long period the central thesis of the *General Theory*, that firms are free, within wide limits, to accumulate as they please, and that the rate of saving of the economy as a whole accommodates itself to the rate of investment that they decree. (Robinson 1962, pp. 82–83)

Harrod's and Domar's main contributions were the first to treat the capacity effect of investment explicitly. Whether these two authors should be seen as the founding fathers of post-Keynesian growth theory, however, may well be disputed, because, in the end, they merely formulated the conditions for an equilibrium in which capacity effects of investments are taken into consideration. The determinants of long-period growth processes, however, are not treated by both authors, as will be seen below. For the determination of long-period growth, the approaches by Kaldor, Robinson, Kalecki and Steindl will have to be consulted in the following chapters. In the present chapter, however, we start with Domar and Harrod. Domar tried to determine an equilibrium growth rate of income, which guarantees a constant utilization of production capacities, taking into account the capacity effect of investment. Therefore, we treat his approach first, in Section 2.2. Harrod was interested in the trade cycle and in dynamic theory, and he predicts unstable dynamics around the growth equilibrium, which is therefore dealt with after the presentation of Domar's approach. Harrod's approach is presented in Section 2.3, and it is assessed in Section 2.4. Finally, in Section 2.5, we deal with the textbook 'post-Keynesian Harrod–Domar growth model', and we show that it has nothing to do with Harrod's and Domar's problems and that it provides rather the grounds for neoclassical growth theory, which is discussed in Chapter 3.

2.2 DOMAR: THE CONDITIONS FOR A CONSTANT RATE OF UTILIZATION OF GROWING PRODUCTION CAPACITIES

Through the explicit examination of the capacity effect of investment, Domar (1946)[8] in 'Capital expansion, rate of growth and employment' tried to overcome the Keynesian restriction on the short period and to formulate the conditions for equilibrium growth at a constant rate of utilization of growing production capacities in the long period:[9] 'Because investment in the Keynesian system is merely an instrument for generating income, the system does not take into account the extremely essential, elementary, and well-known fact that investment also increases productive capacity' (Domar 1946, p. 139).

The model Domar provides includes the following assumptions: the price level is constant, which means that nominal and real values are equal and an explicit introduction of the price level can be omitted from the presentation; there are no lags, which means that saving and investment are each related to income of the same period; saving and investment are net of depreciation; and productive capacity is a measurable concept for the economy as a whole. Domar assumes that the economy is initially in equilibrium with the productive capacity (Y^p) being equal to national income (Y), and he sets himself the task 'to discover the conditions under which this equilibrium can be maintained, or more precisely, the rate of growth at which the economy must expand in order to remain in a continuous state of full employment' (Domar 1946, p. 138). In what follows, however, Domar no longer deals with full employment of labour, which would have meant considering the growth of labour supply and of labour productivity, too, but rather he focuses on the utilization of productive capacities given by the capital stock, taking into account the dual nature of investment, as mentioned above.

The change in productive capacities or in potential output (dY^P), that is the domestic product at full utilization of the real capital stock, depends on real net investment (I), that is the change of the capital stock (dK), and the marginal productivity of capital, which is assumed to be constant and thus corresponds to the average productivity of capital ($\kappa = dY^p/dK = Y^p/K$):

$$dY^p = \kappa dK = \kappa I. \tag{2.1}$$

For a closed economy without economic activity of the state, the demand determined income effect (dY) of a change in net investment (dI) is given by the simple Keynesian multiplier relation, in which it is assumed that the average propensity to save (s) is given and constant:

$$dY = \frac{1}{s} dI. \tag{2.2}$$

Starting from an equilibrium in the goods market, in order for the output produced by the additional productive capacities to be sold and the increased level of production to be maintained, capacity (supply) and income (demand) effects of investment have to be equal in each period:

$$dY^p = dY. \tag{2.3}$$

Inserting the equations (2.1) and (2.2) into equation (2.3) gives:

$$\kappa I = \frac{1}{s} dI. \tag{2.4}$$

From this, it follows that:

$$\hat{I} = \frac{dI}{I} = \kappa s. \tag{2.5}$$

Therefore, for the goods market equilibrium to be maintained and the rate of capacity utilization to remain constant, investment has to grow at a specific rate which is given by the propensity to save and the productivity of capital. A growing productive potential thus requires ever increasing investment demand. If the rate of growth of investment falls short of the rate given in equation (2.5), unused capacity will be the consequence.

Since we have assumed a constant propensity to save which relates income and domestic output to investment through the Keynesian multiplier in equation (2.2), in the goods market equilibrium investment and income or output grow at the same rate. Therefore, the equilibrium rate of growth of output and income, which maintains the goods market equilibrium at a constant rate of capacity utilization, is also given by the average propensity to save and the productivity of capital:

$$\hat{Y} = \frac{dY}{Y} = \kappa s. \tag{2.6}$$

And, as the productivity of capital was assumed to be constant as well (equation (2.1)), with a constant rate of utilization the capital stock has to grow at the same rate as the domestic product:

$$\hat{K} = \frac{dK}{K} = \kappa s. \tag{2.7}$$

Therefore, taking the capacity effect of investment into account, Domar has shown in a simple model that all endogenous variables have to grow at the same rate, given by the exogenous propensity to save and the productivity of capital, in order for the supply of and the demand for goods to move in step and to maintain a goods market equilibrium at a full or normal rate of utilization of productive capacities determined by the capital stock. Thus, by considering the capacity effects of investment, the static goods market equilibrium of Keynes's *General Theory* is transformed into a dynamic equilibrium. However, the Domar model does not include any investment function, so no definite conclusions can be drawn from the model concerning the reaction of the system out of equilibrium.[10]

2.3 HARROD'S FORMULATION OF A DYNAMIC THEORY

The approach presented by Harrod (1939) in 'An essay in dynamic theory' also deals with the capacity effect of investment, or more generally with the implications of positive saving and investment for economic theory and economic modelling.[11] Harrod was initially interested in explaining the trade cycle.[12] In 'An essay' this interest developed more broadly into an attempt at formulating a dynamic theory designed to overcome the, in his view, static nature of previous economic theory, including Keynes's *General Theory*. Whereas static theory is concerned with level values of the variables of interest, dynamic theory deals with the rates of growth in the values of these variables. Harrod's intention was not to provide a full model of distribution and growth, which is able to describe the development of the economy through time, or through 'historical time', to use the characteristics introduced by Joan Robinson (1956, 1962), which will be discussed in Chapter 4 of this book.[13] Therefore, Harrod introduced 'An essay' with the following words: 'The following pages constitute a tentative and preliminary attempt to give the outline of a *dynamic* theory' (Harrod 1939, p. 14, emphasis in the original).

Harrod's analysis is based on the combination of the multiplier theory with respect to the determination of income and the acceleration principle with respect to the determination of investment, which together were to provide the foundation for economic dynamics. For the sake of simplicity, in the following outline of Harrod's approach we assume constant prices in a closed economy framework without economic activity by the state. An explicit consideration of the price level in the formal presentations can therefore be omitted, as with the presentation of Domar's approach above.

Harrod's (1939) approach starts off with the conditions for a dynamic long-run goods market equilibrium, which should provide a reference position for the analysis of the short-run cyclical dynamics of the trade cycle. For this purpose, a proportional saving function is assumed, in which aggregate saving (S) depends on the average propensity to save (s), which is taken as given and constant, and the level of income, respectively the domestic product (Y):

$$S = sY. \tag{2.8}$$

If we divide equation (2.8) by the capital stock (K) and expand the equation, we receive for the saving rate (σ) of the economy as a whole:

$$\sigma = \frac{S}{K} = \frac{S}{Y}\frac{Y}{Y^p}\frac{Y^p}{K} = \frac{su}{v}. \tag{2.9}$$

The macroeconomic saving rate can thus be decomposed into the average propensity to save (s), the rate of capacity utilization ($u = Y/Y^p$) and the capital–potential output ratio (v). The actual capital–output ratio is thus given by $K/Y = v/u$.

In a dynamic goods market equilibrium saving and investment have to be equal ($I = S$). Therefore, the rate of growth of the capital stock has to be equal to the saving rate for the goods market to clear continuously. The equilibrium accumulation rate is thus given as:

$$g^* = \frac{I}{K} = \frac{S}{K} = \frac{su}{v}. \tag{2.10}$$

Provided that the capital–potential output ratio and the rate of capacity utilization are constant, as they should be in equilibrium, and the capital stock and output thus grow at the same rate, the equilibrium growth rates for the capital stock and for the domestic product are the same:

$$g^* = \hat{K} = \hat{Y} = \frac{su}{v}. \tag{2.11}$$

Harrod (1939, p. 16) calls the equilibrium growth rate the 'warranted rate of growth' and defines it as follows: 'The warranted rate of growth is taken to be that rate of growth which, if it occurs, will leave all parties satisfied that they have produced neither more nor less than the right amount.' This implies that the warranted rate of growth describes a potential or notional equilibrium growth path at which the sales and, therefore, also the capacity utilization expectations of firms are fulfilled:

> The line of output traced by the warranted rate of growth is a moving equilibrium, in the sense that it represents the one level of output at which producers will feel in the upshot that they have done the right thing, and which will induce them to continue in the same line of advance. (Harrod 1939, p. 22)[14]

Only if the actual investment decisions and hence the accumulation rate chosen by the firms correspond to the warranted rate will the goods market clear at the expected or normal rate of capacity utilization, and there will be no reason for firms to change their production and supply decisions or their investment behaviour. This means that along the warranted rate of growth the level of production (Y) determined by aggregate demand should correspond to the planned or target level of entrepreneurs when they have made decisions over expanding productive capacities (Y^p) by means of investment in the capital stock. The rate of capacity utilization should therefore be equal to the target or normal rate of utilization: $u_n = Y_n/Y^p$. The warranted rate of growth (g_w), for both output and capital stock, therefore becomes:[15]

$$g_w = \frac{su_n}{v}. \tag{2.12}$$

The warranted rate of growth is thus determined by two variables. The first, the average propensity to save, determines the multiplier effect of investment on output and income. The second is the firms' target capital–output ratio (v/u_n), which is determined by the technologically given capital–potential output ratio and the normal rate of utilization of the potential output.[16] Therefore, this second variable represents the accelerator effect of an increase in output capacity used at its normal or target rate on the technologically required change in the capital stock.

The capital–potential output ratio in equation (2.12) is assumed to be given and constant, which Harrod (1948, p. 84) considers to be a condition for steady advance.[17] This can be based either on the assumption of constant technical conditions of production or on the assumption of a specific type of technological progress, that is 'Harrod neutral technological change'. According to Harrod (1948, p. 23), this type of technological change means that technological progress which improves the productivity of labour is embodied in the capital stock such that the increases in potential output and capital stock move in step.[18]

Since the capital–potential output ratio and the propensity to save for the economy as a whole are given and constant, and in equilibrium capacity utilization has to be at its normal rate, which is considered to be given and constant, too, the warranted rate attains an invariant value itself. It becomes a 'benchmark' for the actual rate of growth of output and the capital stock, which is independent of and does not adjust itself to the actual rate of growth. The latter is determined by investment decisions of firms, which are independent of saving decisions in the economy, undertaken by households and by firms themselves (retained earnings). And it is by no means guaranteed that firms in the aggregate will invest and accumulate exactly at the warranted rate in equation (2.12). The actual rate of growth may thus deviate from the warranted rate of growth. If the actual rate exceeds the warranted rate, firms will observe that they can sell more than they have planned. Capacity utilization will be above the target or normal rate, and the actual capital–output ratio will fall short of the target capital–output ratio: $v/u < v/u_n$. And, if the actual rate of growth falls short of the warranted rate, firms will not be able to sell what they have planned to sell. Capacity utilization will be below the target or normal rate, and the actual capital–output ratio will exceed the target capital–output ratio: $v/u > v/u_n$.

According to Harrod (1939, pp. 22–23), a deviation of the actual rate of growth from the warranted rate, and of output from potential output and hence capacity utilization from the normal rate of utilization, will not be self-correcting. On the contrary, by means of applying the accelerator principle to the investment decisions of firms, he argues that the economy will move further away from the warranted rate as soon as it slightly deviates from this rate.[19] In other words, the equilibrium given by the warranted rate of growth is highly unstable. This can be shown by adding the acceleration principle to the model:[20]

$$g = \alpha + \beta(u - u_n), \quad \alpha,\beta > 0, \tag{2.13}$$

$$d\alpha = \upsilon(u - u_n), \quad \upsilon > 0. \tag{2.14}$$

What equations (2.13) and (2.14) tell us is that firms' accumulation rate (g) is determined by the expected growth rate of sales (α) and the deviation of the actual rate of capacity utilization from the normal rate of utilization. If utilization is equal to the normal rate, capital accumulation will be equal to the warranted rate ($g = \alpha = g_W$), and firms will continue to accumulate according to the warranted rate. This can be shown with the help of Figure 2.1, representing the goods market equilibria in the points of intersection of the saving function (g) from equation (2.9) and the investment function (g) from equation (2.13). In point A these two functions intersect at the normal rate of capacity utilization. Here firms will thus continue to accumulate at the warranted rate of growth. However, if decentralized investment decisions of firms do not yield the aggregate investment function g_0 in Figure 2.1, but the investment function g_1, the goods market equilibrium will be at point B and the associated rate of utilization u_1 will exceed the normal rate. Firms observe that they can

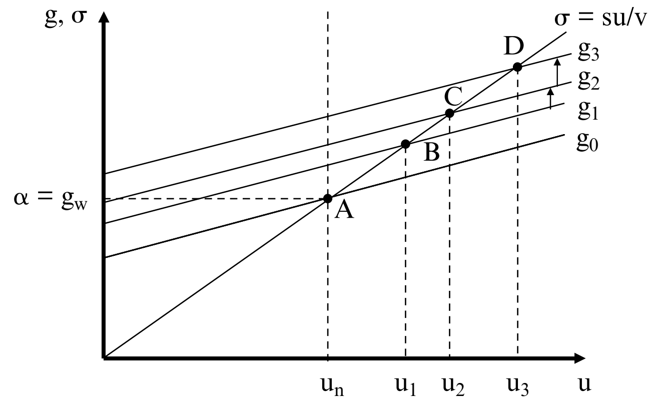


Figure 2.1 The unstable warranted rate of growth

sell more than they had planned to sell when installing the capital stock, their sales expectations improve and they will therefore decide to speed up capital accumulation, which means that the constant α in the investment function increases according to equation (2.14). The accumulation function in Figure 2.1 starts shifting upwards from g_1 to g_2, generating an even higher goods market equilibrium rate of capacity utilization, which will further shift the accumulation function upwards. In this process the rates of capital accumulation and growth will continuously deviate from the warranted rate of growth, and the economy will show a tendency towards inflationary overheating.

If decentralized investment decisions generated an accumulation function below g_0 in Figure 2.1, equilibrium capacity utilization would fall short of the normal rate. Firms would observe that they could not sell what they had planned to sell when expanding the capital stock, sales expectations would be scaled down and the accumulation function would start shifting downwards. In this process, the goods market equilibrium would be moved ever further away from the normal rate of utilization and from the warranted rate of accumulation and growth. The economy would tend towards deflationary stagnation with increasing unemployment, if labour supply grew with some constant exogenous rate.

The results regarding the determination of the warranted rate of growth and its dynamic instability are summarized by Harrod in 'An essay' as follows:

> The dynamic theory so far stated may be summed up in two propositions. (i) A unique warranted line of growth is determined jointly by the propensity to save and the quantity of capital required by technological and other considerations

> per unit increment of total output. Only if producers keep to this line will they find that on balance their production in each period has been neither excessive nor deficient. (ii) On either side of this line is a 'field' in which centrifugal forces operate, the magnitude of which varies directly as the distance of any point in it from the warranted line. Departure from the warranted line sets up an inducement to depart farther from it. The moving equilibrium of advance is thus a highly unstable one. (Harrod 1939, p. 23)

The dynamic instability has been derived by Harrod from the comparison of the actual rate of growth and the warranted rate of growth without any reference to the 'natural rate of growth' so far. Harrod (1939) introduces this natural rate of growth only in the last part of 'An essay' and defines it as follows:

> Alongside the concept of warranted rate of growth we may introduce another, to be called the natural rate of growth. This is the maximum rate of growth allowed by the increase of population, accumulation of capital, technological improvement and the work/leisure preference schedule, supposing that there is always full employment in some sense. (Harrod 1939, p. 30)

The natural rate of growth (g_n) may thus be defined as the sum of the rate of growth of labour productivity, which is the output per worker ($y = Y/L$) determined by the technical conditions of production and the organization of the labour process, taking the desired working hours per worker as a constant, and the rate of growth of the labour force (L):

$$g_n = \hat{L} + \hat{y}. \tag{2.15}$$

Both determinants of the natural rate of growth are considered to be exogenous.[21] The warranted rate of growth may deviate from the natural rate of growth at any point in time, without triggering an endogenous adjustment process.[22] If the warranted rate of growth is below the natural rate and if, by a fluke, the accumulation decisions of firms exactly correspond to the warranted rate, the system will grow at this rate and will display rising unemployment. Upwards instability will be constrained when output hits the level determined by the natural rate of growth, as is shown in Figure 2.2.

If the warranted rate of growth exceeds the natural rate of growth, it cannot be sustained by the actual rate of growth. Therefore, the latter will have to fall below the warranted rate in the long run and the economic system will thus be characterized by a tendency towards a chronic depres-

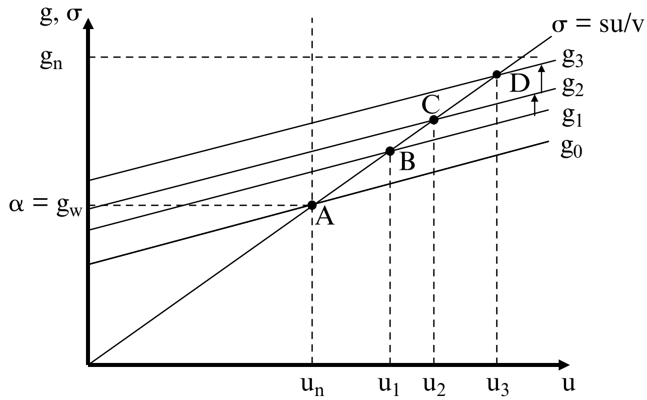


Figure 2.2 The warranted rate of growth below the natural rate of growth

sion, as shown in Figure 2.3, where point A cannot be sustained and the economy moves to point E and F, and so on.

Harrod summarizes his findings regarding the actual, the warranted and the natural rate as follows:

> Thus there are two distinct sets of problems both for analysis and policy, namely: (1) the divergence of G_w [the warranted rate, E.H.] from G_n [the natural rate, E.H.]; and (2) the tendency of G [the actual rate, E.H.] to run away from G_w. The former is the problem of chronic unemployment, the latter the trade cycle problem. (Harrod 1948, p. 91)

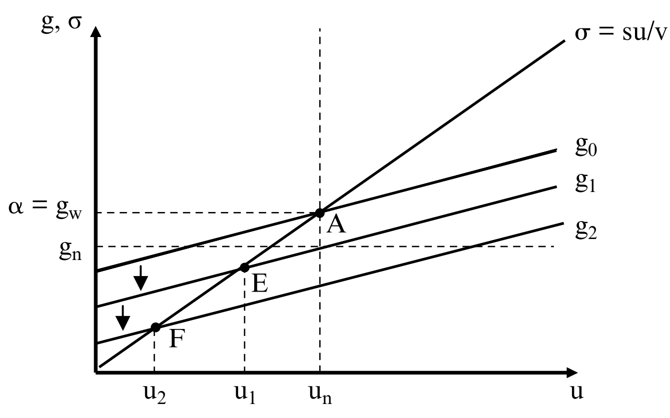


Figure 2.3 The warranted rate of growth above the natural rate of growth

Harrod (1948, pp. 89–91) finally discusses the implications of these deviations and of the instability of the warranted rate for an explanation of the trade cycle. A detailed overview of this, however, is beyond the scope and the purpose of this chapter, but we will come back to some of the related issues in the next section, assessing Harrod's contribution to growth theory and its implications.

2.4 ASSESSING HARROD'S APPROACH

Our outline of Harrod's approach has shown that he does not present a complete theory of growth, as has already been made clear by authors like Kregel (1971, chap. 9, 1980), Asimakopulos (1991, chap. 7) and Besomi (2001), among others. For this purpose the determinants of investment decisions and capital accumulation would have required a more in-depth consideration, because these are the driving forces of growth in a Keynesian model. Harrod's application of the acceleration principle may be important but not sufficient, as Kregel (1971, pp. 113–118) argues. The study of the inducement to invest would also have required the consideration of the monetary rate of interest and the costs of investment finance, as well as the rate of profit or the share of profits in value added. Kregel also criticizes that there is no theory of distribution in Harrod's approach and that the relationship between distribution and saving is hardly discussed at all. Asimakopulos (1991, p. 153) confirms this view: 'The distribution of income was not a topic that received much attention in Harrod's writings on dynamic economics. The equilibrium distribution was taken as given, rather than explained by Harrod's model, and he admitted that he had not gone deeply into the question of income distribution.'

Given these omissions, Kregel concludes:

> Harrod has provided a much needed methodological approach and a valuable start towards placing the *General Theory* in a dynamic context. The idea that the warranted and the natural rate are not necessarily the same or equal and the complications that arise when they are not ranks as a basic contribution to growth. The general approach, however, lacks the necessary variables to answer other important problems in growth. (Kregel 1971, p. 118)

But what exactly is Harrod's contribution and how could it be developed towards a theory of growth? Besomi (2001) argues that the initial draft of Harrod's 'An essay' submitted to John Maynard Keynes as the editor of the *Economic Journal* clearly contained a three-step analysis, which became less visible and clear in the published version. The first step was meant to determine a dynamic equilibrium at a moment in time. It also was to analyse potential instabilities keeping the parameters of the model constant, that is assuming a given and constant average propensity to save and a given and constant target capital–output ratio, which means a constant capital–potential output ratio and a given and constant normal rate of capacity utilization. The second step then dealt with the development through time and allowed parameters and thus the warranted rate to change, which provided some explanations for the trade cycle. And, in the third step, long-period constellations of the actual, the warranted and the natural rate were discussed together with the economic policy implications arising from these constellations. Although all three steps are still visible in the published version, steps two and three got drastically shortened, because of the interventions of Keynes, the editor, and the focus of 'An essay' was then more on the first step.[23]

What is important in Harrod's procedure is that he not only determined the warranted rate of growth at a given moment in time, but examined the stability of the warranted rate at a moment in time as well, assuming the determinants of the warranted rate to remain constant if the system is out of equilibrium.[24] This is, of course, problematic, because it excludes the possibility that the determinants of the warranted rate, the average propensity to save and the firms' target capital–output ratio might change whenever there is a deviation from the warranted rate. Shifts in equilibria generated by disequilibria, and hence a potential path dependence of the growth equilibrium, get out of the picture. Therefore, Besomi (2001) argues that the stability analysis should have been conducted in the second part of Harrod's procedure and not in the first part in order to obtain some realistic conclusions with respect to potential instabilities in real world economies moving through historical time.

Discussing the stability of the warranted rate of growth, when the system moves through historical time, has severe implications. If the economic system is on the warranted growth path, in each period decentralized investment decisions by firms will have to add up to the volume of investment required by the warranted rate. This, however, should not be taken for granted, as Asimakopulos (1991, pp. 155–158) has pointed out, with reference to Keynesian fundamental uncertainty.[25] As we will discuss in more detail in Chapter 4 when dealing with Joan Robinson's approach, the problem raised by Asimakopulos is about the status of an equilibrium growth path in the respective theory of distribution and growth and the predictive power with respect to long-run growth in historical time which is appended to the equilibrium growth path derived from the theoretical model.

Another implication of taking adjustment through time seriously, however, is directly related to Harrod's instability theorem. If the system is out of equilibrium and moving through historical time, the constancy of the determinants of the warranted rate of growth can no longer be taken for granted. Both the average propensity to save and the firms' target capital–output ratio may change as a response to disequilibrium. Let us discuss the two potential endogeneity channels of the warranted rate with respect to the actual rate of growth in turn, keeping the capital–potential output ratio constant, by assuming either constant technical conditions of production or Harrod neutral technological change.

The first channel, a change in the firms' target capital–output ratio, is related to the firms' perception of the normal rate of capacity utilization u_n. In the outline above reconstructing Harrod's arguments we have assumed that firms have a clear perception of their target rate of utilization of new productive capacities when they make decisions about net investment in the capital stock and that this target is kept constant in the accumulation process. However, this may be doubted for three reasons. First, since firms are well aware that the future demand for their output is uncertain they might be willing to accept a range of rates of capacity utilization without changing investment behaviour. Second, even if they have a clear target rate of utilization they might be willing to accept short- or medium-run deviations from the target without changing investment behaviour. And, third, if the target rate of utilization is missed they might be willing to revise the target. The normal rate of capacity utilization might thus become an endogenous variable with respect to the actual rate, within limits, of course. The endogeneity of the equilibrium rate and also of the normal rate of capacity utilization is an important element of the Kaleckian approach to distribution and growth, which is discussed in Chapters 5 to 11.

The principal effects of an endogenous target rate of capacity utilization, or the target rate of utilization being a range, are demonstrated in Figure 2.4. Here, firms do not have a clear perception of the normal rate of capacity utilization, but are willing to accept the rate of utilization within the range from u_{n1} to u_{n2}, without changing their investment behaviour. As long as the goods market equilibrium rates of capacity utilization fall in this range, the investment function will not get shifted, as in the equilibria in points A and B in Figure 2.4. Of course, this also means that the warranted rate of accumulation and growth becomes a range, here between g_{w1} and g_{w2}.

A second channel of adjustment of the warranted rate towards the actual rate of growth is a change in the average propensity to save in the economy. The reason for this may be either a change in individual saving behaviour or a change in income distribution, provided that the propensities to save between different income groups differ. Let us consider the latter case in more detail. There is good reason to assume that the propensity to save out of wages falls short of the propensity to save out of profits. First, wage

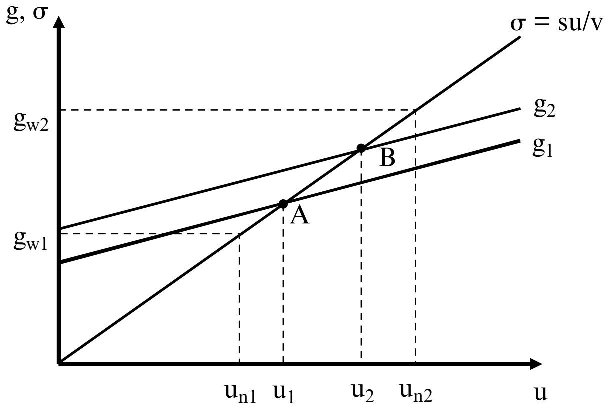


Figure 2.4 The normal rate of capacity utilization as a range, preventing Harrod's instability problem

earners on average belong to the low income households whereas profit earners belong to the households with higher incomes. If the marginal propensity to save increases with the level of income, as claimed by Keynes (1936, pp. 96–98), redistribution from wages to profits will increase the average propensity to save. Second, profits include retained earnings of the corporate sector of the economy, which are not available for household consumption and thus saved by definition. This provides another reason why redistribution from wages to profits will increase the average propensity to save in the economy. Therefore, if a deviation of the actual rate from the warranted rate triggers a change in distribution this will affect the warranted rate and might adjust it towards the actual rate. For the case that the actual rate exceeds the warranted rate, redistribution at the expense of wages and in favour of profits is required. In this case prices would have to rise faster than nominal unit labour costs. For the opposite case, that is the actual rate falling short of the warranted rate, prices would have to fall relative to nominal unit labour costs. Therefore, what is required for the appropriate adjustments to take place are flexible prices in the goods market and more rigid nominal unit labour costs. The dependence of the average propensity to save on income distribution and the determination of income shares by the investment and saving decisions of firms and profit earners are key elements of the post-Keynesian distribution and growth theories put forward by Kaldor and Robinson. We will provide a detailed treatment in Chapter 4.

The principal pattern of adjustment of the warranted rate towards the actual rate of growth through a change in distribution and in the average

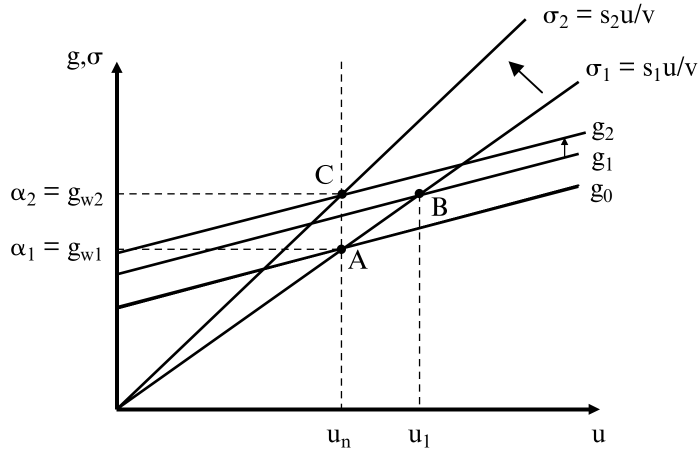


Figure 2.5 The endogenous average propensity to save as a remedy for Harrod's instability problem

propensity to save is shown in Figure 2.5. Again we assume that the initial warranted rate of growth g_{w1} is given at u_n in point A. Optimistic, decentralized and uncoordinated investment decisions by firms generate an investment function g_1 and a rate of capacity utilization u_1 exceeding the normal rate of utilization. The economy thus moves to point B and has a tendency towards further explosion. The accumulation function gets shifted further towards g_2, but firms now increase prices in the face of overutilization of their productive capacities. With rigid nominal unit labour costs this causes redistribution at the expense of wages and in favour of profits, and hence an increase in the average propensity to save of the economy from s_1 to s_2. Therefore, the saving rate function rotates counter-clockwise from σ_1 to σ_2; the concomitant reduction in the growth of consumption demand reduces the rate of capacity utilization, which moves back towards u_n. Inflationary pressure will come to a halt as soon as the economy is back at the normal rate of capacity utilization at the higher warranted rate of growth g_{w2} in point C.

Relaxing the assumptions of a given and constant average propensity to save and a given and constant target capital–output ratio, therefore, might limit or even wipe out the instability of the warranted rate of growth in an economy moving through historical time. The warranted rate of growth might hence become (partially) endogenous with respect to the actual rate of growth. Whether the mechanisms briefly outlined here are wholly convincing will be discussed in the context of those post-Keynesian distribution and growth models which have applied them and have relied on these mechanisms in order to generate the possibility of stable demand driven growth paths. These are the Kaleckian–Steindlian models relying on an endogenous equilibrium rate of capacity utilization, with functional income distribution and the average propensity to save as exogenous variables for the process of accumulation and growth, and the Kaldorian–Robinsonian models relying on an endogenous determination of income shares and the average propensity to save, considering the normal or target rate of capacity utilization to be exogenous for the growth and accumulation process.

In 'An essay' Harrod (1939, pp. 25–26) briefly considers that changes in the target capital–output ratio and the average propensity to save may change and thus restrict his instability principle. Whereas the former is considered to be irrelevant, for the latter it is argued that the changes will be too small to stop the instability tendencies. However, in *Towards a Dynamic Economics* Harrod (1948, pp. 89–90) argues that the warranted rate itself fluctuates in the course of the trade cycle following the actual rate, because of fluctuations in the average propensity to save in the short period, in particular. But, although the warranted rate may be partially endogenous with respect to the actual rate, the instability principle is nonetheless maintained.

Following the same line of argument, in particular in Harrod (1959, pp. 460–462), he then concludes that his instability theorem has shown that the economic system is locally unstable, but not necessarily globally:

> While I hold that the instability theorem is safe, in the sense that the warranted rate of growth is surrounded by centrifugal forces and that a chance divergence from the warranted rate will be accentuated, I do not claim to have made any thorough-going analysis of the regions lying farther afield of the warranted rate. (Harrod 1959, p. 460)

If we assume that initially the warranted rate of growth is below the natural rate, there are three potential causes for upwards instability to be contained, according to Harrod (1959). Obviously, the ultimate ceiling for growth acceleration is the level of output given by the natural rate of growth itself. As soon as full employment is reached, the maximum rate of growth to be attained is the growth rate of the labour force plus the growth rate of labour productivity. But growth acceleration may stop well before full employment, if mobility of labour is limited or bottlenecks in the production of specific types of capital goods arise, such that difficulties in shifting the factors of production towards the expanding industries mark a turning point. A second cause for a maximum of growth below the natural rate may arise if prices start to increase before full employment is reached. Profit inflation and redistribution at the expense of labour will then increase the average propensity to save; the warranted rate of growth will temporarily be lifted above the actual rate and bring accelerated growth to a halt. A third cause for growth acceleration to stop below full employment is based on firms' expectations. In the later phase of a boom firms may become sceptical whether the rate of advance can go on and may reduce their speed of accumulation of fixed capital before full employment is reached. In essence this means that entrepreneurs temporarily increase their target or normal rate of capacity utilization and reduce the target capital–output ratio, which makes the warranted rate increase above the actual rate and terminates the boom. Downwards instability is contained by autonomous investment which is independent of changes in aggregate demand and hence the accelerator principle, by replacement investment in order to maintain a basic level of production and/or by a decrease in the propensity to save in order to maintain basic levels of consumption (Harrod 1948, pp. 90–91, 1959, 1973, pp. 36–37).[26] Technically, the effect is that in a downswing the target capital–output ratio will rise temporarily and the propensity to save will decline, the warranted rate of growth will fall below the actual rate, and this will terminate the slump and initiate another economic upswing (Harrod 1973, pp. 36–41). Figure 2.6 presents in a stylized way the interaction of the actual and warranted rate of growth in the course of the trade cycle as described above, with g_a representing autonomous capital accumulation.[27]

From our outline it follows that Harrod's considerations seem to be meant to provide a dynamic theory of cyclical growth, which generates cycles as the result of forces keeping the system away from equilibrium

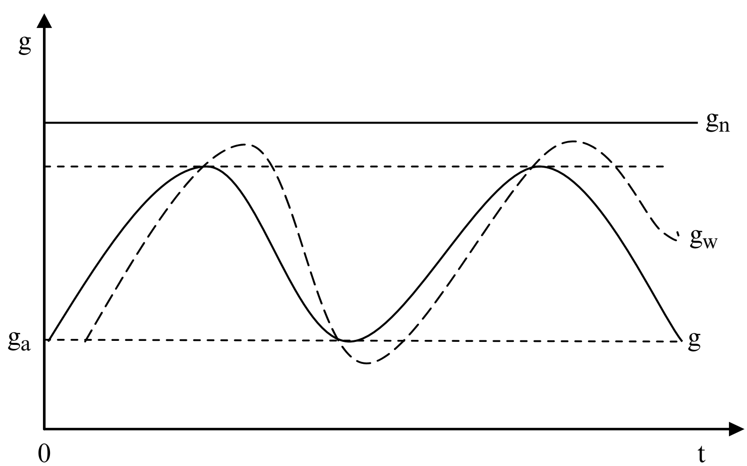


Figure 2.6 Interaction of actual and warranted rates of growth in the course of the trade cycle

and forces preventing the system from exploding, as has already been argued by Besomi (2001). These cycles are generated by non-linearities in the multiplier and in the accelerator relationships. Harrod, however, was not able to provide any precise model of cyclical growth. Modern authors, such as Skott (1989a, 1989b, 2010, 2012), Shaikh (1991, 1992, 2009) and Fazzari et al. (2013), however, have built models on Harrodian foundations which generate locally unstable but globally stable equilibrium growth paths. These models are based on the post-Keynesian idea of investment decisions being independent of saving in the long period, and on Harrod's notion of a target capital–output ratio and thus a given normal rate of capacity utilization which is achieved in the long-period growth equilibrium. In particular Peter Skott has used this approach in order to criticize the Kaleckian approaches to distribution and growth and to provide a Harrodian alternative. We will come back to these approaches in Chapter 11, where we will discuss the critics of the Kaleckian approach.

2.5 THE TEXTBOOK VERSION OF THE 'POST- KEYNESIAN HARROD–DOMAR GROWTH MODEL' – ASSUMING AWAY HARROD'S AND DOMAR'S CENTRAL PROBLEMS

In many textbooks on macroeconomics and on growth, either the contributions by Harrod and Domar are ignored altogether,[28] or they appear as the 'post-Keynesian Harrod–Domar growth model',[29] which, however, misses the main points Domar and in particular Harrod intended to make and which is, therefore, only loosely related to their contributions.[30] The textbook version of the Harrod–Domar growth model is rather inspired by Robert Solow's (1956) interpretation of the contributions of Harrod and Domar and the related problems, which then became the starting points for neoclassical growth theory, to be discussed in Chapter 3 of this book.[31] In his 'A contribution to the theory of economic growth', Solow assesses Harrod's approach as follows:

> In Harrod's terms the critical question of balance boils down to a comparison between the natural rate of growth which depends, in the absence of technological change, on the increase of the labor force, and the warranted rate of growth which depends on the saving and investing habits of households and firms.
>
> But this fundamental opposition of warranted and natural rates turns out in the end to flow from the crucial assumption that production takes place under conditions of *fixed proportions*. There is no possibility of substituting labor for

> capital in production. If this assumption is abandoned, the knife-edge notion of unstable balance seems to go with it. (Solow 1956, p. 65, emphasis in the original)

Following Solow's interpretation, the instability of the warranted rate of growth which is in the focus of Harrod's work disappears from the stage. What remains is the relationship between the warranted rate of growth and the natural rate of growth and the lack of adjustment of the former to the latter, due to the assumption of a fixed coefficient production technology, according to Solow. This is exactly the story told by the textbook Harrod–Domar growth model.

The textbook Harrod–Domar growth model, as for example in Branson (1989, pp. 570–574), starts with the assumption of a fixed coefficients production technology, that is a limitational production function with a fixed capital–output ratio ($v = K/Y$), assuming the utilization of the capital stock at the target or normal rate equal to one ($u = u_n = 1$), and a fixed labour–output ratio ($a = L/Y$):

$$Y = \min\left(\frac{K}{v}, \frac{L}{a}\right). \tag{2.16}$$

With a fixed coefficient technology, v units of capital and a units of labour are required to produce one unit of output, and there is only one technically efficient combination of capital and labour, which is given by:

$$\frac{K}{v} = \frac{L}{a} \quad \Rightarrow \quad \frac{K}{L} = \frac{v}{a}. \tag{2.17}$$

If the ratio of capital to labour available in the economy exceeds v/a, the capital stock will not be fully utilized. And, if the ratio of capital to labour falls short of v/a, there will be unemployment in the economy.

Next it is assumed that investment is identically equal to saving and that saving is a constant fraction of income. Saving decisions therefore determine investment:

$$I \equiv S = sY. \tag{2.18}$$

If the capital stock is fully utilized, or utilized at the target or normal rate, we obtain from the production function in equation (2.16):

$$Y = \frac{K}{v}. \tag{2.19}$$

Solving equation (2.18) for Y and substituting it into equation (2.19) yields the accumulation rate at which the goods market equilibrium output and the full capacity output are equal:

$$g = \frac{I}{K} = \frac{s}{v}. \tag{2.20}$$

From the assumption of a technologically given and fixed capital–output ratio, it follows that capital stock and output grow at the same rate and hence:

$$g = \frac{I}{K} = \frac{dK}{K} = \frac{dY}{Y} = \frac{s}{v} = g_w. \tag{2.21}$$

Therefore, we receive Domar's and Harrod's well-known rate for the equilibrium growth of capital stock and output, the warranted rate of growth. This is the rate of growth which maintains full or normal utilization of the capital stock. Since it was assumed in equation (2.18) that investment is always identically equal to saving, the actual rate of growth is always equal to the warranted rate of growth. Harrod's instability problem, which arose because of the potential deviation of the actual from the warranted rate of growth, is eliminated by assumption.

Finally, the rate of growth of output which is associated with full employment of labour has to be determined. From the production function in equation (2.16) we obtain the full employment output as:

$$Y = \frac{L}{a}. \tag{2.22}$$

Therefore, in order to maintain full employment, output has to grow at the same rate as the labour supply. The latter is taken to be exogenous:

$$\hat{Y} = \hat{L}. \tag{2.23}$$

If we allow for technological change and rising productivity of labour, which is the inverse of the labour–output ratio ($y = 1/a$), and take technological change to be exogenous, too, the growth rate of output which maintains full employment of labour becomes:

$$\hat{Y} = \hat{L} + \hat{y} = g_n. \tag{2.24}$$

This is, of course, the natural rate of growth already introduced in the section on Harrod's original approach.

In the textbook Harrod–Domar growth model we now have two equilibrium rates of growth of output: first, the warranted rate of growth in equation (2.21) given by the full or normal utilization of the capital stock; and, second, the natural rate of growth in equation (2.24) given by the full employment of labour. Only by a fluke will these two rates be equal and generate a full utilization, full employment growth equilibrium:

$$\frac{s}{v} = \hat{L} + \hat{y} \quad \Leftrightarrow \quad g_w = g_n. \tag{2.25}$$

However, if the warranted rate falls short of the natural rate of growth ($s/v < \hat{L} + \hat{y}$), the economy will be facing increasing unemployment and full employment can thus not be maintained.[32] And, if the warranted rate exceeds the natural rate of growth ($s/v > \hat{L} + \hat{y}$), utilization of the capital stock will decrease continuously, eroding profitability and thus undermining the growth process. The equilibrium in equation (2.25) is therefore said to possess 'knife-edge' properties (Branson 1989, p. 574; Snowdon and Vane 2005, p. 602).

Following Solow (1956), the central problem of the standard textbook Harrod–Domar model seems to be the assumption of a fixed coefficients production technology, because it prevents the adjustment of the warranted towards the natural rate of growth through a variation in the capital–labour ratio and the capital–output ratio. If instead a neoclassical production function allowing for the substitution between capital and labour is assumed, the adjustment of the warranted to the natural rate of growth and hence stable full employment growth is made possible and is indeed the only solution in the face of flexible relative factor prices for labour and capital. This will be outlined in Chapter 3 of this book, dealing with the neoclassical growth model.

As we have already noticed above, the textbook version of the Harrod–Domar growth model misses Domar's and in particular Harrod's main problems, because it does not deal at all with the relationship between the actual and the warranted rate of growth. Thus, the Harrod–Domar growth model is actually a neoclassical model with a built-in rigidity, namely the fixed coefficients production function. This model ignores the problem of effective demand for long-run growth. Of course, it is therefore not surprising at all that purely neoclassical solutions will be obtained if the perceived rigidity of a fixed coefficients production function is removed. Let us therefore conclude this section with a quotation from Steindl (1981c, p. 130) which can be fully supported:

I think that the attempt to hybridise Harrod and neo-classicism can only produce a freak. Harrod wanted to show the relevance of effective demand to long run growth, and his equation makes sense only in this context. In contrast to this neo-classicism is interested in an optimum, an equilibrium implying full employment, a concept which is difficult to adapt to growth and development in conditions of rapid change. Economists should rather not try to unite what logic has parted.

NOTES

1. For a short overview of Keynes's monetary theory of production, the principle of effective demand and the implications of these for the post-Keynesian research programme see Hein (2008, chap. 6), and for a short overview of the history and methods of post-Keynesian economics see Lavoie (2011a). For textbook and edited books on post-Keynesian economics see Robinson (1937a), Kregel (1973), Robinson and Eatwell (1973), Eichner (1978), Arestis (1992), Lavoie (1992, 2006a, 2014), Palley (1996a), Holt and Pressman (2001), Davidson (2011), Hein and Stockhammer (2011a), King (2012) and Harcourt and Kriesler (2013). For the history of post-Keynesian economics see, in particular, King (2002), Harcourt (2006) and Pasinetti (2007). On Keynes and Keynes's economics, see Harrod (1951), Chick (1983), Skidelsky (1983, 1992, 2000, 2003), Hayes (2006), Davidson (2007), Dostaler (2007) and Tily (2007).
2. For example, Keynes (1936, pp. 16–17) accepts the 'first classical postulate' with respect to the labour market, that is a falling marginal productivity curve of labour, which implies an inverse relationship between the real wage rate and employment. Of course, in his approach the neoclassical causality between the real wage rate and employment is reversed. It is aggregate demand which determines employment, and through this channel the real wage rate is affected.
3. See also Kregel (1971, chap. 7), who stresses the commonalities of Keynes's and Kalecki's basic contributions to the foundations of post-Keynesian distribution and growth theory.
4. For an overview of post-Keynesian theories of distribution, see for example Kregel (1978), Baranzini (1987), Asimakopulos (1988) and Palley (2012b).
5. Of course, Hicks's (1937) IS–LM model laid the foundation for this kind of interpretation, and in the neoclassical synthesis Keynes's *General Theory* then became a special case theory within a seemingly more general neoclassical approach. For textbook versions see Felderer and Homburg (1992, chaps V–VI) and Snowdon and Vane (2005, chap. 3).
6. See also Kregel (1976), Eatwell (1983a, 1983b), the contributions in Eatwell and Milgate (1983), and Kurz (1994).
7. For surveys of post-Keynesian distribution and growth theories see Kurz and Salvadori (2010), Dutt (2011b), Keen (2012) and Panico (2012). See also the contributions in Setterfield (2002a, 2010). On some fundamental differences between post-Keynesian and neoclassical theories of growth see, for example, Kregel (1971), Kalmbach (1972, pp. 21–38), Cornwall (1978) and Setterfield (2001, 2003).
8. For a systematic presentation of Domar's approach see also Kromphardt (1977, pp. 102–106) and Pasinetti (1974, pp. 93–95). On Domar's life and work, see, for example, Brown (1987).
9. Interestingly, Domar (1946) does not refer to the earlier contribution by Harrod (1939). Only in a later paper, which covers the same ideas in a more extensive fashion, does he acknowledge: 'After this paper was sent to the printer, I happened to stumble on an article by R.F. Harrod, published in 1939, which contained a number of ideas similar to those presented here' (Domar 1947, p. 92, fn. 11a).
10. It is left open here whether, based on this observation, Robinson (1962, p. 83, fn. 2)

is right with respect to Domar when she argues that 'his model cannot properly be assigned to the Keynesian group'.

11. See also Harrod (1948, 1959, 1973). For presentations and discussions of Harrod's approach see Sen (1970), Kregel (1971, chap. 8, 1980), Pasinetti (1974, pp. 95–97), Kromphardt (1977, pp. 106–113), Asimakopulos (1991, chap. 7) and King (2002, chap. 3). On Harrod's life and work see, for example, Eltis (1987).
12. See Harrod (1936) on a first attempt at providing a theory of the trade cycle.
13. See in particular Kregel (1980) and Besomi (2001) for outlines of the development of Harrod's dynamic theory and the misunderstandings which have appeared in the succeeding discussions.
14. In Harrod (1948, p. 82) we find a similar definition: 'I define G_w [the warranted rate of growth, E.H.] as that over-all rate of advance which, if executed, will leave entrepreneurs in a state of mind in which they are prepared to carry on a similar advance. Some may be dissatisfied and have to adjust upwards or downwards, but the ups and downs should balance out and, in the aggregate, progress in the current period should be equal to progress in the last preceding period.'
15. If we set $u_n = 1$ we obtain the more familiar expression for the warranted rate $g_w = s/v$. And if we take into account that $v = 1/\kappa$, it becomes obvious that the warranted rate of growth in equation (2.12) is Harrod's analogue to Domar's equilibrium rate of growth in equations (2.6) and (2.7).
16. In 'An essay' Harrod (1939, p. 16) called this variable C and defines it as follows: 'Let C stand for the value of the capital goods required for the production of a unit increment of output.' In *Towards a Dynamic Economics* the variable is called more precisely C_r and we read: 'C_r is thus the required capital coefficient' (Harrod 1948, p. 82). The capital coefficient is the same as the capital–output ratio.
17. 'But as a condition for a steady advance we have to assume that C_r does not change over the range of income increase that occurs during the postulated period of steady advance' (Harrod 1948, p. 84). Note that C_r is the required capital–output ratio, i.e. the capital–output ratio including the target rate of capacity utilization of the firm sector.
18. Harrod (1948, p. 23) writes: 'I define a neutral advance as one which, at a constant rate of interest, does not disturb the value of the capital coefficient.'
19. See also Harrod (1948, pp. 85–86). In Harrod (1973, pp. 33–34) he strongly rejects the 'knife-edge' metaphor, which had been used to describe his instability principle, as exaggerating. He rather argues: 'It requires a fairly large deviation [of the actual rate from the warranted rate, E.H.], such as might be caused by a revision of assessments across the board in some important industry, like the motor car industry, to produce a deviation sufficient to bring the instability principle into play' (Harrod 1973, p. 33).
20. Harrod (1939, 1948, pp. 79–80) also includes investment not immediately affected by changes in aggregate demand and output but determined by long-run considerations in his arguments. However, this has no substantial effects on the derived instability. Therefore, we omit this from our outline for the sake of simplicity.
21. In Harrod (1973, pp. 21–26) we find considerations about the potential endogeneity of the growth rate of the labour force with respect to actual growth. However, Harrod (1973, p. 26) concludes these considerations 'by regarding the increase of the working population as an exogenous variable'. With respect to technological progress, Harrod (1973, pp. 26–27) argues that basic innovations are exogenous and that the implementation of these innovations into the production process depends on the 'quality of entrepreneurs', that is on their 'intelligence, imagination and competence', and on the degree to which 'Keynes's "animal spirits"' are prevalent.
22. See Harrod (1939, pp. 30–32, 1948, pp. 87–89) on the relationship between the warranted rate and the natural rate of growth.
23. See Besomi (1995) for an overview of the Harrod–Keynes exchange on 'An essay'.
24. 'The foregoing demonstration of the inherent instability of the moving equilibrium, or warranted line of advance, depends on the assumption that the values of s and C

are independent of the value of G. This is formally correct. The analysis relates to a single point of time' (Harrod 1939, p. 24). C is the required capital–output ratio, s the propensity to save and G the actual rate of growth in Harrod's (1939) notation. See also Kregel (1980) and Asimakopulos (1991, chap. 7) on the methodological peculiarities of Harrod's approach towards the analysis of dynamic instability.

25. Asimakopulos (1991, p. 156) argues that Harrod was well aware of this problem but did not draw the appropriate conclusions. For example, Harrod (1948, p. 65) argued: 'In Dynamics we must not, any more than in Statics, think away uncertainty.'
26. In Harrod (1973, p. 36) fiscal and monetary policies providing a floor to the economic downswing are also discussed.
27. Harrod (1973, p. 36) makes the distinction between the 'normal' warranted rate of growth that applies when the system is in (unstable) equilibrium and the 'special' warranted rates of growth that occur as a response to out-of-equilibrium processes. In Figure 2.6 we are referring to Harrod's special warranted rate of growth.
28. For many modern textbooks, growth theory is equivalent to neoclassical growth theory and starts with the contributions by Solow (1956) and Swan (1956). Classical and post-Keynesian predecessors are more or less ignored. See, for example, Abel et al. (1998), Colander and Gamber (2002), Froyen (2002), Blanchard (2009) and Carlin and Soskice (2006).
29. For textbook versions of the 'Harrod–Domar growth model' see, for example, Branson (1989, chap. 23), Snowdon and Vane (2002a, 2005, chap. 11.9), Barro and Sala-i-Martin (2004, chap. 1.4) and Aghion and Howitt (2009, chap. 2.1).
30. For a critique of the textbook versions of the 'Harrod–Domar growth model' based on Solow's interpretation see, in particular, Kalmbach (1972, pp. 21–27) and Besomi (2001).
31. See also Solow (1970, chap. 1).
32. Since developing economies are usually facing warranted rates of growth falling short of the respective natural rates of growth, the use of the textbook version of the Harrod–Domar growth model in development economics implies that the main focus should be raising the average propensity to save in these countries in order to increase the warranted rate of growth. However, it remains completely unclear how the actual rate of growth will adjust towards a higher warranted rate. As Snowdon and Vane (2005, pp. 600–602) argue, this view prevailed in development economics in the 1950s and 1960s and seems to persist in international financial institutions. See also Cesaratto (1999) on this interpretation.

3. Neoclassical distribution and growth theory: old and new – and a critique

3.1 INTRODUCTION

In this chapter we address the neoclassical distribution and growth theory. As is well known, the neoclassical paradigm started out in the 1870s with the works by William Stanley Jevons, Carl Menger and Leon Walras attempting to replace the classical price, distribution and growth theory. Whereas classical theory had focused on the reproduction of a growing capitalist economy split into different social classes, neoclassical theory put forward an approach based on pre-societal individuals, subjective values, and supply and demand schedules generating optimal market equilibria. This meant that the focus of classical political economy, in particular of Adam Smith and David Ricardo but also of Karl Marx, on functional income distribution, capital accumulation and growth dynamics was replaced by focusing on static optimal allocation equilibria.[1] As we will outline in Section 3.2 of this chapter, this approach provides a theory of distribution which is inherent to the general equilibrium price theory, based on 'first principles'. These are a given production technology and given utility functions, given initial endowments and the assumption of strictly maximizing behaviour of individuals in perfectly competitive markets. Section 3.3 will then deal with the aggregate version of the neoclassical distribution theory, which was put forward in the late nineteenth century by authors like John Bates Clark and Knut Wicksell. This approach provides a marginal productivity theory of distribution of the social product to the factors of production, capital and labour (and land in more extended models). Since the focus of the neoclassical paradigm has been on optimal allocation based on individual maximizing behaviour, it comes as no surprise that growth issues were treated rather late in this paradigm. It was only in the 1950s, when Robert M. Solow and Trevor Swan published what are now called 'old neoclassical growth models', mainly as a response to the instability properties postulated in the Keynesian approach by Roy Forbes Harrod outlined in Chapter 2 of this book. The properties of the Solow model, which is a full employment growth model with exogenous technological progress, will be outlined and discussed in Section 3.4 of this chapter. The implications of this approach with regard to productivity convergence and, in particular, the treatment of technological progress as an exogenous and thus unexplained variable in the model have given rise to a second generation of neoclassical growth models, so-called 'new growth models' or 'endogenous growth models', starting in the 1980s with the works of Paul M. Romer and Robert E. Lucas. These approaches attempt to explain productivity growth within the model, applying the neoclassical 'lenses of scarcity' and relating technological progress to preferences and technology. We will discuss basic versions of these models in Section 3.5 and focus, among other things, on the role of income distribution. In Section 3.6 we will then deal with fundamental critiques of the neoclassical distribution and growth theories, old and new. The first fundamental critique questions the relevance of the old and new neoclassical approaches for a monetary production economy in which aggregate demand also has a role to play in the long run. It will be touched on only briefly, because it lies at the roots of post-Keynesian distribution and growth theories, which are outlined in the following chapters. The second fundamental critique, which will be discussed more extensively, deals with the 'capital controversy' or the 'Cambridge–Cambridge' debate of the 1950s and 1960s questioning the logical consistency of the neoclassical macroeconomic, distribution and growth approach outside a one-good barter economy.

3.2 NEOCLASSICAL MICROECONOMICS AND THE UNITY OF PRICE AND DISTRIBUTION THEORY

Neoclassical results for functional income distribution, or income shares of factors of production, can be derived from the micro-theoretical foundations of the disaggregated general equilibrium model, which goes back to Leon Walras (1954) and which proves the existence of an equilibrium price vector on all goods and factor markets under specific conditions.[2] With perfect competition, prices for goods and factors of production are generated on the respective markets according to the principle of supply and demand. Both households and firms have to solve a maximization problem under constraints. Starting out with given initial endowments, given preferences or production possibilities respectively, households maximize their utility and firms maximize their profits. Hereby, in each case, it is assumed that the economic agents act as price takers and adjust their supplied or demanded quantities to changes in the market price. The determination of goods and factor prices is treated symmetrically. Just like goods prices, factor prices are interpreted as scarcity indices. Factors of production, in particular labour and capital goods, are also treated in a uniform way – and therefore the procedure to determine their prices is symmetric, too.

Looking at any factor market, the profit maximizing factor demand, with a profit function (Π) with two factors of production (x_i, x_j) and a homogeneous output (Y), is determined as follows:

$$\Pi = p_y Y - p_i x_i - p_j x_j. \tag{3.1}$$

If the prices p_y, p_i and p_j for the firm are given and if the input of factor j is kept constant, that is j is treated as a fixed factor of production, it follows that profits are solely determined by the input of factor i:

$$\Pi(x_i) = p_y Y(x_i) - p_i x_i - p_j x_j. \tag{3.2}$$

For the profit maximum it follows:

$$\frac{\partial \Pi}{\partial x_i} = p_y \frac{\partial Y}{\partial x_i} - p_i = 0 \Rightarrow p_y \frac{\partial Y}{\partial x_i} = p_i. \tag{3.3}$$

The profit maximizing factor demand is therefore given when the factor price equals the value of the marginal product of that factor. Thus, with prices given, the marginal revenue function of the examined factor of production determines the factor demand function. Since the neoclassical micro theory assumes production functions with smooth substitution between factor inputs, as well as falling marginal products and hence revenues of each factor of production, one receives falling factor demand curves with rising factor prices.

The factor supply curve for each factor market is generated as follows. Starting off with a specific set of initial endowments of goods and time of each household, the utility maximizing factor supply can be derived from the condition for the utility maximizing goods demand of the household for consumption purposes, with given market prices and a given order of preferences with the usual attributes. The factor supply then consists of the part of the initial endowments of the household which is not used for own consumption. In a two-goods model, the well-known condition for utility (U) maximizing goods demand will be fulfilled if the ratio of the marginal utilities of both goods equals the respective price ratio, or if it corresponds to the inverse of the marginal rate of substitution (dx_j/dx_i):

$$\frac{p_i}{p_j} = \frac{\dfrac{\partial U}{\partial x_i}}{\dfrac{\partial U}{\partial x_j}} = \left|\frac{dx_j}{dx_i}\right|. \tag{3.4}$$

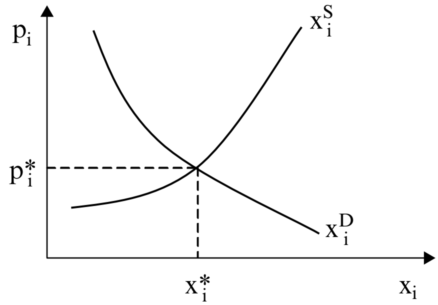


Figure 3.1 Neoclassical partial factor market equilibrium

As long as the substitution effect of a price change dominates the income effect, a rise of the price of good i relative to the price of good j leads to a reduced own demand of the household for good i. It follows that the supply of good i as a factor of production i on the factor markets increases if the price for good i increases. Therefore, a rising factor supply curve is obtained.

Having determined the slopes of the profit maximizing factor demand curve (x_i^D) and of the utility maximizing factor supply curve (x_i^S) as functions of the market price of the respective factor of production, the market equilibrium can be determined as in Figure 3.1.

Since the market equilibrium simultaneously determines the equilibrium price (p_i^*) and the equilibrium quantity of the factor of production (x_i^*) supplied and demanded, the income (Y_i) of the factor of production i is also determined as:

$$Y_i = p_i^* x_i^*. \tag{3.5}$$

If there are n factors of production in the economy, the same procedure as for factor i is applied simultaneously to all the other factors of production. Summing up the income of each factor of production, total income in the economy is obtained, and the income share (z_i) of each factor of production can easily be calculated as:

$$z_i = \frac{Y_i}{\sum Y_i}. \tag{3.6}$$

Therefore, the neoclassical general equilibrium price theory is also a theory of distribution or income shares. Within the framework of a general equilibrium model, the theory simultaneously determines equilibrium quantities and prices on all markets, that is on all goods and factor markets. The equilibrium solution for the factor markets simultaneously determines the distribution of the real product to the factors of production and thus the factor income shares. Furthermore, since the initial endowment of the households with factors of production is assumed to be given and known, the incomes of the individual household and its share in the total income are determined, too. In other words, the neoclassical microeconomic general equilibrium theory includes not only a theory of functional income distribution but also a theory of the personal or household distribution of income, each based on first principles.[3]

3.3 THE AGGREGATE MARGINAL PRODUCTIVITY THEORY OF DISTRIBUTION

The aggregate neoclassical theory of functional income distribution is an aggregation of the microeconomic marginal productivity theory of distribution sketched in the previous section. In the aggregate version presented here only two factors of production, capital and labour, and the distribution of the real product among these two aggregated factors of production are considered. Land as a factor of production will not be addressed here.[4] While classical authors, including Karl Marx, had argued that wages are determined first, by the required means of subsistence and/or by class struggle, and that profits, rents and interest are then given by the remaining surplus in the social product, 'the neoclassical approach aimed to explain all kinds of income *symmetrically* in terms of supply and demand in regard to the services of the respective "factors of production", labor, land and "capital"' (Kurz and Salvadori 1997, p. 428, emphasis in the original). Explaining functional income distribution by supply and demand in factor markets, and thus by marginal productivities and relative scarcities of the factors of production, goes back in particular to Wicksell (1893) and Clark (1899), however without applying an aggregate production function.[5] A macroeconomic production function including an aggregate 'capital' was then proposed by Cobb and Douglas (1928) and is now widely used in standard textbooks.[6] How exactly this aggregation of potentially heterogeneous capital goods used in production to an aggregate quantity called 'capital' takes place is not discussed at all in these neoclassical textbook versions. The same is true with respect to the aggregation of potentially heterogeneous output goods to a single quantity 'output' in the aggregate production function. We will come back to this issue in Section 3.6, the final section of this chapter.

In the Cobb/Douglas production function the multitude of factors of production from the Walrasian model discussed in Section 3.2 are reduced to just two: labour (L), with the partial elasticity of production α, and capital (K), with the partial elasticity of production β:

$$Y = L^{\alpha}K^{\beta}, \ \ \alpha + \beta = 1. \tag{3.7}$$

The Cobb/Douglas production function contains decreasing partial marginal products:

$$\frac{\partial Y}{\partial L} = \alpha L^{\alpha - 1}K^{\beta}, \tag{3.8}$$

$$\frac{\partial Y}{\partial K} = L^{\alpha}\beta K^{\beta - 1}. \tag{3.9}$$

The average product of each factor of production is declining with partial factor variations as well, but it exceeds the respective marginal product:

$$\frac{Y}{L} = \frac{L^{\alpha}K^{\beta}}{L} = L^{\alpha - 1}K^{\beta}, \tag{3.10}$$

$$\frac{Y}{K} = \frac{L^{\alpha}K^{\beta}}{K} = L^{\alpha}K^{\beta - 1}. \tag{3.11}$$

By means of solving equations (3.8) and (3.9) for α and β and inserting equations (3.10) and (3.11) respectively, it follows for the partial elasticities of production:

$$\alpha = \frac{\frac{\partial Y}{\partial L}}{\frac{Y}{L}} = \frac{\frac{\partial Y}{Y}}{\frac{\partial L}{L}}, \tag{3.12}$$

$$\beta = \frac{\frac{\partial Y}{\partial K}}{\frac{Y}{K}} = \frac{\frac{\partial Y}{Y}}{\frac{\partial K}{K}}. \tag{3.13}$$

The partial elasticities of production thus describe the ratio of the marginal productivity to the average productivity for each factor of production. As both α and β are smaller than one, the marginal products of the factors of production have to be smaller than their corresponding average products.

The Cobb/Douglas production function is linearly homogeneous, which means that the scale elasticity, as the sum of the partial elasticities of production, or the degree of homogeneity equals one. With total factor variation, the production function generates constant returns to scale.

With marginal productivity remuneration and with the constancy of α and β, it can be shown that both the wage share and the capital income share are technically given by the production function. If the remuneration of the factors of production follows the profit maximizing rule of the firm, the real wage rate (w^r) and the real interest rate (r) have to be equal to the marginal product of labour and of capital, respectively:

$$w^r = \frac{\partial Y}{\partial L}, \tag{3.14}$$

$$r = \frac{\partial Y}{\partial K}. \tag{3.15}$$

The real rate of interest is interpreted as a commodity rate of interest, and hence as a rate of profit, but not as a monetary interest rate corrected by some price deflator. We therefore use 'real rate of interest' and 'rate of profit' synonymously here. Inserting equations (3.14) and (3.15) into equations (3.12) and (3.13) respectively, it follows that:

$$\alpha = \frac{w^r}{\frac{Y}{L}} = \frac{w^r L}{Y} = \frac{W}{Y}, \tag{3.16}$$

$$\beta = \frac{r}{\frac{Y}{K}} = \frac{rK}{Y} = \frac{\Pi}{Y}. \tag{3.17}$$

The elasticity of production of the production factor labour thus determines the wage share, that is the share of wages (W) in the real product, and the elasticity of production of the production factor capital determines the profit share, that is the share of capital incomes (Π) in the real product. Adding up equations (3.16) and (3.17) and taking into consideration that $\alpha + \beta = 1$, it becomes clear that, with marginal productivity remuneration, the real product is distributed completely to the two factors of production, without any unexplained remainder:

$$W + \Pi = (\alpha + \beta)Y = Y. \tag{3.18}$$

Equation (3.18) also makes clear that the marginal productivity theory of distribution can explain the complete distribution of the real product to the two factors of production only if the production function has a degree of homogeneity equal to one, which means that it generates constant returns to scale. If the degree of homogeneity is larger than one, increasing returns to scale prevail. A proportional increase of the factor inputs leads to a disproportionately large increase of output. Therefore, total output is not sufficient for marginal productivity remuneration, because $\alpha + \beta > 1$. In the case of the degree of homogeneity being lower than one, decreasing returns to scale prevail. With marginal productivity remuneration of the factors of production, the real product is not fully distributed, because $\alpha + \beta < 1$, and there is an undistributed remainder. Only with a neoclassical production function with constant returns to scale, as assumed here, does the marginal productivity theory provide an explanation for the complete distribution of the real product to the factors of production.

Since with the Cobb/Douglas production function the functional income distribution is only determined by technology, the factor price ratio has no influence on factor income shares. A change in the ratio of the real wage rate to the real interest rate does not affect income shares, but only affects the composition of the factor inputs. The optimal factor input ratio, the cost minimal capital–labour ratio for the production of a given output, is achieved when the factor price ratio is equal to the ratio of the marginal productivities of the factors of production. Inserting correspondingly and solving yields:

$$\frac{r}{w^r} = \frac{\frac{\partial Y}{\partial K}}{\frac{\partial Y}{\partial L}} = \frac{L^{\alpha}\beta K^{\beta-1}}{\alpha L^{\alpha-1}K^{\beta}} = \frac{L\beta K^{-1}}{\alpha} = \frac{\beta L}{\alpha K}. \tag{3.19}$$

From this it follows for the cost minimizing or profit maximizing capital–labour ratio:

$$\frac{K}{L} = \frac{\beta w^r}{\alpha r}. \tag{3.20}$$

As the partial elasticities of production are given by the production function, an increase in the real wage rate relative to the real interest rate leads to an increase of the optimal capital–labour ratio. Labour will thus be substituted by capital.

The Cobb/Douglas production function implies a substitution elasticity (ε) precisely equal to one. This can be shown as follows. The substitution elasticity is the ratio of the relative change of the capital intensity to the relative change in the real interest rate–real wage rate ratio:

$$\varepsilon = \left| \frac{\frac{\partial(K/L)}{(K/L)}}{\frac{\partial(r/w^r)}{(r/w^r)}} \right|. \tag{3.21}$$

If the real interest rate–real wage ratio is reduced, labour becomes more expensive relative to capital, and profit maximizing firms will substitute capital for labour. The substitution elasticity of one results from the determination of the optimal capital–labour ratio in equation (3.20). This equation can also be written as:

$$\frac{K}{L} = \frac{\beta w^r}{\alpha r} = \frac{\beta}{\alpha}\left(\frac{r}{w^r}\right)^{-1}. \tag{3.22}$$

From this it follows for the derivation of the capital–labour ratio with respect to the factor price ratio:

$$\frac{\partial(K/L)}{\partial(r/w^r)} = -\frac{\beta}{\alpha}\left(\frac{r}{w^r}\right)^{-2}. \tag{3.23}$$

Inserting equations (3.22) and (3.23) into equation (3.21) yields the following result for the substitution elasticity:

$$\varepsilon = \left| \frac{\partial(K/L)}{\partial(r/w^r)} \frac{\frac{r}{w^r}}{\frac{K}{L}} \right| = \left| -\frac{\beta}{\alpha}\left(\frac{r}{w^r}\right)^{-2} \frac{\frac{r}{w^r}}{\frac{\beta}{\alpha}\left(\frac{r}{w^r}\right)^{-1}} \right| = 1. \tag{3.24}$$

With a substitution elasticity equal to one, the technologically determined income distribution cannot be changed by, for example, real wage rate hikes enforced by trade unions. The factor substitution triggered by a change in the factor price ratio will cause a corresponding change of the factor input ratio. An increase in the real wage rate, and hence a decrease in the real interest rate–real wage ratio, causes a substitution of capital for labour and thus reduces employment.

If a production function with an elasticity of substitution different from one were assumed, the effect of a change of the factor price ratio on income distribution would not exactly be compensated by an opposite change in the factor input ratio. In the case where the substitution elasticity is larger than one, a decrease (increase) of the real interest rate–real wage rate ratio leads to a disproportionately large reaction of the capital–labour ratio, which means that the wage share will fall (rise) and the capital income share will rise (fall). If the substitution elasticity is smaller than one, a decrease (increase) of the real interest rate–real wage rate ratio leads to a disproportionately low reaction of the capital–labour ratio, which means that the wage share will rise (fall) and the capital income share will fall (rise). In these cases, the income shares are also determined by the factor input ratio, besides the parameters of the production function (α, β). At the end of the day, however, functional income distribution remains technologically determined, because the factor input ratio is itself determined by the factor price ratio, which in turn is determined by the marginal productivities of the factors of production, which are given technologically.

3.4 OLD NEOCLASSICAL GROWTH THEORY: THE STABILITY OF FULL EMPLOYMENT GROWTH WITH EXOGENOUS TECHNOLOGICAL PROGRESS

3.4.1 Foundations

The neoclassical theory of growth originates from Robert M. Solow's (1956) examination and interpretation of Harrod's (1939) instability theorem, which we have outlined in Chapter 2.[7] Therefore, from a historical perspective, the neoclassical theory of growth is a rather late contribution to the neoclassical paradigm in economics.[8] It was built on the static price and distribution theory, the foundations of which were laid in the 1870s, and which assumes given resources, preferences and production technologies in order to derive a welfare optimal allocation equilibrium in a free market economy. With the contributions by Solow (1956) and others, this approach was complemented by the 'proof' of a stable growth equilibrium with full utilization of all factors of production, provided that neoclassical principles can be assumed.

As we have shown in the previous chapter, Harrod (1939) derived the potential for cumulative instability 'at a moment in time' between the 'actual rate of growth', determined by the production and investment decisions of the firms, and the 'warranted rate of growth', which is the rate of growth at which goods markets clear at the firms' target rate of capacity utilization. The starting point of Solow's (1956) neoclassical theory of growth is a reinterpretation of Harrod's problem: The cumulative instability potential is now related to the deviation of the 'warranted rate of growth' from the 'natural rate of growth', determined by labour force growth and technological progress, and it is attributed to the fixed coefficients production function assumed by Harrod. Solow then replaces the fixed coefficients production function by a neoclassical production function with smooth substitution between capital and labour. In this way, the variability of the capital–labour ratio, the capital–output ratio and the labour–output ratio is introduced, and through the substitution of the factors of production the adjustment of the warranted towards the natural rate of growth is made possible. Furthermore, it is shown that, with flexible prices and profit maximizing firms, the technologically possible adjustment process towards a full utilization, full employment growth path becomes a necessary economic outcome.

In this way, the neoclassical growth theory analyses in essence the growth of potential output with an overall full employment, full capacity utilization equilibrium, assuming away any problems of effective demand for long-run growth theory. Based on the neoclassical allocation theory and its optimal results it is assumed that the price mechanism always ensures the full utilization of the factors of production. This means that the existence and the stability of an equilibrium real wage rate in the labour market and an equilibrium real interest rate in the capital market are assumed. The model thus accepts the continuous validity of Say's law in the neoclassical version.[9]

Furthermore, Solow's model contains both labour force growth and technological progress as exogenous variables, which are not explained by economic processes in the model. While analysing the growth equilibrium and its stability, the neoclassical theory of production is utilized. A neoclassical production function with the characteristics outlined in Section 3.3 is applied, for the sake of convenience the already discussed Cobb/Douglas production function. In the basic model, the constancy of the propensity to save is assumed, too.[10] In what follows the price level is considered to be constant, and we can thus focus on real variables only.

3.4.2 The Long-Term Growth Path: Actual, Warranted and Natural Rate of Growth

In order to derive the neoclassical long-run equilibrium growth path, we start with a neoclassical production function without technological progress, like the Cobb/Douglas production function introduced in Section 3.3:[11]

$$Y = L^{\alpha}K^{\beta}, \quad \alpha + \beta = 1. \tag{3.7}$$

From this, the growth rate of real output and income is received as the sum of the growth rates of labour and capital, each weighted by their respective elasticities of production:

$$\hat{Y} = \alpha\hat{L} + \beta\hat{K}. \tag{3.25}$$

Since the growth rate of the labour force is treated as exogenously given, and because the partial elasticities of production of labour and capital are given by the production function, for the determination of the growth rate of real output and income only the growth rate of the capital stock has to be determined. For the latter it is assumed that investment (I) is always identically equal to saving (S),[12] assuming away any problems of effective demand, and that saving is related to real income by a constant propensity to save (s) out of income:

$$dK = I \equiv S = sY. \tag{3.26}$$

If, for the sake of simplicity, we disregard depreciation of the capital stock or assume that saving is net of depreciation, dividing equation (3.26) by the real capital stock yields the accumulation rate and its determinants:

$$\hat{K} = \frac{dK}{K} = \frac{I}{K} \equiv \frac{S}{K} = \frac{sY}{K} = \frac{s}{v} = g_w. \tag{3.27}$$

Since the accumulation rate is formulated on the condition that investment and saving are identically equal, which implies a goods market equilibrium, equation (3.27) describes the warranted growth rate (g_w) of the capital stock. It is given by the ratio of the propensity to save ($s = S/Y$) and the capital–potential output ratio ($v = K/Y$), assuming the target or normal rate of utilization of productive capacities to be equal to one. In the neoclassical model, households' saving decisions thus determine the accumulation and growth process. Firms merely act as the households' curates, but do not have an independent role to play when it comes to the decisions over capital accumulation and growth.

Evidently, a growth equilibrium is reached when the growth rate of real output stays constant. With the assumptions being made with respect to the production function and the growth of the labour force this requires that the equilibrium growth rate of the capital stock has to be constant, too. With a given propensity to save, the equilibrium growth rate of the capital stock is only constant if the capital–potential output ratio is constant. And the capital–potential output ratio is only constant if the capital stock and real output grow at the same rate. Hence, the equilibrium condition reads as follows:

$$\hat{Y} = \hat{K}. \tag{3.28}$$

Inserting this equilibrium condition into equation (3.25), we get:

$$\hat{Y} = \alpha\hat{L} + \beta\hat{Y},$$

$$(1 - \beta)\hat{Y} = \alpha\hat{L},$$

$$\hat{Y} = \frac{\alpha}{1 - \beta}\hat{L},$$

$$\hat{Y} = \hat{L}. \tag{3.29}$$

Therefore, the exogenous growth rate of the labour force determines the equilibrium growth rate of real output. For the equilibrium it thus has to hold:

$$\hat{L} = \hat{K} = \hat{Y} = \frac{s}{v} \quad \Rightarrow \quad g_n = g_w. \tag{3.30}$$

In long-run growth equilibrium, the warranted rate of growth (g_w) and the natural rate of growth (g_n), which owing to the absence of technological progress is given by the growth rate of the labour force only, are equal. In 'steady state' growth, real output, capital and the labour force grow at the same rate, which is the natural rate. The capital–output and the capital–labour ratio thus stay constant. In the absence of technological progress, output per worker or labour productivity is constant, too. And in the absence of any population growth and hence any labour force growth the long-run equilibrium growth rate of output will be zero. We will come back to this result when we discuss the effect on an increase in the propensity to save and thus in the warranted rate of growth further below.

Having determined the long-run growth equilibrium by the exogenous growth rate of the labour force, the question to be answered is whether for each natural rate of growth there exists an equilibrium or warranted growth rate of the capital stock. In other words: Is the existence of steady state growth as in equation (3.30) always possible? As the propensity to save has been assumed to be constant, the adjustment of the warranted rate to the natural rate of growth has to occur through a variation in the capital–output ratio. Starting from a neoclassical production function it is guaranteed that for each natural rate of growth there exists a capital–output ratio which makes the warranted rate of growth equal to this natural rate. In other words, the perceived limitations of the so called 'Harrod–Domar growth model' are overcome.

We have seen in Section 3.3 that functional income distribution, applying the aggregate marginal productivity theory of distribution to the Cobb/Douglas production function, is technologically determined by the partial elasticities of production of capital and labour. This, of course, is also true in the long-run growth equilibrium. However, the equilibrium real interest rate, and hence the profit rate, is determined by the exogenously given natural rate of growth and by the propensity to save (Kurz and Salvadori 2003). This can be shown as follows. Applying again the assumption that saving and investment are identically equal we obtain for the natural growth equilibrium:

$$I \equiv S \Rightarrow g_n K = sY \Rightarrow Y = \frac{g_n}{s} K. \tag{3.31}$$

From this it follows:

$$\frac{\partial Y}{\partial K} = \frac{g_n}{s}. \tag{3.32}$$

With marginal productivity remuneration, the real interest rate or the profit rate are equal to the marginal product of capital. From equations (3.15) and (3.32), we thus get:

$$\frac{g_n}{s} = r. \tag{3.33}$$

Therefore, the neoclassical theory of growth provides a model with an exogenous long-run equilibrium growth rate and an endogenously determined equilibrium real interest rate/profit rate.

3.4.3 The Stability of the Equilibrium

Having proven the existence of a growth equilibrium at the natural rate of growth, the question remains whether this growth equilibrium is stable. Will random deviations from the growth equilibrium always lead back to it?[13] Let us assume that by a fluke the growth rate of the capital stock and hence the growth rate of real output are above the equilibrium rate of growth, which means the warranted rate of growth exceeds the natural rate of growth:[14]

$$\hat{Y} - g_n > 0. \tag{3.34}$$

Inserting the condition (3.34) into equation (3.25) for the actual growth rate of real output and taking into account that the natural rate of growth is given by the growth rate of the labour force ($g_n = \hat{L}$), we get:

$$\hat{Y} - g_n = \alpha\hat{L} + \beta\hat{K} - \hat{L},$$

$$\hat{Y} - g_n = (\alpha - 1)\hat{L} + \beta\hat{K},$$

$$\hat{Y} - g_n = -\beta\hat{L} + \beta\hat{K},$$

$$\hat{Y} - g_n = \beta(\hat{K} - g_n). \tag{3.35}$$

As β is smaller than one, in disequilibrium the deviation of the growth rate of real output from the natural rate of growth is smaller than the deviation of the growth rate of capital stock from the natural rate of growth. Because of a falling marginal productivity of capital, in a disequilibrium process, in which the actual rate of growth exceeds the natural rate of growth, we therefore have:

$$\hat{K} > \hat{Y} > g_n. \tag{3.36}$$

With a constant propensity to save out of real income, a growth rate of real income below the growth rate of the capital stock induces a reduction of the latter, because accumulation in each period is determined by saving out of real income. And when the growth rate of the capital stock is reduced this will cause a fall in the growth rate of real income as well. Therefore, we receive the adjustment process of both, the growth rates of the capital stock and of real income towards the natural rate of growth as shown in Figure 3.2.

Alternatively, the neoclassical growth equilibrium and its stability properties can be examined graphically as follows (Solow 1970, chap. 2). We start again with the Cobb/Douglas production function in equation (3.7) and divide by the capital stock:

$$\frac{Y}{K} = \left(\frac{L}{K}\right)^{\alpha} \Rightarrow \frac{1}{v} = \left(\frac{1}{k}\right)^{\alpha}. \tag{3.37}$$

The output–capital ratio, the inverse of the capital–output ratio (v), thus becomes a function of the labour–capital ratio, the inverse of the capital–labour ratio (k). Abstracting again from depreciation of the capital stock and treating output as net output, this function has again falling marginal returns with respect to the labour–capital ratio. Assuming again a constant propensity to save out of income (s) and multiplying equation (3.37) by this saving propensity yields:

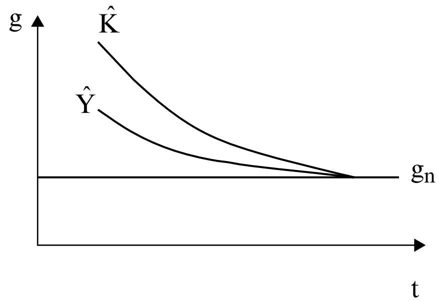


Figure 3.2 Adjustment paths of the growth rates of the capital stock and of real income towards the natural rate of growth

$$\frac{sY}{K} = s\left(\frac{L}{K}\right)^{\alpha} \Rightarrow \frac{s}{v} = s\left(\frac{1}{k}\right)^{\alpha}. \tag{3.38}$$

Equation (3.38) represents the saving–capital ratio as a function of the labour–capital ratio. And, since saving is identically equal to investment in the neoclassical growth theory, this equation relates the warranted rate of growth to the labour-capital ratio. In Figure 3.3 equations (3.37) and (3.38) are presented graphically, and we have also included the natural rate of growth given by the exogenous growth rate of the labour force (g_n).

The long-run growth equilibrium is given by the equality of the natural rate of growth, determined by the exogenous growth rate of the labour force, and the warranted rate of growth, given by the propensity to save and the capital–output ratio, and hence by the intersection of the g_n curve and the s/v curve in Figure 3.3. This point of intersection determines the equilibrium capital–labour ratio (k*) and the equilibrium capital–output ratio (v*). To the right (left) of 1/k* the warranted rate of growth exceeds (falls short of) the natural rate of growth, the capital stock grows at a faster (slower) pace than the labour force, the labour–capital ratio decreases (increases) and moves towards 1/k*, and the output–capital ratio decreases (increases) towards 1/v*.

3.4.4 An Increase in the Propensity to Save

An increase in the propensity to save triggers a similar adjustment process, as already described in the previous section. Starting from an initial growth equilibrium at t_0, an increase in the households' propensity to save from s_0

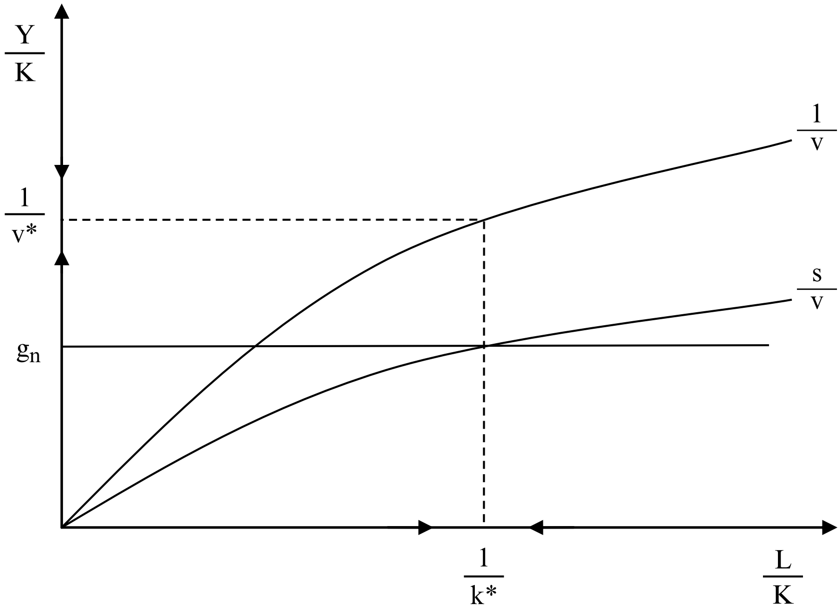


Figure 3.3 Existence and stability of the neoclassical full employment equilibrium growth rate

to s_1, yet with an unchanged capital–output ratio (v_0), will make the warranted rate of growth exceed the natural rate of growth:[15]

$$g_w = \hat{K} = \frac{s_1}{v_0} > g_n = \hat{L} = \frac{s_0}{v_0}. \tag{3.39}$$

In disequilibrium, the growth rate of the capital stock is higher than the growth rate of the labour force. But the growth rate of real income will fall short of the growth rate of the capital stock owing to decreasing returns to capital, and therefore the growth rate of the capital stock adjusts towards the growth rate of the labour force, as described in Subsection 3.4.3. The capital–output ratio rises and adjusts to its new equilibrium level (v_1) determined by the higher propensity to save (s_1). The warranted growth rate of the capital stock is reduced in this process because of the increase in the capital–output ratio until real income and capital stock again grow at the same rate, the natural rate:

$$g_w = \frac{s_1}{v_1} = g_n. \tag{3.40}$$

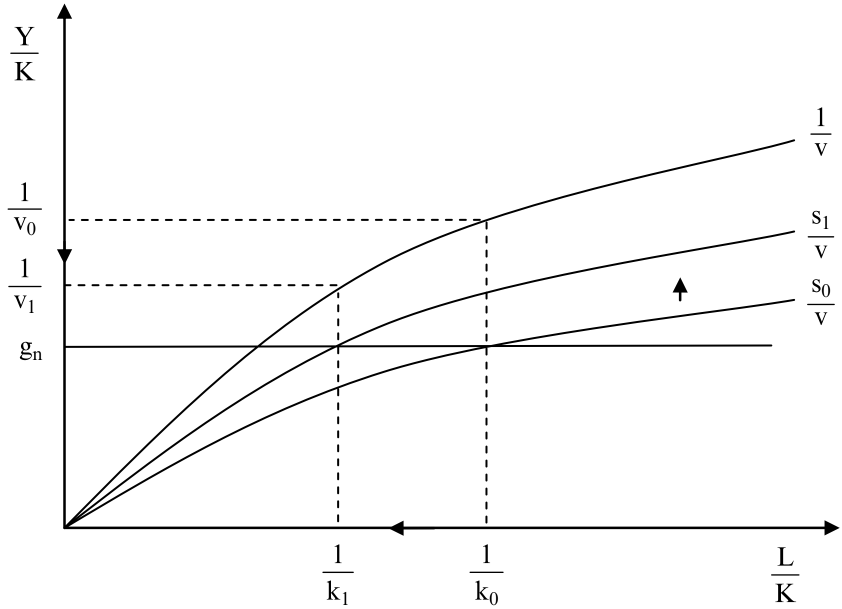


Figure 3.4 An increase in the propensity to save and its effects on the neoclassical growth equilibrium

Graphically, this adjustment can be studied by means of extending Figure 3.3. As can be seen in Figure 3.4, an increase in the propensity to save means an upwards rotation of the s/v curve, from s_0/v to s_1/v. Therefore, the point of intersection with the horizontal g_n curve moves to the left. During the adjustment process the warranted rate of growth exceeds the natural rate of growth, which means that the capital stock grows at a faster pace than the labour force, the labour–capital ratio decreases, as does the output–capital ratio, and the capital–output ratio thus approaches its new equilibrium value v_1.

Therefore, the increase in the propensity to save and invest does not lead to any permanent increase in the rate of growth of the economy. However, it causes an upwards shift of the equilibrium growth path, as can be seen in Figure 3.5. Note that the slope of the log Y curve represents the growth rate of real output/income. The new equilibrium growth path will display a higher capital–labour ratio and a higher capital–output ratio than the old path. During the adjustment process labour productivity will rise towards a higher level because of the increase in the capital–labour ratio. On the new growth path, however, it will then remain constant at this higher level. Functional income distribution, that is the profit share and the wage share, will remain constant because income distribution is determined by the partial elasticities of production of capital and labour in the production function, which do not change. However, the profit rate/real interest rate will be lower on the new growth path, because of the higher propensity to save, as can be seen from equation (3.33). An increase in the propensity to save reduces the scarcity of capital relative to labour and thus reduces the price of capital (the real interest rate) relative to the price of labour (the real wage rate). Since the elasticity of substitution in the Cobb/Douglas production function is equal to one (equation (3.24)), this change in relative factor prices has no effect on functional income distribution, because it is exactly matched by a reverse change in factor intensities.

Summing up so far, the basic neoclassical growth model obtains that long-run equilibrium growth is determined by the growth rate of the labour force, which is taken to be exogenous. Provided that the neoclassical version of Say's law can be assumed to hold and a neoclassical production function can be assumed to prevail, every deviation from the natural rate of growth is self-adjusting. Saving and investment decisions have no impact on the equilibrium growth rate but only affect the growth path. This means that the growth of labour productivity is only a transitional phenomenon which occurs when the propensity to save and to invest

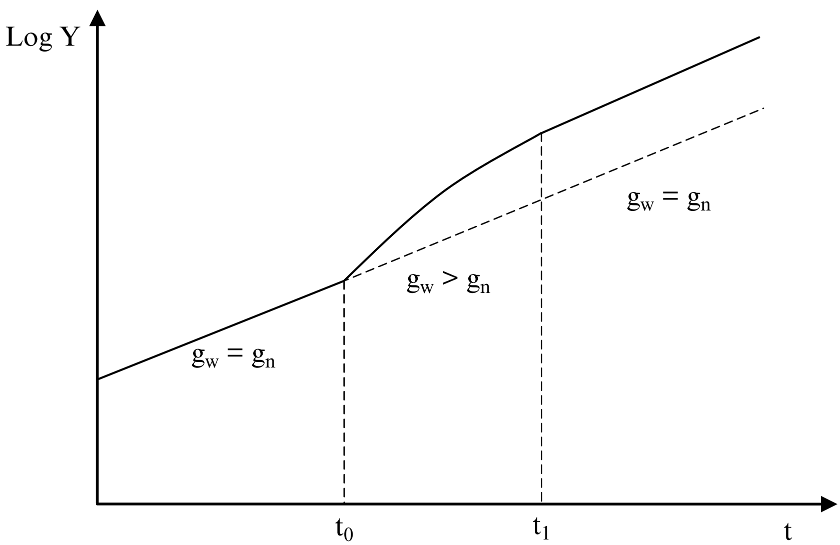


Figure 3.5 Shift of the equilibrium growth path by an increase in the propensity to save

increases and capital stock growth temporarily exceeds the natural rate of growth. However, because of falling marginal returns to capital this deviation peters out, capital stock growth adjusts towards the natural rate of growth and labour productivity stops rising. Therefore, if population growth, and hence labour force growth, is equal to zero, in the long run the economy will be trapped in a stationary state, irrespective of the propensity to save and invest. Long-run growth seems to be possible only if there is positive labour force growth.

3.4.5 Technological Progress as an Unexplained Residual Value

So far, the characteristics of the basic model of the neoclassical theory of growth have been discussed without taking technological progress into consideration. However, the history of developed capitalist economies shows that these are characterized by positive growth in the long run, even with a constant labour force. In other words, there seems to be persistent labour productivity growth. If the sheer increase in the quantity of labour and capital inputs only explains a small part of output growth, a third factor has to be implemented into the neoclassical production function. This factor is 'technological progress', which allows for an increase of real output even with constant labour and capital inputs by means of increasing the productivity of these factors of production. This productivity is called 'total factor productivity', because it is linked neither to labour nor to capital.[16] The Cobb/Douglas production function is hence modified:

$$Y = L^{\alpha}K^{\beta}e^{\tau t}, \quad \alpha + \beta = 1. \tag{3.41}$$

Technological progress is modelled here as an exogenous, exponential trend function of time, where τ represents the exogenous growth rate of technological progress. For the actual growth rate of real output/income we obtain:

$$\hat{Y} = \alpha\hat{L} + \beta\hat{K} + \tau. \tag{3.42}$$

The growth rate is now given as the sum of the growth rate of the labour force and the growth rate of the capital stock, each weighted by their respective partial elasticities of production, and the growth rate of total factor productivity. Empirically, the latter is calculated as a residual in growth accounting invented by Solow (1957). In growth accounting exercises the growth rates of the labour force, the capital stock and output are observed data from the statistics. The partial elasticities of production of labour and capital are taken to be given by the factor income shares from national accounting, assuming marginal productivity remuneration and the properties of a macroeconomic Cobb/Douglas production function to hold. With this information and data, the growth rate of total factor productivity can then be calculated applying equation (3.42).[17]

Finally, starting from equation (3.42), applying the long-run equilibrium condition $\hat{K} = \hat{Y}$ and taking equation (3.27) into account, the long-run growth equilibrium with exogenous technological progress becomes:[18]

$$\hat{L} + \frac{\tau}{\alpha} = \hat{K} = \hat{Y} = \frac{s}{v} \quad \Rightarrow \quad g_n = g_w. \tag{3.43}$$

The natural rate of growth is now given by the sum of the exogenous growth rates of the labour force and total factor productivity. To this rate the warranted rate of growth will adjust through the mechanism described in Subsection 3.4.3. Even with a constant labour force, long-run equilibrium growth may be positive if the rate of technological progress or the growth rate of total factor productivity is positive. The long-run equilibrium growth rate will increase if either the growth rate of the labour force increases or the total factor productivity growth speeds up, as is shown in Figure 3.6.

Regarding the type of technological progress it is first assumed, as mentioned above, that technological progress is exogenous and falls like 'manna from heaven'. It thus has the character of a public good, which means that each firm has access to it without restricting any other firm

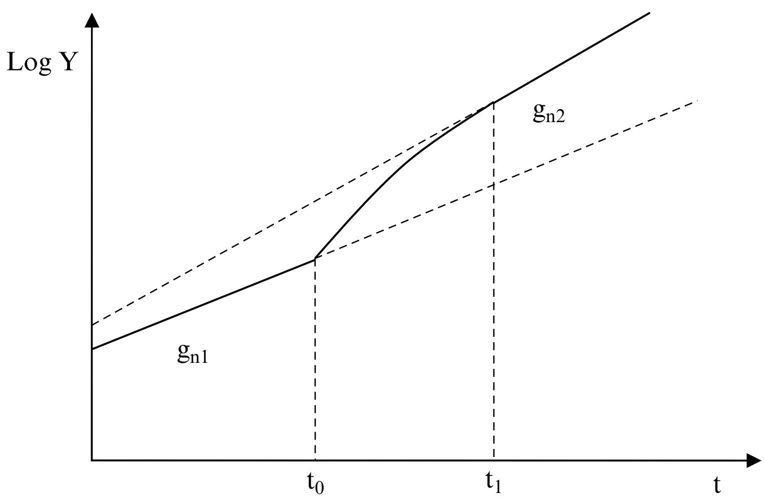


Figure 3.6 An increase in the rate of technological progress and/or in the growth rate of the labour force

using it (non-rivalry and non-excludability). Technological progress is not linked to a specific factor of production and can thus not be accumulated (for example through learning processes during the labour process or through investment in human capital or R&D). Furthermore, it is assumed that technological progress is 'Harrod neutral', which means that the capital–output ratio is constant in the long-run growth equilibrium. Harrod neutral technological progress assumes that technological progress is labour-augmenting, which means that the labour–output ratio decreases but the capital–output ratio remains constant. In other words, labour productivity increases whereas capital productivity remains constant (Solow 1970, pp. 33–38).[19]

Summing up, according to the old neoclassical growth theory the long-run equilibrium growth rate is completely exogenous and does not depend on economic conditions or choices at all. However, the long-run equilibrium growth path is affected by the decisions to save and to invest, which are identical in the model outlined here. Economic policy cannot affect the long-run productivity growth rate, but it may affect the long-run growth path by means of lifting the country's propensity to save and to invest in capital stock.

3.4.6 Implications for Convergence

What are the implications of the old neoclassical growth model for comparative long-run growth of different countries or regions? Since technological progress is considered to be a public good, which is freely available to all countries, long-run growth rates should only differ if labour force growth rates are different. In order to correct for differences in labour force growth we focus on output growth per person employed in what follows, hence on labour productivity growth ($y = Y/L$).[20]

Unconditional convergence of labour productivity means that countries with lower initial levels of capital–labour ratios and of labour productivity will grow faster and catch up to those countries with higher productivity levels. This means that finally, after all the adjustments have taken place, all countries will be on the same productivity growth path given by the freely available technological knowledge. However, this means not only that they make use of the same, exogenously given technology, but also that they have the same average propensity to save and thus the same equilibrium capital–labour ratio. Unconditional convergence is shown in Figure 3.7: the countries have the same propensities to save but different initial levels of productivity. We assume that in t_0 the more developed country A is already on its long-run equilibrium growth path, whereas the less developed country B is not yet and will hence catch up to the same level of

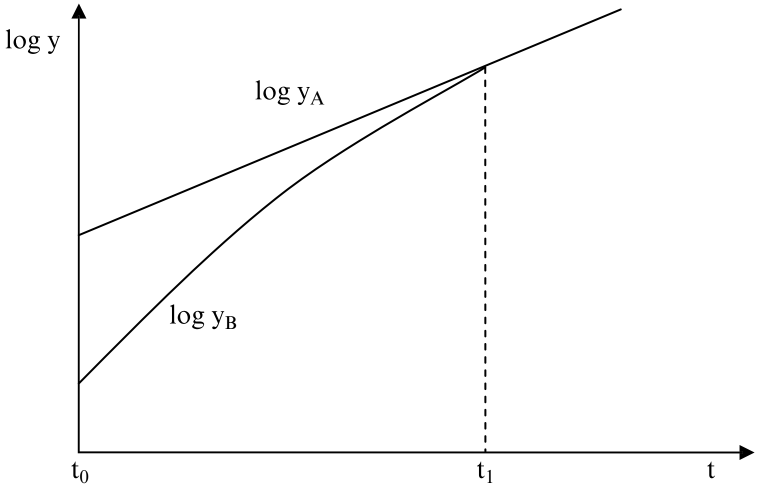


Figure 3.7 Unconditional convergence

productivity at t_1. During the catch-up process, productivity growth in country B will exceed productivity growth in country A, that is the slope of its log y curve will be higher. When country B has successfully caught up in t_1 the levels and the growth rates of productivity in the two countries will be the same.

If propensities to save between countries A and B are different, long-run equilibrium growth paths will differ, too, although long-run equilibrium productivity growth rates will be the same – technology is treated as a public good. This constellation should give rise to conditional convergence, according to the Solow model, as is shown in Figures 3.6 and 3.7. In the rich country A the propensity to save is higher than in the poor country B, the capital–labour ratio exceeds the one in the poor country and the long-run equilibrium productivity growth path is higher than in the poor country. Conditional convergence thus means that countries converge towards their long-run equilibrium productivity growth paths, which may differ from those of other countries if propensities to save are different.

In Figure 3.8 we assume again that, in t_0, country A is already on its long-run equilibrium growth path whereas country B is not on its path. During the catch-up process until t_1, productivity growth in country B will exceed productivity growth in country A. This means the log y curve will be steeper for country B than for country A. However, country B will not converge to the productivity level of country A. Starting in t_1, only productivity growth rates will be the same, which means the log y curves will have the same slope.

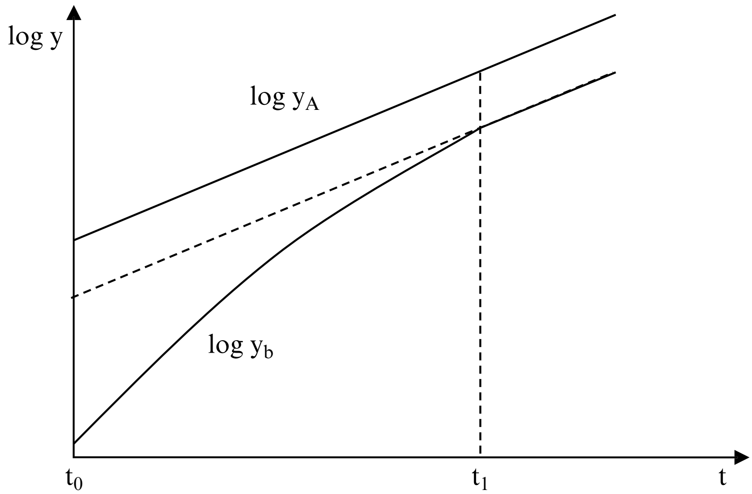


Figure 3.8 Conditional convergence: low-productivity country with a higher productivity growth rate during the convergence process

Finally, Figure 3.9 shows that, during the convergence process towards the respective long-run equilibrium productivity growth rates, productivity growth in the rich country does not necessarily have to be below productivity growth in the poor country. In t_0 the rich country A is even further away from its long-run equilibrium growth path than the poor country B from its path, so that during the adjustment process until t_1 productivity growth in country A will even exceed productivity growth in country B. This means that a poor country will only grow faster than a rich country if it is further away from its long-run equilibrium growth path. As soon as the adjustment process is finalized, productivity in both countries will grow with the same rate but on different growth paths.

Summing up, the Solow model implies neither that all countries should converge to the same level of labour productivity nor that during the convergence process poor countries should generally grow faster than rich countries. However, it implies that in the long run productivity growth rates should be the same in each country, irrespective of differences in the propensities to save and in the rates of accumulation in real capital stock, because technology is considered to be a public good freely available to all countries. In other words, what is expected is absolute convergence in productivity growth rates but only conditional convergence in productivity growth paths. A higher propensity to save will yield higher output per head.

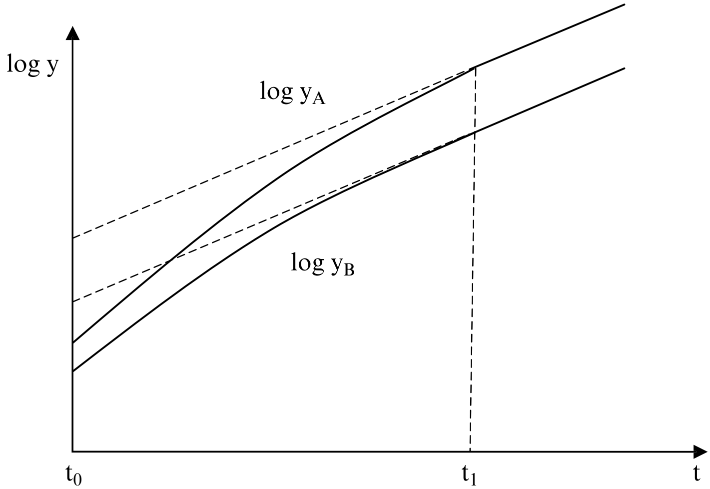


Figure 3.9 *Conditional convergence: low-productivity country with a lower productivity growth rate during the convergence process*

3.5 THE NEW (NEOCLASSICAL) GROWTH THEORY: ENDOGENIZING PRODUCTIVITY GROWTH

3.5.1 Introduction

The unsatisfactory treatment of technological progress as an exogenous variable, which explains most of the observable long-run economic growth and which is not explained by any economic decision making process in the model itself, as well as some problems in explaining some of the stylized empirical facts of the real world economic growth and the (non-)convergence with respect to productivity (growth), gave rise to a new wave of growth theories starting in the 1980s with the models by Romer (1986) and Lucas (1988). Furthermore, the lack of positive long-run effects of higher thriftiness on the rate of growth of the economy must have been puzzling to neoclassical economists, according to Cesaratto (1999). Therefore, the main purpose of the new growth models has been to provide explanations of long-run productivity growth containing technological progress as an endogenous phenomenon which is a result of costly, purposeful and rational economic decisions to abstain from consumption.[21]

As technological progress in the Solow model is treated as an exogenous variable, which is not linked to a certain factor of production and which is freely available to all economic actors in the long run, the long-run convergence of labour productivity growth rates of different countries and regions is predicted, on the one hand. On the other hand, this view implies that long-run productivity growth is independent of the growth of the capital stock, or of investment in human capital or in R&D. However, these implications stand in contrast to some empirical facts of the growth process, or they at least fail to provide explanations for some empirical phenomena, as has been observed in particular in the debate on productivity (growth) convergence in the 1980s and 1990s:[22]

- First, no general convergence is observed in international comparison with respect to GDP per capita or per person employed or per hour worked, and hence with respect to labour productivity. However, if similar countries are considered, for example only OECD countries, GDP per capita seems to converge. Countries with an initially lower GDP per capita ratio grow faster than countries with a higher GDP per capita ratio initially. The notion of 'convergence clubs' also seems to hold true when regions within a country are considered, for example the states of the US or the prefectures in Japan. The findings of no general convergence at the global level do not necessarily contradict the implications of the old neoclassical growth model, as we have shown in Section 3.4. However, with respect to productivity growth rates, there seems to persist a wide variation among broader sets of countries, and this cannot be explained by the old neoclassical growth model.
- Second, the higher the share of capital stock investment in GDP or the growth rate of capital stock per hour worked, the higher is the rate of productivity growth. This means that accumulation of capital stock plays an important role in the growth process and for international or interregional convergence or divergence.
- Third, countries with a high stock of human capital show a tendency towards faster productivity growth. Therefore, investment in education and thus in human capital, measured by the years of schooling for example, plays a role for long-run growth and its potential differences between countries and regions.
- Fourth, high R&D expenditures have a positive impact on productivity growth. Long-run growth is therefore affected by the economic decision to devote a certain share of the productive potential to generating new products and new processes.

The aim of the new growth theory is now to explain these empirical facts by the integration of technological progress as an endogenous variable into the neoclassical model. Basically, three types of approaches can be distinguished, which will be outlined in Subsections 3.5.2 to 3.5.4, without going too much into detail and into the technicalities of the respective models. The first type of models is based on the idea that technical progress and productivity growth arise as an unintended by-product of profit maximizing production and investment decisions at the firm level, as has already been argued in Arrow's (1962) 'learning by doing' model. These positive external effects compensate for the falling marginal productivity of capital and thus allow for continuous growth if there is positive saving and hence capital accumulation. Whereas this type is based on unintentional knowledge accumulation, the second type focuses on the accumulation of human capital based on economic decisions to refrain from consumption. The third type, focusing on R&D investment, aims at explaining technological progress and thus long-run growth as an outcome of resource using and thus costly economic decisions at the microeconomic level. As Cesaratto (1999, p. 782) argues, each of the variants of endogenous growth theory tries 'to explain the diversity of growth experiences on the basis of a theory which hinges upon the endogenous saving choices of the community'.

3.5.2 The AK Model

The AK model is the most basic neoclassical endogenous growth model.[23] It can be used to present the idea that technological progress and productivity growth is an unintended by-product of production and investment activities at the firm level, similar to Arrow's (1962) learning by doing approach in which the productivity of labour increases with work experience. Frankel (1962) and Romer (1986) argue that production and capital accumulation of single firms have knowledge spillovers which are positive externalities for all other firms. Investment of a single firm will increase the general level of knowledge available to all the firms in the economy. The general level of knowledge available to a single firm is thus the result of aggregate capital accumulation in the economy as a whole. This approach allows for treating the production function of a single firm as having constant returns to scale and diminishing marginal productivity of capital. However, owing to positive externalities, the aggregate production function for the economy as a whole exhibits rising returns to scale and a constant marginal productivity of broad capital, which now also includes knowledge and thus human capital. The knowledge spillover from the individual firm level to the economy as a whole exactly compensates for decreasing marginal productivity of physical capital at the firm level.[24] Technological progress is exogenous for the single firm but endogenous for the economy as a whole.

Formally, the idea of long-run growth being driven by knowledge spillovers can be represented as follows. It is again assumed that goods and factor markets are cleared by the price mechanism at full employment equilibrium. Potential and actual real output are produced with the following production function (Rebelo 1991):

$$Y = AK_B, \quad A > 0, \tag{3.44}$$

with Y again as real output, K_B as a broad measure of capital, including physical and human capital, and A as constant productivity of broad capital. Carlin and Soskice (2006, chap. 14.1.2) show that such a production function representing the effects of knowledge spillovers at the aggregate requires 'constant returns to capital accumulation in terms of the accumulation of knowledge' (Carlin and Soskice 2006, p. 533). This, of course, is a very special assumption.[25]

Investment in physical and human capital (I_B) is identically equal to saving, which itself is proportional to real income, with s denoting again the average propensity to save in the economy:

$$dK_B = I_B \equiv sY, \quad s \leq 1. \tag{3.45}$$

Since A in equation (3.44) is constant, we obtain:

$$\frac{dY}{Y} = \frac{dK_B}{K_B} = \frac{I_B}{K_B} = g. \tag{3.46}$$

Inserting equations (3.44) and (3.45) into equation (3.46) yields:

$$g_n = \frac{dY}{Y} = \frac{I_B}{K_B} = \frac{sY}{K_B} = sA. \tag{3.47}$$

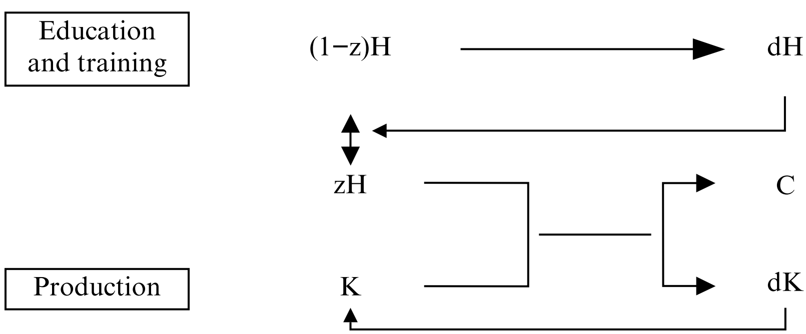
With a constant productivity of broad capital, saving and capital accumulation have a permanent effect on the natural rate of growth. Even if countries have free access to the same technology, long-run growth rates will differ nonetheless as soon as different propensities to save and invest prevail. Since K_B has two components, real capital stock and human capital, the decisions to save directly affect investment in capital stock and, indirectly, in human capital, via spillovers (Cesaratto 1999). An increase in the average propensity to save or in broad capital productivity will increase the long-run rate of growth of the economy. Therefore, the key component of any endogenous growth model is the constant marginal productivity of the factor of production which can be accumulated. In the following subsections we will see that this also holds true for growth models which rely on purposeful and costly human capital accumulation or R&D expenditures.

3.5.3 Human Capital Accumulation

An explicit mechanism based on costly and purposeful behaviour, which compensates for the falling marginal returns of the physical capital stock and generates permanent productivity growth, is human capital accumulation.[26] This type of model has been shaped by the contributions of Uzawa (1965) and Lucas (1988). Uzawa (1965) extends the Solow model by the option of human capital accumulation, while Lucas (1988) additionally takes into consideration the external effects of this accumulation.[27]

The structure of the human capital model is presented in Figure 3.10. Households face the alternative of using their available labour time either for productive work in order to obtain income (Y) – and thus for consumption (C) – or for education and training purposes and thus for the accumulation of human capital (H). Human capital, together with the physical capital stock (K), enters into the production function for consumption and physical capital goods. The economy uses a share (z) of the existing human capital stock for production of goods and the remaining part (1−z) for education and training, whereby additional human capital (dH) is created and accumulated by the households.

Formally, a simplified version of the model can be outlined as follows.[28] We start with the following production function with the usual neoclassical characteristics:



Source: Based on Arnold (1995, p. 416).

Figure 3.10 Structure of the human capital accumulation model

$$Y = Y(K, zH). \tag{3.48}$$

Assuming a constant labour force, the change in human capital (dH) is determined by the already existing human capital, by the share of education and training hours in the overall available working hours, by the parameter δ which indicates the efficiency of the time devoted to education and training with respect to the creation of additional human capital, and by the elasticity of production of existing human capital with respect to additional human capital (ψ):

$$dH = \delta(1 - z)H^{\psi}, \quad \delta > 0, \psi = 1. \tag{3.49}$$

Dividing by the stock of human capital, we obtain the determinants of the growth rate of human capital:

$$\hat{H} = \frac{dH}{H} = \delta(1 - z)H^{\psi - 1} = \delta(1 - z). \tag{3.50}$$

Therefore, if both the efficiency parameter (δ) and the part of the time devoted to education and training (1−z) are constant and the elasticity ψ is exactly equal to one, human capital will grow at a constant rate. However, if the elasticity ψ falls short of one, the accumulation of human capital, that is a rise in H, will permanently reduce the growth rate of human capital in equation (3.50) towards zero. And if the elasticity ψ exceeds one, rising human capital will make the growth rate of human capital in equation (3.50) permanently increase towards infinity. Only if ψ is exactly equal to one will human capital grow at a constant rate.

The growth rate of human capital takes over the role of the exogenous growth rate of technological progress in the Solow model and determines the equilibrium growth rates of output and capital stock as well. Assuming a constant propensity to save, the steady state growth rate, or the natural rate of growth (g_n), is thus determined as follows:

$$\hat{H} = \hat{K} = \hat{Y} = \delta(1 - z) = g_n. \tag{3.51}$$

The natural rate of growth, to which the system adapts in the long run according to the already described mechanisms for the old neoclassical growth model in Subsection 3.4.3, is therefore given by the share of education and training time in the overall working time available and by the efficiency of the time used up for education and training. As a constant labour force has been assumed, equation (3.51) also determines the steady state growth rate of labour productivity. If labour force growth is taken into account, it has to be added to the growth rate in equation (3.51) in order to obtain the natural rate of growth.

So far, the human capital model has demonstrated that the long-run equilibrium growth rate of the economy depends on the growth rate of human capital, which is itself determined by the technology in the education and training sector and by the share of human capital devoted to education and training. Therefore, the more the households are willing to refrain from present consumption and to invest in human capital, the higher will be the long-run equilibrium growth rate of the economy. And the more efficient the education and training sector, the higher will be the long-run equilibrium growth rate. Extending the model presented so far, the decision about the share of human capital allocated to the production of additional human capital is usually modelled as an inter-temporal utility maximization exercise, in which the rate of time preference determines the shares of available human capital the (representative) household is allocating towards the production of goods and the production of additional human capital, respectively. The technology parameters related to the production of human capital in the education and training sector of the economy are taken to be exogenous. As a result, preferences and technology determine the long-run equilibrium growth rate.

Furthermore, external effects of human capital accumulation, and hence spillover effects of individual investment in human capital for the economy as a whole, improve the overall level of knowledge and thus have positive effects on the productivity growth rate of the economy, as was shown by Lucas (1988). However, as is well known from neoclassical microeconomics, the existence of positive external effects implies that private investment in human capital will fall short of the socially optimal amount of human capital accumulation. This kind of market failure can be tackled by government intervention in the market process, for example by subsidizing human capital accumulation or providing (partly) public education and training.

3.5.4 Research and Development

A second approach relating long-run equilibrium productivity growth to intentional economic decisions focuses on investment in R&D. This approach has been put forward, in particular, by Romer (1990, 1994) and has also been elaborated by Grossman and Helpman (1991, chap. 3, 1994).[29] Before we sketch the structure of R&D models, two implications of R&D investment have to be singled out, which are related to the non-rivalry of technological knowledge. Once technological knowledge has been invented by firm A, it can be used by firm B without restricting the use of firm A. Technological knowledge thus has public good characteristics.

1. This means that, in order to induce a single firm to invest in R&D and to improve existing products or methods of production or to invent new products or methods of production, the access of other firms to this new technological knowledge has to be temporarily restricted, for example by patents, so that the innovating firm can temporarily monopolize the invention and obtain the benefits in the form of temporary extra profits. Therefore, the endogenous growth models relying on investment in R&D as the determinant of long-run growth have to leave the world of perfect competition and have to be set in a monopolistic competition framework.[30]
2. The public goods characteristics of technological knowledge imply that the results of past investment in R&D, at least after a while, are available to all firms and thus provide a basis for their R&D activities. Private R&D activities thus create positive external effects or spillovers, which are available for the economy as a whole. On the one hand, this enables the generalization of technological progress and productivity growth. On the other hand, however, external effects indicate that the volume of privately undertaken R&D investment is suboptimal from the perspective of the economy as a whole. This finding would again justify government interventions, subsidizing private R&D expenditures or providing public basic R&D.

The outline of a simple R&D endogenous growth model can be based on the approach by Grossman and Helpman (1991, chap. 3), which we have drastically simplified here.[31] In this model, labour (L) is the only primary factor of production, and there is hence no physical capital stock. It is assumed that there is no labour force growth and the quantity of available labour is thus constant. Therefore, growth is only possible if labour productivity increases. Output (Y) only consists of a homogeneous consumption good (C). This consumption good is produced with labour employed in production (L_P) making use of the available knowledge (A) about intermediate products (x(i)). The state of generally available technological knowledge can be conceived of as the sum of intermediate products:

$$A = \sum x_i. \tag{3.52}$$

The more intermediate products are known, the more developed is the division of labour and the higher is the productivity of labour. The model thus draws on Adam Smith's well-known idea that productivity growth is based on the increasing division of labour and the degree of specialization.

Either available labour can be employed to produce the final consumption good in the production sector of the economy (L_P) drawing on the existing knowledge about intermediate products, or labour can be employed in order to increase the quantity of the known intermediate products (dA) by R&D activities (L_R), and thus to increase productivity through specialization. Since the full employment condition is assumed to hold, an increase in R&D activities means a reduction in present consumption – in order to increase future consumption. The structure of the R&D model is shown in Figure 3.11.

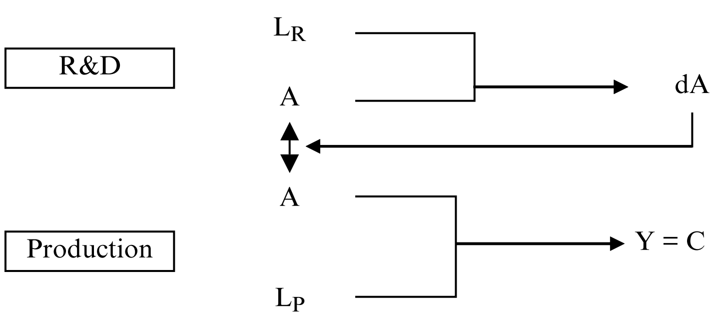
Formally, the essential features of the model can be outlined as follows. Output, which solely consists of one type of consumption good (Y = C), is produced by labour employed in production making use of the existing technological knowledge:

$$Y = C = Y(A, L_P). \tag{3.53}$$

Technological knowledge, that is knowledge about intermediate products, is generated in the R&D departments of the firms, in which R&D labour makes use of the existing stock of generally available technological knowledge in order to invent new intermediate products and thus new technological knowledge:

$$dA = \theta L_R A^{\vartheta}, \quad \theta > 0, \vartheta = 1. \tag{3.54}$$

The change in technological knowledge depends on the volume of labour employed in R&D activities, the efficiency of this labour (θ) and the



Source: Based on Arnold (1995, p. 425).

Figure 3.11 Structure of the R&D model elasticity of production of the existing and freely available technological knowledge with respect to the generation of new technological knowledge (ϑ). The elasticity ϑ is assumed to be equal to one. Dividing equation (3.54) by A we obtain the growth rate of technological knowledge:

$$\hat{A} = \frac{dA}{A} = \theta L_R A^{\vartheta - 1} = \theta L_R. \tag{3.55}$$

The growth rate of technological knowledge thus depends on the volume of labour employed in R&D activities and the efficiency of this labour with respect to inventing new intermediate products and thus improving specialization. In order to obtain a constant growth rate of technological knowledge and thus of labour productivity in the production of final output, it is again important that the elasticity ϑ is exactly equal to one. If the elasticity ϑ fell short of one, a constant amount of R&D labour would generate a permanently decreasing growth rate of technological knowledge; a rising A would make the growth rate of technological knowledge converge towards zero. And if the elasticity ϑ exceeded one, a constant amount of R&D labour and a rising A would generate a permanently increasing growth rate of technological knowledge. Only if ϑ is exactly equal to one will technological knowledge grow at a constant rate, provided that θ and L_R are constant.

In the long-run equilibrium, with the labour force constant, growth is determined by the growth rate of technological knowledge, and therefore we obtain:

$$\hat{Y} = \hat{C} = \hat{A} = \theta L_R = g_n. \tag{3.56}$$

With the assumptions being made, a constant amount of labour in R&D thus generates a constant rate of growth of real output and, with the employment in the production of final output given, a constant rate of productivity growth. An increase in the number of people employed in R&D will thus permanently increase the rate of growth of the economy as well as the productivity growth rate. Extending the model presented so far, the decision about the share of available labour allocated to the R&D department of the economy can again be modelled as an inter-temporal utility maximization exercise, in which the rate of time preference determines the shares of available labour which are allocated to the production of goods and the production of additional knowledge in the R&D department, respectively. The technology parameters related to the production of technological knowledge in the R&D sector of the economy are taken to be exogenous. Again, preferences and technology determine the long-run equilibrium growth rate.

We will come back to the properties of the model when assessing the new growth theories in Subsection 3.5.6, but first we will briefly address the role of income distribution in the new growth theory.

3.5.5 The Role of Income Distribution in the New Growth Theory

Whereas the old neoclassical growth theory provides a model with an exogenous long-run equilibrium growth rate and an endogenously determined equilibrium real interest rate/profit rate, as we have outlined in Subsection 3.4.2, this causality is reversed in the new growth theory. Kurz and Salvadori (2003) show that the models of the new growth theory can be characterized as determining the profit rate/real interest rate exogenously, through the production technology and through preferences, and the rate of growth is then endogenously determined by the saving–investment mechanism. This can be shown for the AK model outlined in Subsection 3.5.2. From the production function in equation (3.44) we can derive the marginal product of broad capital which determines the real rate of interest/rate of profit, if we assume marginal productivity remuneration:

$$\frac{\partial Y}{\partial K_B} = A = r. \tag{3.57}$$

Inserting equation (3.57) into equation (3.47) for the long-run equilibrium rate of growth, the natural rate, in the AK model we obtain:

$$g_n = sA = sr. \tag{3.58}$$

The natural rate of growth is thus given by the real rate of interest, which is determined by the production technology, and by the propensity to save, which we have taken to be exogenously given, but which is determined by the rate of time preference in the more elaborated new growth models. From this it follows that a higher average propensity to save will generate a higher long-run rate of growth. And to the extent that interest/profit earners have a higher propensity to save as wage earners, or that high income households' propensity to save exceeds the propensity to save of low income households, redistribution in favour of capital incomes or in favour of high income households should be conducive to higher long-run equilibrium growth rates. In other words, higher inequality should be growth enhancing.

However, empirically these implications are not generally found, as has been acknowledged by several authors in the new growth theory approach since the mid-1990s (Aghion et al. 1999). This literature has usually referred to the growth effects of personal income distribution, the changes of which are however closely related to changes in functional distribution if the factors of production, in particular capital, are unevenly distributed across the households.

Kuznets (1955) in a widely cited paper had already argued that the relationship between inequality in the personal or household distribution of income and economic development tends to be hump shaped. In the course of economic development, inequality first rises before it then tends to decline.[32] Kuznets (1955) mentions two forces which cause increasing income inequalities in the initial phase of economic development. First, since saving is concentrated in the upper income class brackets, the income yielding assets are concentrated in the hands of the upper classes, too, and hence also the income streams from these assets. The accumulation of these assets in the start-up period of economic development thus contributes to increasing inequality in the personal distribution of income. Second, the shift away from agriculture with lower but more equally distributed per-capita income to industry and manufacturing with higher but more unequal distribution of per-capita income causes an increase in overall income inequality. It is therefore structural change associated with economic development which initially contributes to increasing income inequality. But, in the course of development, counteracting forces arise which finally dominate the tendency of income distribution and make inequality decline. Kuznets (1955) refers to the following forces: political decisions to reduce inequality in the distribution of wealth, for example wealth taxes, rent and interest rate controls, or government induced inflation devaluating financial assets, technical change devaluating accumulated property assets, and most importantly the catching up of lower income households with respect to income generated from skilled labour. In particular the catching up of lower income groups will reduce inequality in the distribution of household incomes in the course of economic development.[33]

Barro (2000) in a panel data study for a broad set of countries, from the mid-1960s to the mid-1990s, confirms the Kuznets curve relationship between economic development and inequality. Growth differentials, however, have only minor relevance in the explanation of inequality differentials across countries. Barro (2008), extending the examination period to the 2000s, basically confirms his earlier findings.

Whereas the causality in the Kuznets curve relationship runs mainly from growth to distribution, Barro (2000) also addresses the reverse, the effects of inequality on growth. Here he finds that 'higher inequality tends to retard growth in poor countries and encourage growth in richer places'

(Barro 2000, p. 5). The updates of his estimations, in order to cover the early 2000s, again confirm the earlier findings (Barro 2008). Forbes (2000, p. 869), however, finds opposite results and argues 'that in the short and medium term, an increase in a country's level of income inequality has a significant positive relationship with subsequent economic growth'. However, these results do not seem to be robust with respect to variations in the econometric model specification and the utilized datasets, according to Galbraith (2012, pp. 74–77).[34]

In a more recent study Berg et al. (2008, p. 1), focusing on the sustainability of growth in 140 countries from the early 1950s to the early 2000s, find that 'growth duration is positively related to: the degree of equality of the income distribution; democratic institutions; export orientation (with higher propensities to export manufactures, greater openness to FDI, and avoidance of exchange rate overvaluation favorable for duration); and macroeconomic stability (with even moderate instability curtailing growth duration)'. Berg and Ostry (2011, p. 13), drawing and elaborating on the mentioned study, find that '[t]he key result from the joint analysis is that income distribution survives as one of the most robust and important factors associated with growth duration . . . Inequality is thus a more robust predictor of growth duration than many variables widely understood to be central to growth.'

When it comes to the explanation of the empirical findings (although not generally robust) that countries with less unequal income distribution, but otherwise similar initial conditions, grow faster than countries with higher income inequality, new growth models are usually taken as a reference. Since in the basic versions of these models a higher saving–income ratio and thus less equal distribution of income should be beneficial to growth, further factors have to be added to prevent and reverse this principal basic relationship.[35] Generally, three groups of factors and channels can be distinguished.

First, with imperfect capital and credit markets, the distribution of wealth and income may have considerable influence on the ability to invest in human capital or in research and development, which affects the long-run equilibrium rate of growth, as shown in the previous sections (Aghion et al. 1999).[36] On the one hand, with decreasing marginal revenues of investment in human capital, a high degree of inequality in distribution leads to a lower average rate of growth than a less unequal income and wealth distribution, because the marginal revenues of human capital investment are higher for less wealthy income groups than for the more wealthy. On the other hand, in imperfect capital markets credit financing of investment of whatever type will depend on the wealth or the income of the debtor which is available as collateral to the creditor. Hence, even with potentially highly profitable investment projects (in human capital or in R&D) the access of less wealthy groups to the means of financing these investments is restricted. Therefore, the income and wealth distribution affects the rate of technological progress and thus the per-capita growth rate of output. The redistribution of income and wealth in favour of low income and wealth groups and/or an improvement of the functioning of capital markets would thus increase the long-run growth rate of the economy.

A second group of studies refers to political economy arguments and the potentially distorting effects of taxation introduced to reduce inequality (Alesina and Rodrik 1994; Persson and Tabellini 1994).[37] In democratic societies a high degree of inequality in the distribution of income and wealth might lead to the election of a government which attempts to reduce this inequality by increasing the tax burden on the rich. This will reduce investment owing to detrimental incentive effects, so the argument goes, and thus also economic growth. This conclusion seemingly conflicts with the distribution policy recommendation, which results from models with the imperfect capital markets argument. However, as Aghion et al. (1999) remark, the negative incentive effects of taxation aiming at redistribution could be avoided if the tax increases for the wealthy classes do not aim at the revenues from their economic activities, but at their stock of wealth.

A third channel is related to the effects of political instability on investment and hence on long-run growth (Alesina and Perotti 1996).[38] According to this argument, a high degree of income inequality is supposed to be followed by illegal activities, corruption, rent seeking and social instability, which will negatively affect saving and investment and thus long-run growth.

Summing up, although the basic new growth models would predict a positive relationship between inequality and long-run growth, several real world channels have been introduced into this kind of approach which may lead to just the opposite conclusion with respect to the growth effects of changes in income and wealth distribution.

3.5.6 Progress and Limitations of New Growth Theory

In this subsection we shall briefly assess the progress new growth theory has made as compared to old growth theory, but also the immanent limitations of this new approach. The general and basic problems of old and new growth theory, which are the lack of aggregate demand considerations, the assumption of Say's law holding continuously, the ruling out of involuntary unemployment of labour and underutilization of the capital stock, and the problems with the concept of aggregate capital, physical as well as human, and aggregate output in macroeconomic production functions will be addressed in the next section.

As we have outlined in the previous sections, unlike the case in the old neoclassical growth theory in the tradition of the Solow model, in the new growth theory the long-run equilibrium growth rate is determined endogenously within the model. Technological progress no longer has to be assumed to be exogenous and generally available to all economic actors as a public good. It either is modelled as a side effect of higher saving–income and thus investment–income ratios and depends on associated knowledge spillovers, as shown in the context of the AK model, or it is the result of purposeful economic decisions to abstain from consumption and to allocate resources towards productivity enhancing activities, as in the human capital or R&D models. These models thus provide some explanations for incomplete convergence of long-run productivity growth at a global scale and the formation of so-called 'convergence clubs'. They thus open the window to relate long-run growth, as well as growth convergence or non-convergence, to economic factors, such as investment in capital stock, in human capital or in R&D.[39] Furthermore, following these models long-run growth can be influenced by appropriate economic policies affecting the determinants of growth. This is particularly so because these models assume positive external effects of investment in the growth enhancing factors (physical capital, human capital, R&D), so that the market process left on its own will lead to suboptimal results from a social welfare perspective. Within this framework, this is clearly an indication for government interventions stimulating or taking over (part of) the investment in the growth determining factors.

However, it should be noticed that the results of new growth theory with respect to the positive effect of capital accumulation on long-run productivity growth is not particularly new or innovative, taking a history of economic thought perspective (Dutt 2003; Kurz and Salvadori 2003). Already the classical economists, like Adam Smith (1776) and in particular Karl Marx (1867, 1894), had focused on the endogenous generation of productivity growth through capital accumulation.[40] Also within the framework of the post-Keynesian distribution and growth theory, Kaldor (1957, 1961) in particular had already presented models with endogenous productivity growth in the 1950s and 1960s, as will be outlined in Chapter 4 of this book.

Nonetheless, on the one hand, Kurz (2006, p. 163) is right in pointing to the progress which has been made by new growth models as compared to old neoclassical growth theory:

> In conventional theory, whenever increasing returns that are (dominantly) internal to the firm, externalities, public goods (or bads), incomplete and asymmetric information and so on are involved, there is a problem of market failure. Since the literature on 'new' or 'endogenous' growth revolves around precisely these phenomena, the question of public policy, institutional arrangements and mechanism design are close at hand. While capital accumulation is still at the centre of the analysis, these wider issues, which figured prominently in the classical authors, have been brought back into the picture.

On the other hand, however, this progress has been made within the limits set by the methodology of the neoclassical approach, which is an approach based on individual optimization under exogenous constraints. Compared to old neoclassical growth theory, new growth theory has merely moved the borders of the exogenous parameters of the model (Fine 2000; Setterfield 2001). Whereas the old neoclassical theory of growth considers the rate of technological progress itself as an exogenous variable, which is not explained within the framework of the model and to which the other variables of the system adjust in the long run, in the models of the new growth theory the determinants of technological progress, which is itself 'endogenous', become the exogenous parameters. These are the time preference of households, which determines the division of available labour (or human capital) between the production of goods and the production of human capital or technological knowledge in the R&D sector, respectively, and the technology parameters in the education and training or R&D sectors of the economy. Long-run growth is thus again determined by preferences and technological conditions of production (now for the production of human capital and technological knowledge), and can hence be treated with the well-known neoclassical instrument of utility and profit maximization under constraints.

Assessing technological progress and long-run growth 'through the lenses of scarcity' (Kalmbach 1994, my translation) has thus several problems, as has been outlined by Setterfield (1994, 2001), Skott and Auerbach (1995), Palley (1996b), Fine (2000) and Dutt (2003), among others. Apart from the basic problems to be discussed in the next section, the lack of effective demand considerations, the full employment assumption and the problems with the concept of aggregate capital and aggregate output in a macroeconomic production function, these problems relate to the treatment of the generation of preferences and the causes for their changes, the modelling of the process of innovations, the modelling of expectations in an uncertain environment, the inadequate integration of historical and institutional factors into the models, and so on.[41] For example, with regard to the determination of consumption and saving (and thus investment), the new growth models assume a utility maximizing consumer with stable preferences, which do not change during the growth process. It is assumed that this consumer is capable of maximizing an inter-temporal utility function over an infinite period of time. This requires that all present and future consumption possibilities are known, and thus products to be developed in the future are already known today and can enter into the utility function of the (representative) household with definite values, an extremely restrictive and unrealistic view (Kalmbach 1994).

Solow (2000, 2007) has alluded to another important problem which shows up in the three types of new growth models discussed here and which we have already touched on when outlining the models. In each of the models the mechanism which generates a constant rate of productivity growth is quite peculiar.

> And sure enough, if you root around in every such model you find somewhere the assumption that dx/dt = G (.) x, where x is something related to the level of output. It may be the production function for human capital, or the production function for technological knowledge, or something else, but it will be there. And the plausibility of the model depends crucially on the plausibility and robustness of that assumption. I want to emphasize how special this is: it amounts to the firm assumption that the growth rate of output (or some determinant of output) is independent of the level of output itself. (Solow 2007, p. 5)

In the AK model exactly constant returns to broad capital have to be assumed, which means that the positive externalities for the economy as a whole exactly compensate for the falling marginal productivities of the capital stock at the firm level. 'If there is the slightest touch of diminishing returns, then the model becomes standard-neoclassical and does not deliver an endogenously determined rate of growth', as Solow (2000, pp. 368–369) argues. He continues, 'if there is the slightest touch of increasing returns to capital, then the model becomes too powerful for its own good and generates infinite output in finite time' (Solow 2000, p. 369). The AK model is thus not very robust, and the empirical implications are extremely restrictive. Similarly, the human capital model has to assume constant returns to human capital in the production of additional human capital, which again is a quite restrictive assumption. As soon as increasing marginal returns show up here, productivity growth rates will increase forever, whereas falling marginal returns will make productivity growth converge towards zero. And also in the R&D models it has to be assumed that the elasticity of production of existing technological knowledge with respect to additional technological knowledge is exactly equal to one, so that a constant amount of labour devoted to R&D activities generates a constant rate of growth of technological knowledge, and an increase of this amount of labour raises the rate of growth, and not just the level, of technological knowledge.

Finally, as we have also explained above, the R&D models require the abandoning of perfect competition and the formulating of the models in a monopolistic competition framework. Otherwise there would be no reason for private firms to devote any resources to R&D activities, because technological knowledge has public goods characteristics. However, abandoning perfect competition poses serious problems for the neoclassical price and distribution theory, which is based on perfect competition, as we have outlined above, as well as for all the welfare implications associated with this approach. Solow's final remarks on income distribution in his review of old and new neoclassical growth theories, pointing out that these distribution and price theories underlie the old and new growth theories in this paradigm, can be read as a support for our conclusion:

> Very little has been said in this survey about income distribution (in other words, about the determination of factor prices). That is because there is no special connection between the neoclassical model of growth and the determination of factor prices. The usual practice is to appeal to the same view of factor pricing that characterizes static neoclassical equilibrium theory. (Solow 2000, p. 378)

3.6 FUNDAMENTAL CRITIQUE OF THE NEOCLASSICAL DISTRIBUTION AND GROWTH THEORY

3.6.1 Two Main Areas of Fundamental Critique

In this final section of the chapter on the neoclassical theories of distribution and growth, old and new, we will address two areas of fundamental critique directed towards this kind of approach. The first area of fundamental critique is related to the relevance of the old and new neoclassical approaches for a monetary production economy in which aggregate demand also has a role to play in the long run. If this is taken seriously, on the one hand, Say's law cannot be assumed generally to hold, and problems of involuntary unemployment and underutilization of productive capacities may arise in the long run, too. And on the other hand, the growth path of productive capacities given by capital stock accumulation, productivity growth and labour supply growth cannot be examined and understood without taking the dynamics of aggregate demand into account. This means that the problems posed by Domar and Harrod, and discussed in Chapter 2, cannot simply be assumed away. It is thus seriously inappropriate to treat growth issues as inter-temporal maximization problems of a single immortal household, as in neoclassical growth models and as is nicely summarized by Solow (2000, p. 353):[42]

> The model economy traces out just the path that it would follow if it were planned by the single, immortal household, solving infinite-time utility maximization constrained only by given technological possibilities and inevitable identities. Under these favorable assumptions, the decentralization to competitive firms does not matter; in effect the industrial sector faithfully carries out the wishes of the household.

The old as well as the new neoclassical growth theories are thus missing adequate models taking into account the role of money, aggregate demand, investment decisions by firms, fundamental uncertainty and also historical time in an appropriate way. Integrating at least some of these issues into distribution and growth theory is the major focus of post-Keynesian approaches, which will be discussed in the following chapters of this book.

The second area of fundamental critique focuses on the concepts of capital and output applied in the aggregate neoclassical theory of distribution and in the old and new neoclassical growth models. This critique was put forward in the 'capital controversy' or in the 'Cambridge–Cambridge' debate in the 1950s and 1960s, and it questions the logical consistency of the neoclassical approach outside a one-good barter economy. This critique and its implications will be discussed in more detail in the following subsections of this chapter.

3.6.2 The Capital Controversy and Its Implications: The General Issue

The capital controversy, or the 'Cambridge controversies in the theory of capital' (Harcourt 1972), or just the 'Cambridge–Cambridge controversy',[43] started with a paper by Joan Robinson (1953/54), 'The production function and the theory of capital', questioning the concept of aggregate 'capital' and a 'well behaved' aggregate production function, in which a lower real wage rate is associated with a more labour intensive method of production. As Lavoie (1992, pp. 26–27) and Cohen and Harcourt (2003) point out, Robinson's critique is not primarily focused on the aggregation problem related to the concept of 'capital' as such, but rather on the supposed instantaneous substitution processes based on the aggregate neoclassical production function in a world without historical time and adjustment costs. We will focus on the implications of this broader critique when discussing Robinson's approach to distribution and growth in a historical time theoretical framework in Chapter 4 of this book. In the present section, however, we will deal with the narrower problem of aggregation and the interdependence of prices and income distribution, touched upon in the capital controversy.[44] In this respect the capital controversy has shown that the aggregate neoclassical distribution and growth theory is theoretically inconsistent outside of a one-good economy and thus untenable. Only in a one-good economy is it possible to formulate an aggregate production function, from which a strictly inverse relationship between the factor price ratio and the factor input ratio as postulated in the neoclassical theory can be derived. Only in a one-good economy can capital be aggregated in the same physical units and thus a single quantity can be derived. The same is true for aggregate output, which in a one-good economy can also be aggregated by adding up physical units of the single good. Only on this basis can the marginal productivity of capital then be calculated as a mere physical relationship, which in a perfectly competitive environment determines the real interest rate or the rate of profit – with respect to neoclassical theory we are using these terms interchangeably in this section – and thus functional income distribution. And only under these conditions can it then be argued that an increase in the real wage rate–real interest rate ratio will cause a rise in the capital–labour ratio employed, because profit maximizing firms will substitute capital for labour.

In a more-than-one-good economy, however, the formulation of an aggregate production function faces the problem that heterogeneous capital goods have to be aggregated to a single magnitude. The same is true for heterogeneous output. For this purpose the relative prices of input and output goods have to be known in order to calculate the respective aggregates and to formulate an aggregate production function. Therefore, strictly speaking, the outcome of this process is not a production function any more, because it no longer denotes exclusively technical input–output relationships (Pasinetti 2000). However, for the purpose of the analysis it could be argued that multiplying the respective heterogeneous inputs and outputs with their relative prices in order to obtain 'capital' and 'output' as single magnitudes just facilitates the aggregation problem without changing the results. But, since Ricardo (1817), it is well known that changes in functional income distribution and changes in relative prices are interrelated. Wicksell (1934) also noted that the value of capital goods in the production function depends on the rate of interest, an observation which then became known as 'price Wicksell effects' (Robinson 1953/54; Kurz and Salvadori 1997, p. 445; Pasinetti 2000).

It was finally Piero Sraffa (1960), in *Production of Commodities by Means of Commodities: A Prelude to a Critique of Political Economy*, who rigorously demonstrated that relative prices and the functional distribution of income can only be determined once a distribution parameter is known.[45] In order to be able to calculate the aggregate 'capital', either the real wage as a bundle of goods or the profit rate/real interest rate has to be known. For each profit rate (real wage rate), a different sum of prices for the produced capital goods arises. The same is again true for aggregate output as a single magnitude in value terms.[46]

In the aggregate neoclassical distribution theory, the real interest rate/profit rate is determined by the marginal productivity of aggregate capital. But, in order to determine the single magnitude 'capital' and its marginal productivity, the real interest rate has to be known. Obviously, the argumentation runs in a circle: In order to determine the real rate of interest, the real rate of interest has to be known. An alternative attempt to determine the value of 'capital' entering into the production function by the present value of the future profits of the capital goods in use, and not by their present market prices, does not allow the leaving of this circle. For the calculation of the present value of the future profits, again an interest rate as a discount factor would be needed. Therefore, a one-directional, causal derivation of the real interest rate from the value of capital and its marginal product is impossible in a more-than-one-good economy.

This general criticism can be turned against the 'neoclassical parables' (Samuelson 1962) of a stable and continuously inverse relationship between the capital–labour ratio and the real interest rate–real wage rate ratio and thus against the idea of continuously downward sloping factor demand curves in labour–real wage rate space and capital–real interest rate space.[47] As shown above, the idea of a stable and continuously inverse relationship between the capital–labour ratio and the real interest rate–real wage rate ratio is central for the neoclassical aggregate marginal productivity theory of distribution and for the neoclassical growth theory, especially for the derivation of the existence and the stability of a full employment growth equilibrium. Within the context of the discussion of 'reverse capital deepening' and 're-switching of techniques', which we will touch upon explicitly within a simple model, it was shown that the neoclassical parables do not generally hold in a more-than-one-good economy. Therefore, the aggregate marginal productivity theory of distribution as well as the results from the neoclassical theory of growth cannot be sustained.

Before turning to a simple model, in order to derive the problems for aggregate neoclassical growth and distribution theories, it should be noted that Solow (1956) himself was quite careful and cautious, always making clear that he was assuming a one-good economy for his neoclassical growth model. In his later paper he argues:

> Probably the best method of exposition is to think of the neoclassical growth model as being a story about an imaginary economy that has only one produced

> good that can be consumed directly or stockpiled for use as a capital good. It is then an exact theory of that economy; and it becomes a difficult practical matter whether it provides a useful analogue of a multi-commodity economy. (Solow 2000, p. 351)

As the general argument outlined above has made clear and the demonstration of 'reverse capital deepening' and 're-switching of techniques' provided below will show in more detail, the neoclassical conclusions for a one-good economy do not generally hold in a multi-commodity model and are therefore not a 'useful analogue'.

3.6.3 A Simple Model

The simple model we use for our demonstrations is based on Harris (1978, chaps 4–5). We assume a given level of production in a two-goods economy, good 1 being a capital good and good 2 being the consumption good. Although we only have one type of capital good, total output is composed of two types of goods, a certain number of the capital good and a certain number of the consumption good, so that the problem we have outlined above arises with respect to the aggregation of output to a single magnitude, an aggregation which is required for an aggregate production function.

Each good in our model economy is produced with the capital good and labour as inputs in single production processes, which means that each production process only has one type of output good. The capital good is completely used up in the production process so that there are no fixed capital issues to be considered. We assume a fixed coefficient technology for each industry, with the a_{ij} denoting the fixed input–output coefficients and the a_{0j} the fixed labour–output coefficients. Competition among firms establishes a uniform rate of profit or a uniform real interest rate (r) on the capital advanced all over the economy, and competition among workers establishes a uniform nominal wage rate (w). Wages are assumed to be paid post factum so that they are not part of capital advanced on which the rate of profit is calculated. From these assumptions we obtain the following system of prices:

$$a_{11}p_1(1 + r) + a_{01}w = p_1, \tag{3.59}$$

$$a_{12}p_1(1 + r) + a_{02}w = p_2. \tag{3.60}$$

Since the technology described by the $a_{ij}(j = 1,2)$ and $a_{0j}(j = 1,2)$ is given and known, in the two equations (3.59) and (3.60) we have four unknowns:

the rate of profit/real interest rate (r), the nominal wage rate (w), the price of the capital good (p_1) and the price of the consumption good (p_2). The system is thus underdetermined. In order to move towards a closure of the system we can choose the consumption good as a numeraire, because we are only interested in relative prices. This adds another equation:

$$p_2 = 1. \tag{3.61}$$

However, the system is still underdetermined, which implies that, contrary to neoclassical microeconomic price and distribution theory outlined in Section 3.2, relative prices and distribution, that is the wage rate and the rate of profit, cannot be determined simultaneously. In order finally to close the system we have to add some information about distribution. This information can be related either to the wage rate or to the rate of profit/real rate of interest.

Following the classical tradition, the degree of freedom could be closed by assuming that workers receive a subsistence real wage rate (w_s^r), which is a certain amount of consumption goods per hour or month worked allowing for the survival of the workers and their families:

$$w = w_s^r p_2. \tag{3.62}$$

Equations (3.59) to (3.62) provide a system which allows for the determination of the relative prices and the remaining distribution variable, the rate of profit/real interest rate. With the closure in equation (3.62), the real wage rate is thus the exogenous variable, whereas the rate of profit/real rate of interest becomes the endogenous variable, together with relative prices.

According to Ricardo (1817, chap. V), the Malthusian population dynamics, and hence a positive effect of the real wage rate on population growth and on labour supply growth, would prevent the real wage rate from persistently deviating from the subsistence level. However, there arise certain difficulties in applying this concept to modern capitalist economies, because it is not quite clear how a historically given subsistence real wage rate should be defined given the level and the frequently changing habits of consumption nowadays, on the one hand. On the other hand, what workers receive in the labour market is not a consumption goods bundle but a nominal wage, that is a certain amount of money, and the real wage rate is only given as soon as prices have been established in the goods market. Therefore, some authors in the neo-Ricardian tradition have suggested closing the system by taking the rate of profit as the exogenous variable, being itself determined by the 'real' monetary rate of interest, that is the monetary rate of interest corrected for inflation (Panico 1985; Pivetti 1985, 1988, 1991). In doing this they can rely on a scant note by Sraffa (1960, p. 33):

> The rate of profits, as a ratio, has a significance which is independent of any prices, and can well be 'given' before the prices are fixed. It is accordingly susceptible of being determined from outside the system of production, in particular by the level of the money rates of interest.
> In the following sections the rate of profits will therefore be treated as the independent variable.

The risk-free monetary rate of interest (i) determined outside the system of production, by central bank policies or by financial markets, can be taken to determine uniquely the general rate of profit, if the rate of profit of enterprise (r_F) as a compensation for the 'risks and troubles' of investment in real capital stock is taken as a constant:[48]

$$r = r_F + i. \tag{3.63}$$

Equations (3.59), (3.60), (3.61) and (3.63) thus provide an alternative system which allows for the determination of the relative prices and the remaining distribution variable, which is now the real wage rate. With the closure in equation (3.63), the rate of profit/real rate of interest is the exogenous variable, whereas the (real) wage rate becomes endogenous, together with relative prices.

Irrespective of which closure of the system is chosen, the price of the capital good (p_1) and thus the value of capital advanced, as well as the value of the given total output, depend on distribution. Whenever the real wage rate (or the rate of profit in the alternative closure) changes, the price of the capital good will change and thus the value of capital advanced as well as the value of total output.

So far, our small model has underlined that a theory of distribution is required before relative prices can be determined. Relative prices and distribution cannot be determined simultaneously, and income distribution can hence not be determined by the forces of supply and demand in the markets for goods and factors of production. The rate of profit/real interest rate and the real wage rate cannot be interpreted as indices of scarcity reflecting their respective marginal productivities. The system has a degree of openness which has to be closed by a specific theory of distribution. Finally, the rate of profit and the real wage rate are inversely related; an increase in one variable means a decrease in the other. However, this relationship does not need to be linear, as will be argued next.

In order to analyse the relationship between the rate of profit and the real wage rate, which in our system is equal to the nominal wage rate because we have chosen the consumption good as a numeraire, we follow Harris (1978, chap. 4) and define the relative capital intensities (μ) of the two industries as follows:

$$\mu = \frac{\frac{a_{12}}{a_{02}}}{\frac{a_{11}}{a_{01}}}, \quad \mu > 0. \tag{3.64}$$

As shown by Harris (1978, pp. 99–103) the shape of the wage–profit curve describing the possible relationship between the rate of profit and the real wage rate for a given technology (a_{ij}, a_{0j}), will depend on the values of μ. For $\mu = 1$, which means that the physical capital–labour ratios in each department are the same, a linear wage–profit curve is obtained (Figure 3.12). If the physical capital–labour ratio in the production of consumption goods exceeds the physical capital–labour ratio in the production of capital goods and $\mu > 1$, the wage–profit curve will be convex (Figure 3.13). And, if the physical capital–labour ratio in the production of capital goods exceeds the physical capital–labour ratio in the production of consumption goods and $\mu < 1$, the wage–profit curve will be concave (Figure 3.14).

Finally, to obtain the implications of these curves for the associated capital–labour ratios, with the value of capital as a function of distribution and hence the profit rate, we start from the distribution equation of the social product, consisting of capital and consumption goods in equation (3.65). The total value of the social product (Y) is a function of the rate of profit, because the relative price of the capital good depends on income distribution. The social product is completely distributed to wages and profits. The sum of wages is given by the level of employment (L) and the

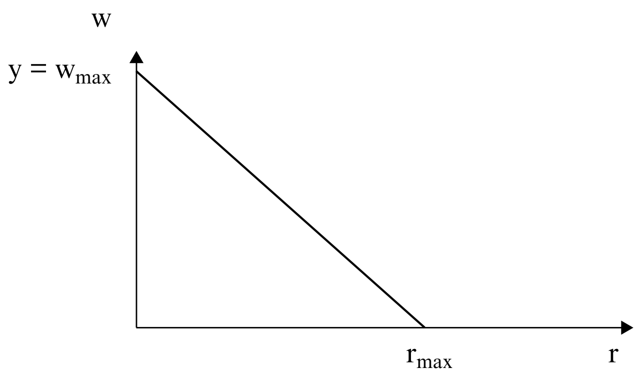


Figure 3.12 Linear wage–profit curve (μ = 1)

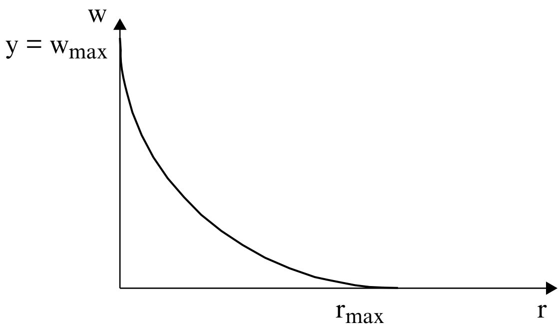


Figure 3.13 Convex wage–profit curve ($\mu > 1$*)*

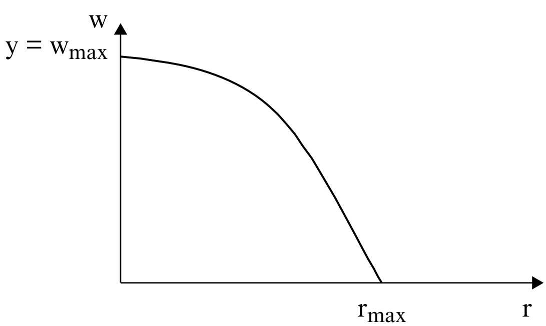


Figure 3.14 Concave wage–profit curve ($\mu < 1$*)*

wage rate (w), and the sum of profits is given by the general rate of profit and the value of the capital stock (K), which for the reason given above is also a function of the rate of profit:

$$Y(r) = wL + rK(r). \tag{3.65}$$

Dividing equation (3.65) by the level of employment, noting that labour productivity is $y = Y/L$ and the capital–labour ratio is $k = K/L$, we obtain:

$$y = w + rk \quad \Rightarrow \quad k = \frac{y - w}{r}. \tag{3.66}$$

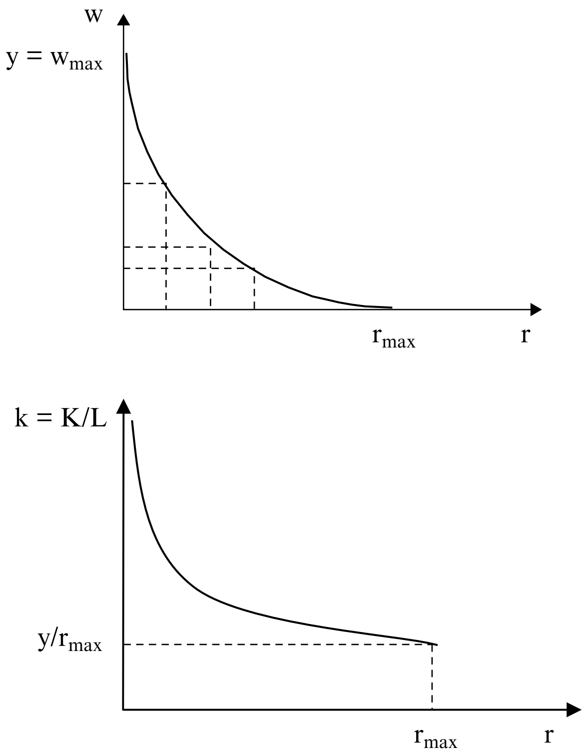


Figure 3.15 Capital–labour ratio with a convex wage–profit curve

The capital–labour ratio is thus a function of the rate of profit and the wage rate. This is so because the capital–labour ratio has the value of capital in the numerator, which depends on income distribution, because the relative price of the capital good is affected by distribution. More precisely, the capital–labour ratio is given by the part of the social product which is not distributed to workers divided by the rate of profit, as shown in equation (3.66).

Applying equation (3.66) to a production technology which generates convex wage–profit curves, we obtain that a continuous increase in the rate of profit by one unit is accompanied by an increase in $y-w$, with marginal increases declining. This means that the capital–labour ratio will fall when the rate of profit/real interest rate increases, as is shown in Figure 3.15. In this case, the changes in relative prices caused by a change in distribution trigger a fall in the value of capital, which generates a reaction of the capital–labour ratio measured in value terms and generates an observation

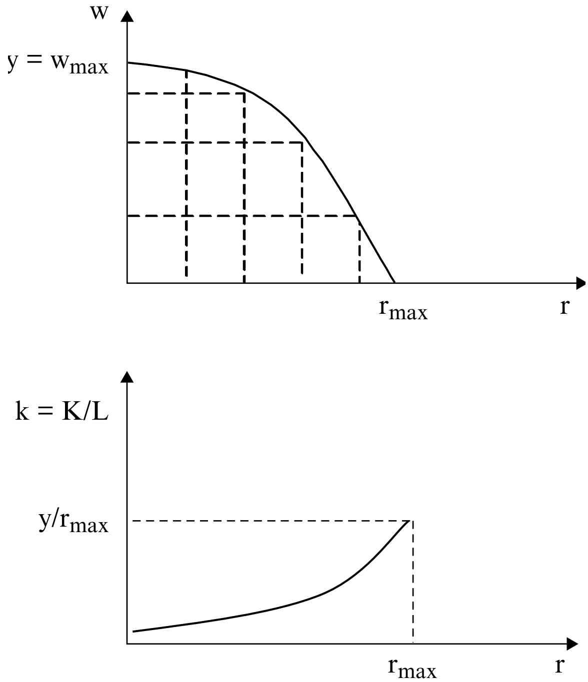


Figure 3.16 Capital–labour ratio with a concave wage–profit curve: reverse capital deepening

which seems to be consistent with neoclassical implications. However, since there is no change in the production technology, the a_{ij} remain constant, the observed fall in the measured capital–labour ratio whenever the rate of profit increases is exclusively due to the decline in the relative price of the capital good in this case. There is no substitution of labour for capital in physical terms going on.

For the concave wage–profit curves we obtain the opposite result, as can be seen in Figure 3.16. A continuous increase in the rate of profit by one unit is accompanied by an increase in y−w, with marginal gains rising. This means that the capital–labour ratio in value terms will rise when the rate of profit/real interest rate increases, although there is no change in the production technology. This increase is exclusively due to the rise in the relative price of the capital good when the rate of profit increases. This reverse capital deepening is not consistent at all with neoclassical theory.

Finally, as can easily be checked with the help of equation (3.66) and Figure 3.17, a linear wage–profit curve implies a constant capital–labour

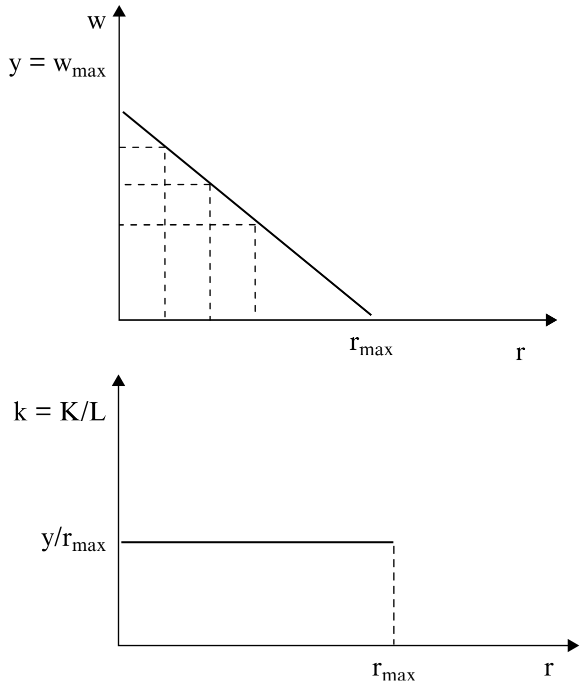


Figure 3.17 Capital–labour ratio with a linear wage–profit curve

ratio whenever there is a change in the rate of profit and hence in income distribution. In this case, a change in distribution will have no effect on the measured capital–labour ratio. Only if we start from a linear wage–profit curve will changes in distribution have no effect on relative prices and hence on the value of capital. Remember that linear wage–profit curves will be obtained if $\mu = 1$, which means that we have the same physical capital–labour ratio in the production of the consumption good and in the production of the capital good. This is the special condition in which the capital–labour ratio will only change if there is a change in the production technology, that is in the coefficients a_{ij} and a_{0j}.[49]

Whereas the phenomenon of reverse capital deepening is based on the relative price effects of distributional changes, the phenomenon of re-switching of techniques to be discussed next is related to changes in the production technology, which means changes in the a_{ij} and a_{0j} of our model. The debate on the 'choice of techniques' in a more-than-one-good economy has shown that, with a continuously increasing real interest rate/profit rate, profit maximizing firms might drop a specific technique but choose it again when an even higher real interest rate/profit rate prevails.

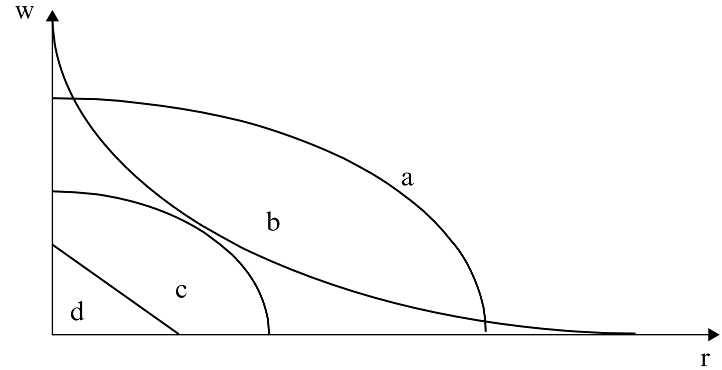


Figure 3.18 *Choice of techniques*

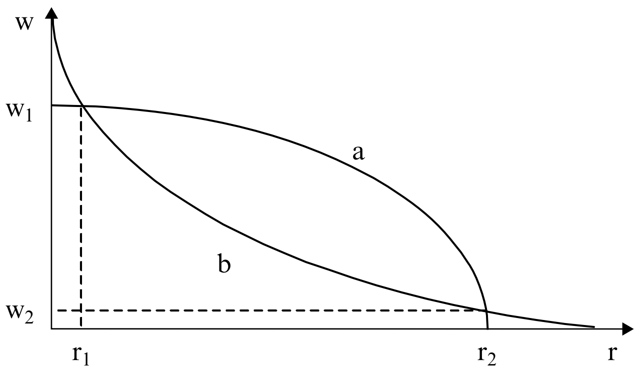


Figure 3.19 *'Re-switching of techniques'*

This re-switching of techniques contradicts the results of the neoclassical model. According to this approach, profit maximizing firms should choose less capital intensive techniques when there is a continuous increase of the real interest rate–real wage rate ratio. The reoccurrence of a technique should be impossible.

In order to demonstrate the possibility of re-switching of techniques, let us assume that, for our model economy with two sectors of production, two production methods are available in each sector. The capital good may be produced with the technology a_{11}^{A}, a_{01}^{A} or the technology a_{11}^{B},a_{01}^{B}; the consumption good may be produced with the technology a_{12}^{A}, a_{02}^{A} or the technology a_{12}^{B}, a_{02}^{B}. Therefore, altogether the economy has the choice between four 'techniques' for the production of the capital good and the consumption good as possible combinations of the technologies mentioned above: 'technique a' ($a_{11}^A, a_{01}^A; a_{12}^A, a_{02}^A$), 'technique b' ($a_{11}^A, a_{01}^A; a_{12}^B, a_{02}^B$), 'technique c' ($a_{11}^B, a_{01}^B; a_{12}^A, a_{02}^A$) and 'technique d' ($a_{11}^B, a_{01}^B; a_{12}^B, a_{02}^B$). The results are four wage–profit curves, as shown in Figure 3.18.

Profit maximizing firms will always choose the technique which allows for the highest profit rate at a given wage rate. Techniques c and d are inefficient, because for each wage rate there exists a technique with a higher profit rate. The only efficient techniques which remain are technique a and technique b.

The technology frontier based on these two techniques assigns the maximum profit rate to each wage rate and vice versa. As shown in Figure 3.19, this frontier has three parts:

1. If the profit rate is smaller than r_1 and the corresponding wage rate is higher than w_1 ($r < r_1$ and $w_1 < w$), technique b will be chosen.
2. If the profit rate is between r_1 and r_2 and the corresponding wage rate is between w_1 and w_2 ($r_1 < r < r_2$ and $w_2 < w < w_1$), technique a will be chosen.
3. If the profit rate is higher than r_2 and the corresponding wage rate is lower than w_2 ($r_2 < r$ and $w < w_2$), technique b will be chosen again.

A continuous increase in the real interest rate/profit rate from its minimum to its maximum means that first technique b will be chosen, then technique a (switching) and finally technique b again (re-switching). Profit maximizing firms will thus choose the same technique at a low and a high rate of interest/rate of profit, a result which is inconsistent with neoclassical theory.

Considering the effects of this pattern of the choice of techniques for the capital–labour ratio, we obtain the results in Figure 3.20. An increase of the real interest rate/profit rate from its minimum up to r_1 is connected with a decrease of the capital–labour ratio. As explained above, this result is due to the falling relative price of the capital good and thus a decrease in the value of capital on a convex wage–profit curve, without any change in the chosen technology. If the real interest rate/profit rate reaches r_1, we will see the switching of techniques, the curve for the capital–labour ratio becomes discontinuous, and the capital–labour ratio will fall. Between r_1 and r_2 the capital–labour ratio will rise, because the technology frontier is given by a concave wage–profit curve, which means that the relative price of the capital good rises with an increase in the real interest rate/profit rate. Finally at r_2 the curve for the capital–labour ratio becomes discontinuous again, and the capital labour ratio will jump up when the rate of profit slightly exceeds r_2, because firms will re-switch techniques.

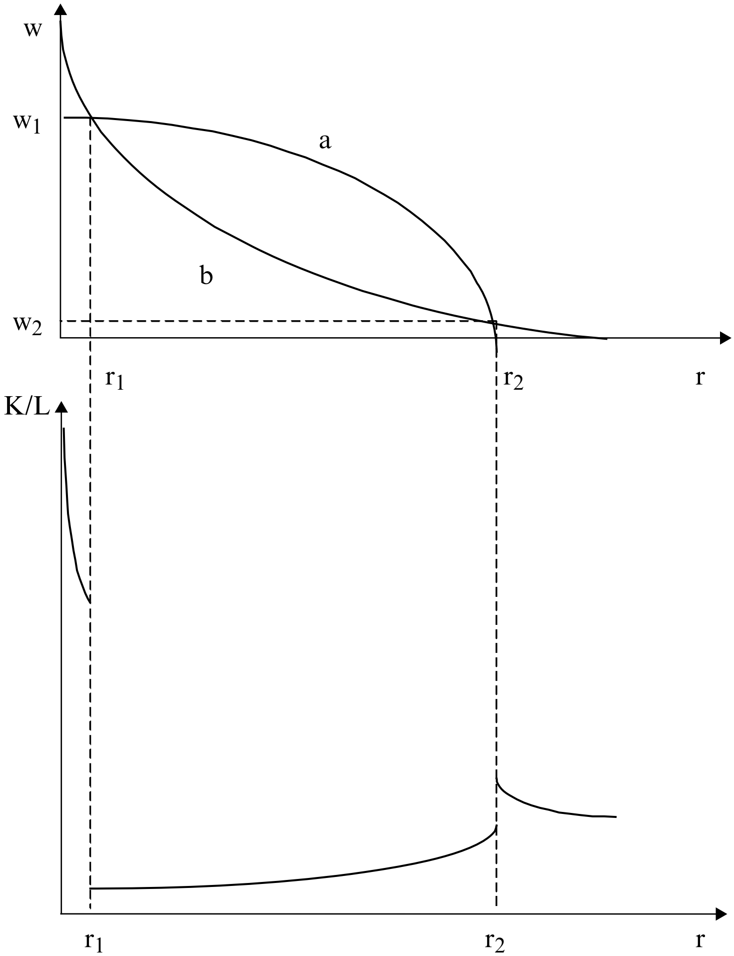


Figure 3.20 'Re-switching of techniques' and the capital–labour ratio

A further increase in the real interest rate/profit rate will then again be associated with a falling capital–labour ratio, because we are back on the convex wage–profit curve and a rise in the real interest rate/profit rate is associated with a fall in the relative price of the capital good. Generally, in a two-goods economy, no continuous reaction of the factor input ratio to the change of the factor price ratio exists as supposed by neoclassical theory based on an aggregated production function. Nominal and real reverse capital deepening cannot be excluded. The neoclassical parables collapse.

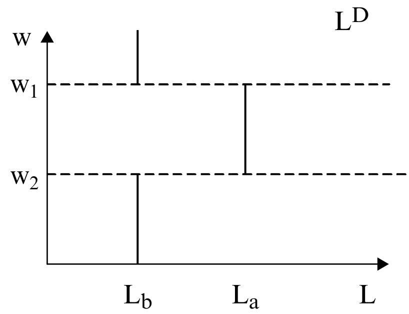


Figure 3.21 Labour demand function with a choice of technique

The breakdown of the neoclassical parables in a two-goods economy also becomes obvious when looking at the labour demand (L^D) of profit maximizing firms in response to a change in the wage rate in Figure 3.21. Since technique a and technique b have different labour–output ratios, at least in one of the two industries, they will be associated with different labour inputs and hence labour demands in order to produce a given output. In Figure 3.21 it is assumed that technique a is connected with a higher labour input than technique b (for the sake of the argument it could also be the reverse). For a wage rate exceeding w_1, profit maximizing firms will choose technique b and hence demand the required labour input in the labour market. A fall of the wage rate below w_1 will make them switch to technique a, with a higher labour input in order to produce the given output, and firms will demand a higher amount of labour in the labour market. When the wage rate falls below w_2, firms will re-switch to technique b, requiring a lower labour input, and will hence demand a lower amount of labour. Again it becomes clear that a lower labour demand can be compatible with both a high and a low real wage rate. The strict inverse relationship between the real wage rate and employment and hence labour demand, as is assumed by the neoclassical distribution and growth theory, breaks down and thus does not generally hold in a more-than-one-good economy.

3.6.4 The Conclusions from the Capital Controversy

The main critique resulting from the capital controversy and concerning the aggregate neoclassical distribution and growth theory can now be summarized as follows:

- There is no way to aggregate heterogeneous goods to homogeneous values the magnitudes of which are invariant with respect to changes in income distribution. Therefore, the choice of technique of profit maximizing firms, the capital–labour ratio and hence the emanating volume of employment cannot be derived from an aggregate production function.

- The rate of interest cannot be interpreted as the marginal product of capital; the real wage rate is not the marginal product of labour. There is no aggregate production function from which these marginal products can be derived.
- Capital and labour income shares cannot be determined by the elasticities of production of capital or labour taken from an aggregate production function.
- An increase in the real interest rate/profit rate is compatible with reverse capital deepening and with the re-switching of techniques. The measured capital–labour ratio is not uniquely related to the real rate of interest/rate of profit. The same is true for the capital–output ratio and consumption per capita.[50]
- Generally, factor demand is not uniquely related to factor prices. Therefore, factor prices cannot be considered as indices of scarcity. There are no continuously downward sloping factor demand curves in factor–factor price spaces. Unemployment can hence not be cured by means of lowering the real wage rate.
- The adjustment processes towards the neoclassical full employment, full capacity utilization growth equilibrium are not warranted at all in a more-than-one-good economy, even if monetary and aggregate demand considerations put forward by Keynesian authors are left out of the picture.

Basically, these conclusions have been accepted and acknowledged by the main neoclassical authors involved in the capital controversy. In his summing up of the debate, Paul A. Samuelson, for example, states:

> reswitching is a logical possibility in any technology . . . Reswitching, whatever its empirical likelihood, does alert us to several vital possibilities:
>
> Lower interest rates may bring lower steady state consumption and lower capital–output ratios, and the transition to such lower interest rate can involve denial of diminishing returns and entail reverse capital deepening in which current consumption is augmented rather than sacrificed.
>
> There often turns out to be no unambiguous way of characterizing different processes as more 'capital-intensive,' more 'mechanized,' more 'roundabout,' except in the *ex post* tautological sense of being adopted at a lower interest rate and involving a higher real wage. Such a tautological labeling is shown, in the case of reswitching, to lead to inconsistent ranking between pairs of unchanged technologies, depending upon which interest rate happens to prevail in the market.

> If all this causes headaches for those nostalgic for the old time parables of neoclassical writing, we must remind ourselves that scholars are not born to live an easy existence. We must respect, and appraise, the facts of life. (Samuelson 1966, pp. 582–583, emphasis in the original)

And, in the highly regarded *New Palgrave: A Dictionary of Economics*, Bliss (1987, p. 885) concludes: ‘it is now generally recognized that there is no rigorous method of aggregating a heterogeneous collection of capital goods’.

Although in the late 1960s and early 1970s and even in the 1980s there seemed to be some agreement that the aggregate neoclassical production function is not tenable, it is by now widely used again, not only in macroeconomic textbooks but also in advanced textbooks on growth and in the revival of growth research in the context of the endogenous growth approach (Pasinetti 2000; Felipe and Fisher 2003).[51] In a sense, the new growth models have even added to the problem, because it remains completely unclear how ‘technological knowledge’ or ‘human capital’ should be quantified and aggregated, and how the changes of these variables, which are of utmost importance for these approaches, should be measured (Steedman 2003). From the macroeconomic textbook literature even mentioning aggregation problems or the capital controversies has more or less disappeared since the 1980s, as McCombie (2011a) has demonstrated. There may be two major reasons for this. The first one is just the attempt at ignoring and repressing uncomfortable arguments and conclusions by the macroeconomic mainstream (Pasinetti 2000). The second one seems to be the conviction that the theoretical irregularities like reverse capital deepening and re-switching of techniques are empirically irrelevant and can therefore safely be ignored when doing theoretical and in particular empirical work. This is basically the tenor of Stiglitz’s (1974) review of Harcourt’s (1972) book, where he argues that re-switching in capital theory may have the same status as the ‘Giffen’s paradox’ in consumer theory, and complains that whereas some exceptional empirical evidence has been presented for the latter there has been none for the former. Furthermore Stiglitz (1974, p. 899) argues that

> [f]rom a practical point of view, economists are always dealing with aggregates . . . The condition under which these aggregates can be formed, that is, under which the aggregates act as if they were homogeneous factors of production, are very restrictive; nonetheless, I believe that, under most circumstances and for most problems, the errors introduced as a consequence of aggregation of the kind involved in standard macro-analysis are not too important.

Temple (1999, p. 150), in a survey of the new growth theory evidence in the *Journal of Economic Literature*, notes that ‘[a]rguably the aggregate production function is the least satisfactory element of macroeconomics, yet many economists seem to regard this clumsy device as essential to an understanding of national income levels and growth rates'. Therefore, there must be some empirical support for the use of neoclassical aggregate production functions, as Felipe and McCombie (2010, p. 189) suspect:

> So why is the aggregate production function so widely and uncritically used? The answer seems to involve a form of Friedman's (1951) methodological instrumentalism. All theories, so the argument goes, involve heroic abstraction und unrealistic assumption, but what matters is their predictive ability. The aggregate production function, it is argued, passes this test with flying colours.

In the following subsection we will briefly address the question of whether theoretical inconsistencies associated with the neoclassical aggregate production function can safely be ignored because of overwhelming empirical support for this aggregate production function.

3.6.5 Empirical Relevance of the Neoclassical Aggregate Production Function – A Way Out?

Several authors have addressed the question of whether empirical estimates based on cross-industry data or on time series data providing a good statistical fit should be interpreted as supporting the empirical soundness and the relevance of aggregate neoclassical production functions in general, and the Cobb/Douglas production function in particular.[52] Felipe and McCombie (2010, pp. 189–190) have nicely summarized the fundamental problem of defending the aggregate neoclassical production function on empirical and econometric grounds as follows:

> The problem with this defence, as we shall show, is that the estimation of a putative aggregate production function using constant-price monetary (value) data cannot provide any inferences about the values of the putative parameters of the production function (output elasticities, aggregate elasticity of substitution) or the rate of technical progress. The reason is that there is an underlying accounting identity that relates these variables. This identity can be easily rewritten in a form that resembles a production function. This precludes any meaningful estimation of the 'production function' and interpretation of the coefficients as estimates of the underlying technology. This critique is arguably the most damaging for the aggregate production function, because it applies even if there were no aggregation problems.

Following Lavoie's (1992, pp. 33–36) presentation, we can illustrate the fundamental problem addressed by Felipe and McCombie (2010) and several other authors as follows.[53] Let us start with the familiar Cobb/Douglas production function from equation (3.41) above:

$$Y = L^{\alpha}K^{\beta}e^{\tau t}, \quad \alpha + \beta = 1, \tag{3.41}$$

with Y and K representing output and capital measured in homogeneous physical units or in some homogeneous indices, L representing labour, α and β representing the elasticities of production of labour and capital, respectively, and τ being the rate of technological progress following some exponential trend. If marginal productivities determine factor prices, the partial elasticities of production (α, β) determine factor income shares, that is the wage share and the profit share, as we have shown above. Dividing equation (3.41) by L yields the per-capita production function:

$$y = k^{\beta}e^{\tau t}, \tag{3.67}$$

with y and k representing labour productivity and the capital–labour ratio, respectively. Rewriting equation (3.67) in growth rates yields the Cobb/Douglas production function used in empirical research:

$$\hat{y} = \beta\hat{k} + \tau. \tag{3.68}$$

Estimation results will thus be interpreted as follows: the estimated constant τ should be the rate of technological progress, the estimated coefficient β should be the elasticity of production of capital, which usually is equal to the profit share in national income, and $1 - \beta = \alpha$ should be the elasticity of production of labour, which is equal to the wage share in national income. Obtaining these results with a good statistical fit is interpreted as supporting the empirical existence of a Cobb/Douglas production function and of marginal productivity remuneration.

Alternatively, let us now start with the national income accounts identity, without making any assumption about the underlying technological production processes:

$$Y = w^{r}L + rK, \tag{3.69}$$

with Y and K representing the values of output and capital at constant prices of some base year, respectively, w^r being the real wage rate, that is the nominal wage rate deflated by some deflator, and r being the rate of profit/real interest rate. Dividing equation (3.69) again by L yields:

$$y = w^r + rk. \tag{3.70}$$

Calculating the derivative with respect to time:

$$\frac{\partial y}{\partial t} = \frac{\partial w^r}{\partial t} + k\frac{\partial r}{\partial t} + r\frac{\partial k}{\partial t}, \tag{3.71}$$

extending:

$$\frac{\partial y}{\partial t} = \frac{\partial w^r}{\partial t}\frac{w^r}{w^r} + k\frac{\partial r}{\partial t}\frac{r}{r} + r\frac{\partial k}{\partial t}\frac{k}{k}, \tag{3.72}$$

and dividing by y and taking into account that generally $\hat{x} = (\partial x/\partial t)/x$, we obtain:

$$\hat{y} = \hat{w}^r\frac{w^r}{y} + \hat{r}\frac{rk}{y} + \hat{k}\frac{rk}{y}. \tag{3.73}$$

Since the profit share in national income is $h = rk/y$ and the wage share is $(1 - h) = w^r/y$, we have:

$$\hat{y} = (1 - h)\hat{w}^r + h\hat{r} + h\hat{k}. \tag{3.74}$$

Taking $(1 - h)\hat{w}^r + h\hat{r} = \phi$ yields:

$$\hat{y} = \phi + h\hat{k}. \tag{3.75}$$

Comparing equation (3.68) derived from the Cobb/Douglas production function and equation (3.75) derived from the national income accounts identity reveals that these are structurally similar. 'It is thus no surprise when income shares are more or less constant through time (time series data) or through sectors (cross-section data) that the Cobb/Douglas would give a good fit: it can be derived from income identities' (Lavoie 1992, pp. 34–35). Therefore, if the profit share and thus the wage share do not vary much and the profit rate/real interest rate and the real wage rate are sufficiently stable, and if the rate of technical progress is a smooth function of time, so that productivity growth does not vary much either, estimations will provide a good fit, because they are estimating an accounting identity. Estimations will produce a poor fit if one of these requirements is violated, as Felipe and McCombie (2010) point out.

Several simulation studies, some of them reviewed by Felipe and McCombie (2010), which generate data series from different non-neoclassical assumptions about production coefficients and pricing at the firm level (for example constant coefficients and mark-up pricing) and then estimate the equations, have shown that a very good fit for an aggregate Cobb/Douglas production function is found, provided that the conditions mentioned above are respected in the data generating process.[54] The simple reason for this is that the data generating process has to respect the accounting identity. Perfect fit estimation results thus do not provide any information whatsoever about the underlying production technologies. 'From this perspective, it also follows that Solow's residual (total factor productivity growth), the *Holy Grail* of the neoclassical growth model, is nothing but a weighted average of the growth rates of the wage . . . and profit rates . . . where the weights are the factor shares' (Felipe and Fisher 2003, p. 255, emphasis in the original).

What has been shown here for the Cobb/Douglas production function also applies to other types of constant elasticity of substitution (CES) functions, as has been demonstrated by Lavoie (1992, p. 35) and Felipe and McCombie (2001), for example. Therefore, we can conclude with Felipe and McCombie (2010) that referring to good fit and seemingly robust empirical estimation results as a support for the use of aggregate neoclassical production functions in theoretical and empirical research is not a viable way out of the problems raised in the capital controversy: 'The implications of the critique are far reaching. It implies that all those areas of neoclassical macroeconomics that use the aggregate production function (with, or without, the assumption that factors are paid their marginal products) have no theoretical or empirical basis' (Felipe and McCombie 2010, p. 190).

3.6.6 Abandon Aggregate Neoclassical Modelling but Retain the Walrasian General Equilibrium Approach for the Analysis of Distribution and Growth?

The fundamental critique presented so far has focused on the aggregate neoclassical capital, distribution and growth theory. Apart from ignoring and repressing the results of the capital controversy or claiming that the theoretical results are empirically irrelevant, a third way out of the problems, chosen in particular by Hahn (1982), has been to argue that the results of the capital controversy only relate to the aggregate neoclassical theory but not to the disaggregated version, that is the Walrasian general equilibrium theory in the tradition of Arrow and Debreu (1954) and Arrow and Hahn (1971). Furthermore, Hahn (1982) has argued that the Sraffa model, on which the capital critique is based, is just a special case of the Walrasian general equilibrium model, following the motto

'Attack is better than defence' (Kurz and Salvadori 1997, p. 471). This is not the place to outline the ensuing debate in any detail. Suffice it to mention that neo-Ricardians and authors in the classical tradition have vigorously rejected Hahn's and others' claims that the Walrasian general equilibrium model encompasses Sraffa's approach as a special case and that it allows the avoidance of the problems raised in the capital controversies (Kurz and Salvadori 1997, pp. 451–467; Pasinetti 2000; Garegnani 2012). The main argument put forward by the opponents is that the Walrasian general equilibrium model, temporary or intertemporal, does not generate a long-period equilibrium in the sense that a uniform rate of profit is established across the economy, which is the crucial equilibrium condition for authors in the classical and Marxian tradition.[55] From this perspective, the Walrasian model just generates a short-period equilibrium with a set of equilibrium market prices for present and future goods, assuming some initial endowments with 'capital goods' as non-produced primary factors. Therefore, Kurz and Salvadori (1997, p. 467, emphasis in the original) conclude that 'there is no presumption that the neoclassical theories of intertemporal or temporary equilibrium are "general", whereas the classical theory is "special". The truth is that these theories are *different*; while the former are short-period, the latter is long-period.' With this modelling strategy, neo-Walrasians avoid the discussion of the important issues of capital, distribution and growth, as Pasinetti (2000, p. 414) argues:[56]

> To sum up, the neoclassical scheme, in the Arrow–Debreu version, needs neither rates of profit nor wage rates as such. It determines 'prices' of given 'resources', and only 'prices'. To find a place in this framework of analysis, any economic phenomenon must be re-moulded and re-interpreted in these terms.
>
> With this conceptual framework, the shift of dominant economic theory in the direction of the neoclassical version descending from the Arrow–Debreu scheme has practically entailed a general escape of economic analysis from the investigation and explanation of the problems of the distribution of income (and of wealth).
>
> At the dawn of classical economic theory, David Ricardo in 1817 opened his *Principles* with the famous proposition quoted at the beginning that 'To determine the laws which regulate this distribution (of income between rent, profit and wages) is the principal problem in Political Economy'. At the end of the 20th century, dominant economic theory has ended up with a theoretical framework (the neoclassical one, in the Arrow–Debreu version), where the process and problems of income distribution have become secondary and, essentially, irrelevant.

As Cohen and Harcourt (2003, p. 208) have stressed, the different views of the Walrasians, on the one side, and the neo-Ricardians and Cambridge post-Keynesians, on the other side, on what determines an equilibrium are guided by different visions on the principal mechanisms and driving forces of modern capitalist economies:

> While neoclassical economics envisions the lifetime utility-maximizing consumption decisions of individuals as the driving force of economic activity, with the allocation of given, scarce resources as the fundamental economic problem, the 'English' Cantabrigians [the neo-Ricardians and post-Keynesians, E.H.] argue for a return to a classical political economy vision. There, profit-making decisions of capitalist firms are the driving force, with the fundamental economic problem being the allocation of surplus output to ensure reproduction and growth . . . Because individuals depend on the market for their livelihoods, social class (their position within the division of labor) becomes the fundamental unit of analysis.

Therefore, we leave the discussion of the relevance of Walrasian economics here, in order to deal with post-Keynesian approaches in the following chapters. These will focus on the issues of income distribution between social classes, and on capital accumulation and growth driven by investment decisions of firms in a macroeconomic context.

NOTES

1. On classical and neoclassical economics in a history of economic thought perspective see, for example, the short overview in Sandelin et al. (2008, chaps 3–4) and more extensively Dobb (1973).
2. For the Walrasian general equilibrium theory, compare for example the textbook versions in Feess (2000, chap. 14), Varian (2010, chap. 31) and Heine and Herr (2013, chap. 2.9). On the implications for the theory of distribution see also Bliss (1987).
3. See Pasinetti (2000) for an assessment of the determination of distribution in the Walrasian general equilibrium theory and a comparison to the classical and the post-Keynesian approaches.
4. For the following outline compare, for example, Bliss (1987) and Feess (2000, chap. 6).
5. For an overview of the historical developments of the different schools of the neoclassical theory of distribution since Jevons, Walras, Böhm-Bawerk, Wicksell and J.B. Clark, see for example Kurz and Salvadori (1997, chap. 14) and Pasinetti (2000).
6. See, for example, the textbook versions of the neoclassical theory of growth in Kromphardt (1977, chap. II), Branson (1989, chap. 24), Rose (1991, chaps VI, X), Abel et al. (1998, chap. 6), Colander and Gamber (2002, chap. 5), Froyen (2002, chap. 19), Barro and Sala-i-Martin (2004, chap. 1.2), Snowdon and Vane (2005, chap. 11), Carlin and Soskice (2006, chap. 13), Aghion and Howitt (2009, chap. 1) and Blanchard (2009, chaps 10–13).
7. Trevor Swan's (1956) contribution can be regarded as an equally important fundamental contribution to neoclassical growth theory, as Solow (2007) acknowledges. Solow (1970, 2000, 2002) and Pasinetti (2000) present overviews and assessments of the neoclassical theory of growth. For textbook versions see, for example, Kromphardt (1977, chap. II), Branson (1989, chap. 24), Rose (1991, chaps VI, X), Abel et al. (1998, chap. 6), Colander and Gamber (2002, chap. 5), Froyen (2002, chap. 19), Barro and Sala-i-Martin (2004, chap. 1.2), Snowdon and Vane (2005, chap. 11), Carlin and Soskice (2006, chap. 13), Aghion and Howitt (2009, chap. 1) and Blanchard (2009, chaps 10–13).

8. Kurz and Salvadori (2003), however, point out that in the late nineteenth and early twentieth centuries Marshall (1890) and Cassel (1932) had already formulated the essential features of a neoclassical growth model, in which the growth trend is given exogenously.
9. Whereas the classical or Ricardian version of Say's law implies neither full employment nor the existence of an economic adjustment mechanism of saving and investment, the neoclassical version relies on the real interest rate in the capital market taking care of the equality of saving and investment in equilibrium and on the real wage rate in the labour market establishing full employment. On the distinction between the classical and the neoclassical version of Say's law see, in particular, Garegnani (1978, 1979).
10. For the extensions with endogenous saving by a representative household, as in the Cass–Koopmans–Ramsey model, see Barro and Sala-i-Martin (2004, chap. 2) and Aghion and Howitt (2009, chap. 1.3).
11. The presentation of the basic model is inspired by Kromphardt (1977, chap. II) and Rose (1991, chap. VI).
12. Within the neoclassical framework either this assumption can be justified by means of assuming that we are dealing with a barter one-good economy, so that the decision not to consume real income is tantamount to a decision to invest in capital stock, because there is no other asset in terms of which income can be saved. This is Solow's (1956, 1970, chap. 2) assumption. Or it can be assumed that we are dealing with an economy in which there is an economic mechanism which smoothly translates the decisions of the household sector to save into decisions of the firm sector to invest in capital stock. Obviously, within the neoclassical framework this mechanism is provided by the real interest rate in the capital market, the flexibility of which adjusts saving and investment.
13. What follows is inspired by Kromphardt (1977, chap. II), in particular.
14. The arguments provided below apply in a symmetric way, if the rate of capital stock growth falls short of the natural rate of growth.
15. On this see also Kromphardt (1977, chap. II), for example.
16. Formally total factor productivity multiplies both labour and capital input.
17. Solow (1957), analysing US data for the period 1909–49, comes to the result that only 12.5 per cent of output per person growth, that is labour productivity growth, can be attributed to an increase of capital inputs; 87.5 per cent are due to exogenous technological progress. Note that this examination does not focus on output growth but on labour productivity growth. However, adding labour force growth to labour productivity growth gives output growth.
18. Note that for the Cobb/Douglas production function we have $\alpha = 1-\beta$.
19. For different types of technological progress see, for example, Rose (1991, chap. X.2), Barro and Sala-i-Martin (2004, chap. 1.2) and Carlin and Soskice (2006, chap. 13.4). Different from 'Harrod neutral' technological progress, 'Solow neutral' technological progress assumes that technological progress is capital-augmenting, which means that the labour–output ratio remains constant but the capital–output ratio decreases. In other words, labour productivity remains constant whereas capital productivity increases. Finally, 'Hicks neutral' technological progress assumes that technological progress is factor-augmenting, which means that both the labour–output and the capital–output ratios decline. Therefore, labour productivity and capital productivity increase.
20. On the implications of the old neoclassical growth model for convergence of labour productivity growth see the textbook treatments in Barro and Sala-i-Martin (2004, chap. 1.2), Snowdon and Vane (2005, chap. 11.12), Carlin and Soskice (2006, chap. 13.5) and Aghion and Howitt (2009, chap. 1).
21. Overviews of the new growth theory and its development can be found in Grossman and Helpman (1994), Romer (1994), Arnold (1995), Cesaratto (1999), Solow (2000, 2007), Blaug (2002), Kurz and Salvadori (2003) and Kurz (2006). For textbook treatments see Barro and Sala-i-Martin (2004, chap. 1.3), Snowdon and Vane (2005, chaps 11.13–15), Carlin and Soskice (2006, chap. 14) and Aghion and Howitt (2009, chaps 2–4).
22. See, for example, Arnold (1995). On productivity convergence and its determinants,

compare for example Maddison (1982, 1987), Abramovitz (1986, 1990), Baumol (1986), Romer (1988), Barro and Sala-i-Martin (1991, 1992), Wolff (1991), Dowrick (1992), Temple (1999) and Cornwall and Cornwall (2002a). See also the textbook treatments in Barro and Sala-i-Martin (2004, chap. 11) and Carlin and Soskice (2006, chap. 13.5).

23. On the AK model see the presentations in Kurz and Salvadori (2003), Barro and Sala-i-Martin (2004, chap. 1.3), Snowdon and Vane (2005, chap. 11.14), Carlin and Soskice (2006, chap. 14.1) and Aghion and Howitt (2009, chap. 2).
24. As Romer (1994) explains in detail, this method goes back to Marshall (1890), who already distinguished between increasing aggregate social returns to scale based on externalities, and constant or falling private returns to scale. The analysis of technological progress thus seemed to be possible within the framework of a neoclassical market theory maintaining the assumption of perfect competition.
25. See also Solow's (2000, 2007) and Cesaratto's (1999) assessments of the AK model, the latter questioning as well the sustainability of the full employment assumption.
26. Mankiw et al. (1992) have integrated human capital into the Solow–Swan model without changing the long-run properties of the model, that is the exogeneity of long-run productivity growth, by means of treating human capital in the same manner as physical capital and assuming falling marginal productivities of human capital, too. See also Snowdon and Vane (2005, chap. 11.16) and Carlin and Soskice (2006, chap. 13.5.3). The treatment of human capital in this section is different from that.
27. On the following model see Arnold (1995). For alternative presentations, see Kurz and Salvadori (2003) and Carlin and Soskice (2006, chap. 14.1.3). See also Cesaratto (1999) for a critical assessment.
28. For more detailed versions see Arnold (1995) and Carlin and Soskice (2006, chap. 13.1.3).
29. For further textbook-like treatments of this type of R&D models of endogenous growth see Kurz and Salvadori (2003), Snowdon and Vane (2005, chap. 11.15), Carlin and Soskice (2006, chap. 14.1.4) and Aghion and Howitt (2009, chap. 3). For a second strand of R&D growth models focusing on Schumpeter's idea of 'creative destruction', so-called Schumpeterian growth models, see Carlin and Soskice (2006, chap. 14.2) and Aghion and Howitt (2009, chap. 4).
30. Romer in an interview in Snowdon and Vane (2005, p. 681) is explicit on this: 'The Solow theory [of technological progress as an exogenously given public good] was a very important first step. The natural next step beyond was to break down the public-good characterization of technology into this richer characterization – a partially excludable non-rival good. To do that you have to move away from perfect competition and that is what the recent round of growth theory has done.' See also Romer (1994, p. 19), who points out that 'we have gone through a progression that starts with models based on perfect competition, moves to price-taking with external increasing returns, and finishes with explicit models of imperfect competition'. See also Grossman and Helpman (1994).
31. For a more detailed version of the following model see Arnold (1995). Carlin and Soskice (2006, chap. 13.1.4) present a textbook version of the Romer (1990) model.
32. For a more extensive discussion of Kuznets's approach and its current relevance see Galbraith (2012, chap. 3).
33. Kuznets (1955, p. 26) is very careful and cautious in drawing general distribution policy conclusions from his tentative observations: 'Because they may have proved favorable in the past, it is dangerous to argue that completely free markets, lack of penalties implicit in progressive taxation, and the like are indispensable for the economic growth of the now underdeveloped countries. Under present conditions the results may be quite the opposite – withdrawal of accumulated assets to relatively "safe" channels, either by flight abroad or into real estate; and the inability of governments to serve as basic agents in the kind of capital formation that is indispensable to economic growth . . . Yet, it is equally dangerous to take the opposite position and claim that the present problems

are entirely new and that we must devise solutions that are the product of imagination unrestrained by knowledge of the past, and therefore full of romantic violence. What we need, and I am afraid it is but a truism, is a clear perception of past trends and of conditions under which they occurred, as well as knowledge of the conditions that characterize the underdeveloped countries today. With this as a beginning, we can then attempt to translate the elements of a properly understood past into the conditions of an adequately understood present.' And he finally concludes: 'For the study of the economic growth of nations, it is imperative that we become more familiar with findings in those related social disciplines that can help us understand population growth patterns, the nature and forces in technological change, the factors that determine the characteristics and trends in political institutions, and generally patterns of behavior of human beings – partly as a biological species, partly as social animals. Effective work in this field necessarily calls for a shift from market economics to political and social economy' (Kuznets 1955, p. 28).

34. 'Thus the evidence shows that Forbes's results cannot be replicated in a more comprehensive dataset based on a more relevant measure of the inequality of pay' (Galbraith 2012, p. 76).
35. On the connection between income distribution and growth in the new growth theory, see for example the overviews in Alesina and Perotti (1994), Aghion et al. (1999), Pasinetti (2000) and Snowdon and Vane (2005, chap. 10.16).
36. For empirical support of the inequality–credit restrictions–growth channel see Perotti (1994).
37. See Bertola (1993) for a similar argument related to factor income shares. For empirical support for the inequality–taxation–growth channel see also Alesina and Rodrik (1994), Perotti (1994) and Persson and Tabellini (1994).
38. For empirical support for the inequality–political instability–growth channel see also Alesina and Perotti (1996) and Perotti (1996).
39. See Carlin and Soskice (2006, pp. 550–553) for the outline of a model dealing with productivity growth convergence issues relying on R&D investment and technology transfer.
40. Kurz and Salvadori (2003, p. 21) conclude their assessment of new growth theory as follows: 'A brief look into the history of economic thought shows that from Adam Smith via David Ricardo, Robert Torrens, Thomas Robert Malthus, Karl Marx up to John von Neumann both the equilibrium and the actual rate of capital accumulation and thus both the equilibrium and the actual rate of growth of output as a whole were seen to depend on agents' behaviour, that is, endogenously determined. In this regard there is indeed nothing new under the sun.'
41. See, for example Landes (1999) and Acemoglu and Robinson (2012) for an account of the relevance of historical and institutional factors for growth in a supply-side context. See also the overviews on this kind of research in Snowdon and Vane (2002b, 2005, chaps 10.17, 11.18). And see for example Baumol (2002) for an attempt at understanding the innovation process from a microeconomic perspective.
42. As, for example, Setterfield (2001) and Dutt (2003) outline, this is the problem not only of old neoclassical growth models but also of new endogenous growth theory.
43. The most prominent combatants in this controversy came from Cambridge, UK, with Joan Robinson, Nicholas Kaldor, Piero Sraffa, Luigi L. Pasinetti and Pierangelo Garegnani attacking the neoclassical approach to capital, and from Cambridge, MA, with Paul A. Samuelson and Robert M. Solow defending the neoclassical approach. For an overview of the capital controversies and the capital critique see, for example, Harcourt (1969, 1972, 1994a), Harris (1978, chaps 4–5), Moss (1980), Pasinetti and Scazzieri (1987), Lavoie (1992, chap. 1.6, 2014, chap. 1.5), Kurz and Salvadori (1997, chap. 14), Pasinetti (2000), King (2002, chap. 4), Harcourt and Kerr (2009, chap. 7), Lazzarini (2011) and Heine and Herr (2013, chap. 3.3). On the relevance of the capital controversy and its outcomes see more recently Cohen and Harcourt (2003) and Garegnani (2012).

44. See Felipe and Fisher (2003) for a broader overview of the literature on the problem of aggregation of production functions.
45. See the overviews by Pivetti (1987), Roncaglia (1988) and King (2002, pp. 90–95). On Sraffa's 'contribution' to the capital controversy see Kurz (1985), and on Sraffa's life and work in general see Roncaglia (2009).
46. 'Therefore, to characterize an industry as "capital intensive" or "labour intensive" in general makes no sense unless the level of the rate of profit is specified at which this characterization is supposed to apply' (Kurz and Salvadori 1997, p. 446).
47. Here, the parable depicts a correct, but simplified, summary of more complex relationships. On the various parables of the aggregate neoclassical theory and their refutation based on a simple Sraffa model, see for example the textbook chapter of Heine and Herr (2013, chap. 3.3).
48. Hein (2006a, 2008, chaps 4–5) has argued that this assumption eliminates any conflict between financial capitalists and industrial capitalists from the system. Therefore, an approach fixing the rate of profit of enterprise in the face of changes in the monetary rate of interest should not be associated with Marx's economics, where the distribution conflict between industrial and financial capitalists figures prominently in *Capital*, Volume 3 (Marx 1894). See also the critique by Nell (1988) and Mongiovi and Rühl (1993).
49. Samuelson's (1962) 'surrogate production function', invented in order to defend the results of the neoclassical parable, is built on linear wage–profit curves. Therefore, this approach only holds true if we have the same physical capital–labour ratios in each industry. Interestingly, this special configuration is also the condition under which the classical and Marxian labour theory of value holds true as a theory of relative prices (Bhaduri 1969). The debate on the Marxian 'transformation problem', that is the transformation from labour values into prices of production, has shown that relative labour values and relative prices of production are only the same if we have the same 'organic composition of capital', that is the same ratio of the value of capital to wages, in each industry. On the transformation problem see, for example, the surveys by Glick and Ehrbar (1987), Hunt and Glick (1987) and Foley (2000).
50. The effects of a change in distribution, that is of the real rate of interest/rate of profit, on the capital–output ratio and on per-capita consumption has not been demonstrated explicitly here. See, for example, Heine and Herr (2013, chap. 3.3) for explicit derivations related to these issues.
51. As pointed out by McCombie (2011a), the aggregate neoclassical production function is also at the roots of the new neoclassical synthesis or the new consensus model in macroeconomics. See, for example, Goodfriend and King (1997) and Goodfriend (2004). For uncritical textbook uses of aggregate production functions in old and new growth models, including aggregates like 'capital', 'human capital' or 'technological knowledge', most of them not even mentioning theoretical problems of aggregation or the capital controversy results, see, for example, the textbook versions of the neoclassical theory of growth in Kromphardt (1977, chap. II), Branson (1989, chap. 24), Rose (1991, chaps VI, X), Abel et al. (1998, chap. 6), Colander and Gamber (2002, chap. 5), Froyen (2002, chap. 19), Barro and Sala-i-Martin (2004, chap. 1.2), Snowdon and Vane (2005, chap. 11), Carlin and Soskice (2006, chap. 13), Aghion and Howitt (2009, chap. 1) and Blanchard (2009, chaps 10–13). Interestingly, Carlin and Soskice (2006, p. 471) have a brief paragraph on the 'Cambridge controversy', in which they argue that 'one has to be careful when extrapolating from one-good models to the multi-product markets of the real economy because only under very special circumstances is aggregation mathematically warranted'. But then they continue: 'Solow's response to this argument was to show that the main insights of the theory are robust to more realistic and complicated representations of technology.' However, Carlin and Soskice neither present a precise reference for the Solow response they are citing nor mention any other contributions to this debate, apart from Robinson's (1953/54) initial paper.
52. See, for example, Shaikh (1974, 1980, 2005), Felipe and McCombie (2001, 2006, 2013)

and McCombie (2011a), as well as further contributions mentioned in the review by Felipe and McCombie (2010). See also Felipe and Fisher (2003) surveying the theoretical literature on aggregation problems of production functions. Fisher (1971, p. 325) had already shown that an aggregate Cobb/Douglas production function will provide a good fit of the data 'even though the underlying technical relationships are not consistent with the existence of any aggregate production function', provided that factor income shares remain constant.

53. See Lavoie (2014, chap. 1.5) for a more extensive review.
54. See, in particular, Shaikh (1974), who shows that even input–output data generating 'HUMBUG' can be represented by a Cobb/Douglas production function.
55. Neo-Walrasian value theory takes preferences, technologies and resource endowments as exogenously given data in order to determine relative prices, whereas the Sraffian or neo-Ricardian theory of value and distribution takes the size and the composition of output, the technical conditions of production and one distribution parameter (the uniform real wage rate or the uniform rate of profit) as exogenously given parameters, and then calculates relative prices and the second distribution parameter.
56. It should also be added that neo-Walrasians were able to prove the existence of equilibrium, but neither its uniqueness nor its stability. As demonstrated by the so-called Sonnenschein–Mantel–Debreu theorem, excess demand functions in the Walrasian system do not have to be continuously downward sloping, giving rise to multiple and unstable equilibria (for example because income effects may dominate substitution effects). On this 'stability nightmare' see Lavoie (1992, pp. 36–41). Lavoie (1992, p. 41) concludes: 'This implies that comparative analysis cannot be performed within the standard neoclassical framework of supply and demand responding to market forces, at whatever level of aggregation. Furthermore the standard assumptions made in macroeconomics or in partial equilibrium microeconomics have no justification whatsoever. Barring imperfections of all sorts, the flexibility of prices will not guarantee the attainment of the optimal Walrasian equilibrium.'

4. Post-Keynesian distribution and growth theories I: Kaldor, Pasinetti, Thirlwall and Robinson

4.1 INTRODUCTION

As already argued in Chapter 2 of this book, since the very start the main purpose of post-Keynesian distribution and growth theory has been to extend Keynes's principle of effective demand from the 'short period' or the 'short run', taking the capital stock as a constant and given, to the 'long period' or the 'long run', in which the capital stock is a variable. This means that aggregate demand determines not only the level of output and employment in the short period but also the growth of productive capacities and their utilization in the long period. Investment is the driving force of the system, and saving adjusts to investment not only in the short period but also in the long period. Whereas in short-period considerations the focus is on the income effects of investment, abstracting from the effects of investment on the capital stock and on productive capacities, in the long period these effects have to be taken into account. In this chapter we deal in particular with the founding mother and fathers of Cambridge, UK post-Keynesian distribution and growth theory. In Section 4.2 we start with the contributions of Nicholas Kaldor, adding some extensions by Luigi L. Pasinetti, on the one hand, and Anthony P. Thirlwall, on the other hand. Then, in Section 4.3, we treat Joan Robinson's contributions. In Section 4.4, the final section, we provide a simple Kaldor–Robinson model of distribution and growth, which synthesizes some, but definitely not all, of the partly different characteristics of Nicholas Kaldor's and Joan Robinson's approaches. In the literature this simplified model has been termed 'post-Keynesian' (Kurz and Salvadori 1997, p. 485), 'neo-Keynesian' (Marglin 1984a, p. 69, 1984b; Dutt 1990a, p. 31; Lavoie 1992, p. 284) or 'Keynesian-type' (Amadeo 1986a).

4.2 KALDOR'S, PASINETTI'S AND THIRLWALL'S CONTRIBUTIONS TO POST-KEYNESIAN DISTRIBUTION AND GROWTH THEORIES

4.2.1 Introduction to Kaldor's Approach

As has been reviewed by King (2009, chaps 4–6, 2010), Nicholas Kaldor's views on growth and distribution have emerged through different stages.[1] From the mid-1950s until the early 1960s, Kaldor developed several formal equilibrium growth models extending the Keynesian principle of effective demand from the short period to the long period and tackling Harrod's instability problem. These models generated full employment long-period steady state growth equilibria in highly abstract frameworks. Kaldor's contributions started with 'Alternative theories of distribution' (Kaldor 1955/56) reviewing and criticizing classical and neoclassical theories of distribution and presenting a 'Keynesian theory of distribution' as an alternative. This paper was followed by complete distribution and growth models in 'A model of economic growth' (Kaldor 1957), 'Capital accumulation and economic growth' (Kaldor 1961) and 'A new model of economic growth' (Kaldor and Mirrlees 1962). Starting in the mid-1960s, however, Kaldor abandoned these highly abstract essentially single sector models and got more interested in empirically inspired and oriented approaches, focusing on sectoral and regional differences and divergences, dynamic returns to scale, cumulative causation and path dependence. This meant abandoning any equilibrium modelling approaches. The main contributions in this period were *Causes of the Slow Rate of Economic Growth in the United Kingdom* (Kaldor 1966a), 'The case for regional policies' (Kaldor 1970b), 'The irrelevance of equilibrium economics' (Kaldor 1972), *Economics without Equilibrium* (Kaldor 1985a) and *Causes of Growth and Stagnation in the World Economy* (Kaldor 1996), the latter published posthumously.[2] In the following sections we will deal with Kaldor's equilibrium growth models first, including the contributions by Luigi L. Pasinetti, and then come to Kaldor's empirical economics of growth, extending these approaches with the contributions of Anthony P. Thirlwall.

Whereas in Harrod's theory the instability tendency of capitalist dynamics were at the centre of analysis, Kaldor's growth models started out with a tendency towards equilibrium growth and thus put the analysis of corresponding stability mechanisms in the centre. In the introduction to his *Collected Economic Essays*, Kaldor formulates this as follows: 'the problem of reconciling the two growth potentials – the "warranted" rate of capital accumulation and the "natural" rate of growth in the effective labour force [that is the growth rate of the labour force plus the growth rate of productivity, E.H.] – appeared as the "basic" dynamic problem' (Kaldor 1980, p. xxii).

In his first complete growth model, Kaldor (1957, p. 591) argues that a distribution and growth model should be capable of explaining the 'historical constancies' of economic growth in developed capitalist economies. These include constant shares of profits and of wages in national income, a constant capital–output ratio, which means that the capital–labour ratio and labour productivity roughly increase in step, and a constant profit rate. Furthermore, in the models to be discussed in the following sections, Kaldor assumes that full employment of labour always holds:[3] 'Our model thus relates to a capitalist economy which is sufficiently highly developed for wages to be above subsistence level and sufficiently competitive at the same time to generate adequate demand to secure full employment' (Kaldor 1957, p. 609).

A Keynesian underemployment equilibrium is thus restricted to apply to the short period, but excluded from the long period. As will be seen below, this assumption is necessary for Kaldor's models to work and for his approach to provide a solution to the Harrodian instability problem.[4] But we should be aware that this assumption implies that in the model economies to be discussed the actual rate of growth is always equal to the natural rate of growth, that is the growth rate of the labour force plus the growth rate of labour productivity. Therefore only deviations of the warranted rate of growth from the natural rate of growth (equal to the actual rate of growth) can be discussed.

With these assumptions the Keynesian element of Kaldor's models thus merely consists of the acceptance of the investment saving causality, following Keynes's (1930a) *Treatise on Money*, but not of the notion of persistent underemployment, as in Keynes's (1936) *General Theory*. In the following sections we will first outline Kaldor's (1955/56) Keynesian distribution theory, which results from the adjustment of saving to investment at full employment and full utilization of productive capacities. Here investment is treated as exogenously given – by the exogenous natural rate of growth. Following Kaldor (1957, 1961) we will then endogenize investment – which means endogenizing the natural rate of growth, because the full employment assumption will be maintained.

4.2.2 Kaldor's Keynesian Theory of Distribution

Kaldor's (1955/56) Keynesian theory of distribution in his 'Alternative theories of distribution' starts with a reference to John Maynard Keynes's (1930a) *Treatise on Money* and an extensive quotation of Keynes's notion of profits being like a widow's cruse in a footnote.[5]

Kaldor (1955/56, p. 94, fn. 1) concludes as follows: 'Keynes regards entrepreneurial incomes as being the resultant of their expenditure decisions, rather than the other way round – which is perhaps the most important difference between "Keynesian" and "pre-Keynesian" habits of thought.'

Kaldor's approach was also influenced by Michal Kalecki's (1942) 'A theory of profits' and by Joan Robinson's (1956) *The Accumulation of Capital*, which was forthcoming when he published his paper (Kaldor 1955/56, p. 94, fn. 3).[6] Kalecki (1942) had presented a theory which explained the volume of profits, but not the profit share or the profit rate as acknowledged by Kaldor, by capitalists' expenditures. It was Kaldor (1955/56, p. 96) who summarized Kalecki's approach, assuming that workers do not save, by the aphorism that 'capitalists earn what they spend, and workers spend what they earn'. We will deal with Kalecki's approach in detail in Chapter 5 of this book. Robinson's approach to distribution is quite similar to Kaldor's, and we will discuss it in Section 4.3 of this chapter.

How does the adjustment of entrepreneurial income to entrepreneurial expenditures, and thus of saving to investment, take place under the conditions of full utilization of productive capacities and full employment? According to Kaldor, it is the variation in the relationship of prices and costs and thus in functional income distribution which provides the key. If a change of investment and thus aggregate demand causes goods market prices to react faster than the nominal wage rate in the labour market, income will be redistributed between wages and profits. Provided that the propensity to save from profits is higher than the propensity to save from wages, this income redistribution causes a change in overall saving and allows for an adjustment of saving to investment.

This adjustment of saving to investment in a fully employed economy growing at the natural rate can be shown more precisely as follows. It is assumed that prices (p) relative to nominal wages (w) are determined by demand in the goods market, which means that there are no restrictions to price flexibility imposed, for example by active cost determined price setting strategies of firms. Nominal income (pY) in a closed economy without a government is distributed to wage income (W), including salaries, and profit income (Π), including retained earnings, dividends, interest and rents:

$$pY = W + \Pi. \tag{4.1}$$

Saving (S) is composed of saving out of wages (S_W) and saving out of profits (S_Π):

$$S = S_W + S_\Pi. \tag{4.2}$$

Distinguishing between a propensity to save from wages (s_W) and a propensity to save from profits (s_Π), overall saving is given as:

$$S = s_W W + s_\Pi \Pi. \tag{4.3}$$

In this approach, a clear distinction has to be made between saving from wage income and the saving of workers' households.[7] If the propensity to save from wages is positive, workers' households accumulate financial wealth and thus a claim on profit income. The income of workers' households is hence – apart from the borderline case of a saving ratio out of wage income equal to zero – not identical with the wage income, and the propensity to save of workers' households is not identical with the propensity to save from wage income. We will come back to this issue when discussing Luigi L. Pasinetti's contributions in Subsection 4.2.3.

Dividing equation (4.3) by national income (pY) yields:

$$s = \frac{S}{pY} = s_W \frac{W}{pY} + s_\Pi \frac{\Pi}{pY}. \tag{4.4}$$

The overall saving–income ratio in the economy thus depends on the weighted average of the propensities to save from wages and from profits, the weights being given by functional income distribution, that is by the wage share (W/pY) and by the profit share (Π/pY). Therefore, with given propensities to save from wages and from profits, the overall saving–income ratio will vary whenever functional income distribution is changed. Through a change of functional income distribution, an adjustment of saving to exogenous investment is hence possible. For this adjustment to take place, the following stability condition has to hold: $s_W < s_\Pi$. In the 'Alternative theories of distribution', Kaldor does not present any extensive discussion as to why this stability condition should hold in the real world. Only in a footnote does he argue that 'the bulk of profits accrues in the form of company profits and a high proportion of companies' marginal profits is put to reserve' (Kaldor 1955/56, p. 95, fn. 1). The reason for the propensity to save from wages falling short of the propensity to save from profits is thus related to the corporate structure of the economy, in which a major part of profits is retained and thus not distributed to households and hence not available for consumption at all. Kaldor (1966b, p. 84) argues that he had 'always regarded the high saving propensity out of profits as something which attaches to the nature of business income, and not to the wealth (or other peculiarities) of the individuals who own property'.[8]

Alternatively, Keynes's (1936, Book III) absolute income hypothesis with respect to consumption and saving could be applied in order to support the hypothesis that the propensity to save from profits should exceed the propensity to save from wages. It is reasonable to assume that wage and profit incomes are unequally distributed over the economy and that high income households receive a relatively higher share of profits and a relatively lower share of wages, whereas low income households receive a relatively lower share of profits and a higher share of wages. Applying Keynes's (1936, p. 97) notion 'of a greater *proportion* of income being saved as real income increases', this would then imply that the propensity to save from profits should exceed the propensity to save from wages.

We can now insert the Kaldorian saving function into the equilibrium condition of the goods market, which is given by the equality of the values of investment (pI) and saving:

$$pI = S. \tag{4.5}$$

Inserting equation (4.3) we thus receive:

$$pI = s_W W + s_\Pi \Pi,$$

$$pI = s_W (pY - \Pi) + s_\Pi \Pi,$$

$$pI = s_W pY + (s_\Pi - s_W)\Pi. \tag{4.6}$$

Dividing by national income (pY) we obtain for the equality of the investment–income and the saving–income ratios:

$$\frac{pI}{pY} = \frac{S}{pY} = s_W + (s_\Pi - s_W)\frac{\Pi}{pY}. \tag{4.7}$$

Rearranging equation (4.7), we get the profit share (h) in national income associated with a goods market equilibrium:

$$h^* = \frac{\Pi}{pY} = \frac{1}{s_\Pi - s_W}\frac{I}{Y} - \frac{s_W}{s_\Pi - s_W}, \quad 0 \leq s_W < s_\Pi \leq 1. \tag{4.8}$$

With given saving ratios from the two different types of income, functional income distribution thus depends on capitalists' investment. The investment–income ratio is still treated as exogenous here and is given by the natural rate of growth (g_n) in the following way, with $v = K/Y$ denoting the capital–output ratio:

$$\frac{I}{Y} = \frac{I}{K}\frac{K}{Y} \Rightarrow \frac{I}{Y} = g_n v. \tag{4.9}$$

Kaldor has thus not only obtained a macroeconomic theory of income distribution which is completely independent of any assumption about the production technology. This distinguishes his approach from the unsustainable neoclassical aggregate marginal productivity theory of distribution, which we have discussed in Chapter 3. Kaldor has also shown that Harrod's (1939) warranted rate of growth ($g_W = s/v$), given by the aggregate saving–income ratio and by firms' target capital–output ratio (v),[9] adjusts to the natural rate (g_n), given by the growth rate of the labour force and of technological progress. As already mentioned, in Kaldor's model the actual rate of growth is equal to the natural rate because of the full employment assumption. The adjustment of the warranted rate to the natural rate takes place via changes in the profit share, which makes the aggregate saving–income ratio adapt to the investment–income ratio determined by the natural rate of growth. From equations (4.7) and (4.9) we therefore obtain:

$$g_n = g_W = \frac{s}{v} = \frac{s_W + (s_\Pi - s_W)h}{v}. \tag{4.10}$$

Kaldor (1955/56, p. 97) summarizes this result as follows: 'Hence the "warranted" and the "natural" rates of growth are not independent of one another; if profit margins are flexible, the former will adjust itself to the latter through a consequential change in P/Y [the profit share in Kaldor's notation, E.H.].'

The determination of the profit share by the propensities to save from wages and profits and by the exogenous investment share in national income, as in equation (4.8), is also shown in Figure 4.1. It includes the aggregate saving–income ratio as a function of the profit share, the exogenous investment–income ratio, and the equilibrium profit share (h^*) at the point of intersection of the saving and the investment curve. The higher the investment share, the higher the equilibrium profit share realized by capitalists as a whole, with given saving propensities from wages and profits. With a given investment share, the profit share in turn depends inversely on the saving propensities from wages and from profits. The higher the prevailing saving propensities, the lower the required profit share for an equality of the saving–income ratio and the exogenous investment–income ratio has to be.

The reaction of the profit share towards a shift in the exogenous investment–income ratio will depend on the difference between the two

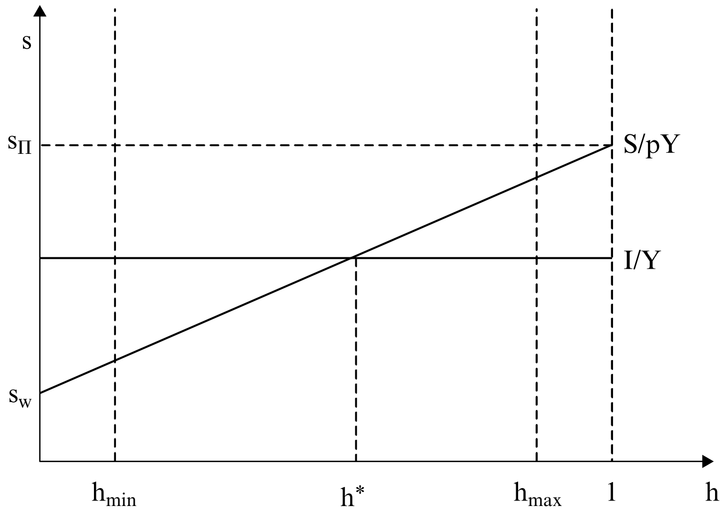


Figure 4.1 Investment share, saving share and profit share in national income

propensities to save. The smaller the gap between the saving ratio from profits and the one from wages, the more strongly the profit share will react towards a change in the investment share, because income redistribution in this case has only very small effects on the overall saving–income ratio. From equation (4.8) we can calculate the 'coefficient of sensitivity of income distribution' (Kaldor 1955/56, p. 95) with respect to a change in the investment share in national income as follows:

$$\frac{\partial h^*}{\partial\left(\frac{I}{Y}\right)} = \frac{1}{s_\Pi - s_W}. \qquad (4.11)$$

With full employment, the adjustment of saving toward investments thus takes place through variations of income distribution. The underlying economic mechanism is a variation of the price level in the goods market relative to the nominal wage rate established in the labour market.

> [A] rise in investment, and thus in total demand, will raise prices and profit margins, and thus reduce real consumption, whilst a fall in investment, and thus in total demand, causes a fall in prices (relatively to the wage level) and thereby generates a compensating rise in real consumption. Assuming flexible prices (or rather flexible profit margins) the system is thus stable at full employment. (Kaldor 1955/56, p. 95)

However, not every investment share will trigger an adjustment of income distribution such that saving adapts to investment. If the investment share falls below the propensity to save from wages, the profit share turns zero and cannot fall any more. And, if the investment share rises above the propensity to save from profits, the wage share turns zero and cannot fall any more. This means that the Kaldorian mechanism adjusting saving to investment at full employment is only valid within the following bounds: $s_W \leq (I/Y) \leq s_\Pi$ (see also Figure 4.1).

These bounds will actually be much narrower, because on the one hand the decrease of the real wage rate ($w^r = w/p$) below a certain subsistence level will not be accepted by the working class, especially if the real wage rate decrease is supposed to take place under the conditions of full employment. The system then hits what Joan Robinson (1962, p. 58) calls the 'inflation barrier', which is going to be dealt with in more detail further below. On the other hand, in order to maintain the investment–income ratio at a certain level (providing full employment), the profit rate on the capital stock has to exceed a certain minimum rate. Formally, the borders can be specified as follows:

$$h_{max}\colon\ w^r \geq w^r_{min} \ \Rightarrow\ h \leq \frac{Y - w^r_{min} L}{Y}, \tag{4.12}$$

$$h_{min}\colon\ r \geq r_{min} \Rightarrow h \geq r_{min}\frac{K}{Y}. \tag{4.13}$$

If the case $w^r \geq w^r_{min}$ is not fulfilled, meaning that the profit share determined by the investment share is above the maximum profit share, Kaldor (1955/56, p. 99) speaks of a Ricardian or Marxian economic situation. In this case, the surplus over the minimum remuneration of workers will not be sufficient to realize the investment required for full employment. In such a constellation, investment in capital stock will be limited by the available surplus of capitalists. The level of production will then be restricted by the capital stock, which does not need to be sufficient for maintaining full employment.

If the condition $r \geq r_{min}$ is not fulfilled, meaning that the profit share determined by the investment share is below the minimum profit share required to obtain a minimum rate of profit, investment will collapse and the economy will face a stagnation characterized by a permanent lack of aggregate demand. Therefore, a Keynesian economic situation will prevail and full employment cannot be maintained either. The reason for this constellation could be an excessive liquidity preference, for example, which causes too high an interest rate and thus too high a minimum profit rate. This will then prevent a full employment volume of investment.[10] Both in the Ricardian–Marxian and in the Keynesian constellation, the Kaldorian distribution mechanism cannot be applied.

Dividing equation (4.8) by the capital–output ratio ($v = K/Y$), we obtain a connection between the growth rate of the capital stock, the accumulation rate ($g = I/K$), and the equilibrium profit rate ($r = \Pi/pK$):

$$\left(\frac{\Pi}{pK}\right)^{*} = \frac{1}{s_\Pi - s_W}\frac{I}{K} - \frac{s_W\frac{Y}{K}}{s_\Pi - s_W} \Rightarrow r^{*} = \frac{g - \frac{s_W}{v}}{s_\Pi - s_W}, \qquad 0 \le s_W < s_\Pi \le 1, v = \bar{v}. \tag{4.14}$$

Kaldor (1955/56) assumes that changes in the profit rate have no systematic feedback effect on the capital–output ratio and on firms' choice of technique, so that the equilibrium rate of profit is uniquely determined by the variables on the right-hand side of equation (4.14). Kaldor acknowledges that the value of capital will change whenever the rate of profit changes, and also that variations in the rate of profit may affect firms' choice of technique and thus the capital–output ratio. However, he considers the factor price effects on the capital–output ratio to be small and not systematic, and holds that movements in the capital–output ratio are rather determined by technological progress.[11] We will come back to this issue in more detail in Subsection 4.2.4. For the purpose of the present section, the capital–output ratio is taken to be constant ($v = \bar{v}$).

With a given capital–output ratio and given saving propensities from profits and wages, the equilibrium profit rate depends positively on the accumulation rate. This becomes even clearer if we assume the classical saving hypothesis to hold, according to which workers do not save and the propensity to save from wages is hence: $s_w = 0$. Equations (4.8) and (4.14) now simplify to:

$$h^{*} = \frac{\Pi}{pY} = \frac{1}{s_\Pi}\frac{I}{Y}, \tag{4.15}$$

$$r^{*} = \frac{\Pi}{pK} = \frac{1}{s_\Pi}\frac{I}{K} = \frac{g}{s_\Pi}. \tag{4.16}$$

The investment–income ratio at the natural rate of growth, together with the propensity to save from profits, determines the profit share. The rate of capital accumulation at the natural rate of growth (which means $g = g_n$), together with the propensity to save from profits, determines the profit rate. This 'Cambridge equation' (4.16) thus provides a macroeconomic theory of distribution which is independent of any assumption about the underlying technology, marginal productivities, perfect competition in labour and capital markets, and so on. It is therefore an alternative to the neoclassical aggregate marginal productivity theory of distribution, which has been discredited by the 'capital controversy', as we have outlined in Chapter 3 of this book.

The Cambridge equation reverses the relationship between income distribution and capital accumulation obtained in the classical and Marxian macroeconomic theories of distribution (Kaldor 1955/56). In classical and Marxian distribution and growth theory the causality starts with the determination of functional income distribution.[12] The real wage rate is determined either by the bundle of subsistence wage goods or by class struggle, and the profit rate is then given by the remaining surplus in aggregate production and by the capital stock. Together with the capitalists' propensity to save and to accumulate out of profits, the rate of profit then determines the rate of capital accumulation and growth ($g = s_{\Pi}r$). In Kaldor's Keynesian theory of distribution, capital accumulation is determined first and then the determination of functional income distribution follows. Accumulation determines the rate of profit and the profit share, and the real wage rate and the wage share become the residual variables in the system.

Kaldor (1955/56) considers his Keynesian theory of distribution as a long-period distribution theory, which is based on flexible prices in the goods market relatively to more sluggish nominal wages in the labour market. For the short period, however, he assumes certain price rigidities to exist in the goods markets and also some real wage rigidities in the labour markets, which slow down the adjustment towards the long-period equilibrium.

4.2.3 Pasinetti's Contributions and Further Developments: Pasinetti and Neo-Pasinetti Theorems

Kaldor's Keynesian distribution theory is related to income categories, not to social groups or social classes, as we have shown above. As Kaldor made clear in the papers following the 'Alternative theories of distribution', in particular in Kaldor (1966b), 'Marginal productivity and the macroeconomic theories of distribution', the main justification for the assumption of a higher propensity to save out of profits than out of wages is not a behavioural assumption but the difference in the institutional nature of profits and wages. The former are retained to a considerable degree by the corporations, whereas the latter are distributed completely to workers' households. With positive saving out of wages, the equilibrium rate of profit depends on technology, the capital–output ratio, and the propensities to save from wages and from profits, as shown in equation (4.14).

Only if the propensity to save from wages is zero is the rate of profit only dependent on capitalists' behaviour and not affected by technology either, as equation (4.15) demonstrates.

On the one hand, this interpretation of Kaldor's saving hypothesis addresses an important institutional feature of modern capitalism. But, on the other hand, it implies that workers' households have different propensities to consume out of different types of income, because, when the propensity to save out of wages is positive, workers' households accumulate wealth and obtain income from wealth. And, since in the model framework the only type of wealth is the capital stock, workers' saving implies that they will own part of the capital stock and therefore obtain part of the profits on the capital stock. Pasinetti (1962, 1974, chap. V and pp. 127–128) examined the consequences of this for the long-period equilibrium and showed that the workers' propensity to save out of their wage and profit incomes has no effect whatsoever on income distribution and the rate of profit in the long-period full employment growth equilibrium, and that the effect of the prevailing technology also drops out, even if workers save.[13] Pasinetti (1962, 1974, chap. V) in his 'Rate of profit and income distribution in relation to the rate of economic growth' is very clear at the outset of his contribution that his model is not meant to include and explain any stylized facts: 'The purpose of this essay is to present a more logical reconsideration of the whole theoretical framework, regarded as a system of necessary relations to achieve full employment' (Pasinetti 1974, p. 103).

And also in the conclusion we can read: 'I should look, therefore, at the previous analysis simply and more generally as a logical framework to answer interesting questions about what *ought* to happen if full employment is to be kept over time, more than as a behavioural theory expressing what actually happens' (Pasinetti 1974, p. 119, emphasis in the original).

Having said this, we can now briefly outline Pasinetti's approach. As in Kaldor (1955/56), Pasinetti assumes that investment and capital accumulation are given by the requirement of maintaining full employment. This means the economy is on its natural rate of growth path. If workers save, they obtain a part of the growing capital stock, because this is the only asset in the system. The same is true for the capitalists, of course:

$$S_{WH} = dpK_{WH}, \tag{4.17}$$

$$S_C = dpK_C, \tag{4.18}$$

with S_{WH} being saving of workers' households out of wages and profits, S_C saving of capitalists out of profits, p the general price level, K_{WH} the capital stock owned by workers' households and K_C the capital stock owned by the capitalists. In long-period equilibrium, the distribution of wealth and hence of the capital stock has to be constant. This means that the workers' share in the total capital stock and the capitalists' share each have to be constant:

$$\frac{K_C}{K} = \text{constant}, \quad \frac{K_{WH}}{K} = \text{constant}, \tag{4.19}$$

with K as the total capital stock in the economy. Constant shares in the total capital stock in long-period equilibrium imply that the total capital stock, the capital stock owned by workers and the capital stock owned by capitalists each have to grow at the same rate, the rate of capital accumulation (g):

$$\hat{K} = \hat{K}_{WH} = \hat{K}_C = g. \tag{4.20}$$

From equations (4.17), (4.18) and (4.20) we therefore obtain:

$$g = \frac{S_{WH}}{pK_{WH}} = \frac{S_C}{pK_C} = \frac{s_C \Pi_C}{pK_C} = s_C r_C, \tag{4.21}$$

with Π_C as the capitalists' profits, s_C as the capitalists' propensity to save out of their profits, and r_C as the rate of profit of the capitalists. If we assume that workers lend their accumulated savings to the capitalists, for the following result it is important to assume that the rate of interest is equal to the rate of profit: 'In a long-run equilibrium model, the obvious hypothesis to make is that of a rate of interest equal to the rate of profit' (Pasinetti 1974, p. 109). Therefore, the rate of profit of the workers' households (r_{WH}) on their capital stock, or the rate of interest they receive, is equal to the overall rate of profit, as is the rate of profit of the capitalists:

$$r = \frac{\Pi}{pK} = r_C = \frac{\Pi_C}{pK_C} = r_{WH} = \frac{\Pi_{WH}}{pK_{WH}}, \tag{4.22}$$

with Π_{WH} as the profits received by the workers' households in terms of interest. From equations (4.21) and (4.22) it therefore follows:

$$r^* = \frac{g}{s_C}. \tag{4.23}$$

The rate of profit in the very long-period equilibrium, when the wealth distribution is constant, too, is thus determined only by factors under control of the capitalists, that is by the rate of accumulation (equal to the natural rate of growth) and the capitalists' propensity to save out of their profits. Technology and workers' households' saving propensities from wages and from profits have no effects on the distribution of income between wages and aggregate profits. The long-period equilibrium rate of profit, the normal rate of profit, is only determined by those macroeconomic variables under control of the capitalists. The workers' propensity to save will affect the capital stock they own and hence the division of profits between capitalists and workers, but not the overall rate of profit. This implies, as Pasinetti shows in detail, the following conclusion: 'Savings out of wages always turn out to be equal to workers' extra consumption out of profits (extra consumption meaning consumption in excess of what the capitalists would have consumed if those profits remained to them)' (Pasinetti 1974, p. 111). Therefore, we do not have to bother about saving propensities of workers out of their different types of income. From the perspective of the workers it is always true that, '[w]hatever the workers may do, they can only share in an amount of total profits which for them is predetermined; they have no power to influence it at all' (Pasinetti 1974, p. 113).

Finally, from equation (4.23) we obtain that with a given natural rate of growth the minimum rate of profit is obtained, when capitalists do not consume at all and $s_C = 1$. In this case equation (4.23) simplifies to:

$$r^* = g, \tag{4.24}$$

and this rate of profit is only determined by the natural rate of growth, which is given by the growth rate of the labour force and by technological progress.[14]

Pasinetti's theorem has been extensively discussed in the literature. Neoclassical authors, such as Samuelson and Modigliani (1966a, 1966b), have questioned the generality of Pasinetti's (1974, p. 116) conclusion that, 'in a system where full employment investments are actually carried out, and prices are flexible with respect to wages, the only condition for stability is $s_C > 0$, a condition which is certainly and abundantly satisfied even outside the limits in which the mathematical model has an economic meaning'.

In particular, Samuelson and Modigliani (1966a) argued that this condition does not in long-period equilibrium prevent the total capital stock being owned by the workers and it will thus not guarantee that a pure capitalist class will survive. If the disappearance of the capitalist class became true, s_C would disappear as well, Pasinetti's macroeconomic theory of distribution would collapse, and there would be room again for the neoclassical aggregate marginal productivity theory of distribution.

Pasinetti (1974, p. 132) conceded that, theoretically, this extreme case is possible, if workers provide all the saving for full employment growth.[15] However, he considered this case to be empirically irrelevant, as did Kaldor (1966b).

Related to this problem the assumption of the equality of the general rate of profit and the rate of interest (or the rate of profit on the capital owned by the workers) has been discussed. Pasinetti (1974, pp. 139–141) has shown that the inclusion of a rate of interest on workers' capital which is lower than but proportional to the general rate of profit slightly modifies his results. The general rate of profit on capital advanced will then be a weighted average of the rate of profit on the capital advanced by the capitalists and the rate of profit on the capital advanced by the workers, which is equal to the rate of interest ($i = r_{WH}$). The weights are given by the shares of the capital stock owned by the capitalists and by the workers, respectively:

$$r = r_C \frac{K_C}{K} + i \frac{K_{WH}}{K}. \tag{4.25}$$

In this case, the workers' propensity to save affects the distance between the general rate of profit and the rate of interest, because it impacts the workers' share in the capital stock. Furthermore, Pasinetti's (1974, p. 141) results imply that a higher rate of interest means a higher general rate of profit. The relationship between the rate of profit and the rate of interest in Pasinetti's framework has been studied more extensively by Fazi and Salvadori (1985), Panico (1997) and Ciccarone (2004, 2008), among others, also introducing financial sectors or government sectors into the model.[16]

Another direction of development has been suggested by Kaldor's (1966b) 'neo-Pasinetti theorem' in the appendix of 'Marginal productivity and the macroeconomic theories of distribution', which attempts to strengthen Pasinetti's conclusion that distribution in long-period growth equilibrium can be consistently explained by a macroeconomic approach, irrespective of the technology of production and so on, and that this distribution is independent of any behavioural assumption regarding workers' decisions to save or to consume.[17] In his new approach, Kaldor no longer distinguishes between capitalists and workers, but between corporations and households, which allows for a consistent argument as to why the propensity to save from profits has to be larger than the propensity to save from wages, as we have already noticed above. Major parts of profits are retained and thus saved in order to provide firms with their own means of investment finance and to gain access to complementary external means of finance. Furthermore, the model explicitly includes capital gains and allows for spending in excess of current income for the individual household. The model has thus two groups of actors, corporations and households, and one financial asset, shares issued by corporations and held by households. Kaldor assumes that investment in the capital stock at current prices ($pI = dpK = gpK$) is financed by retained earnings, given by the retention ratio (s_C) and total profits (Π), and by shares issued by the corporations. The latter are assumed to be a fixed proportion (f) of total investment, so that we get:

$$dpK = s_C\Pi + fgpK. \tag{4.26}$$

Dividing by pK and noting that the rate of profit is $r = \Pi/(pK)$, we obtain:

$$r^* = \frac{(1 - f)g}{s_C}. \tag{4.27}$$

The long-period equilibrium rate of profit is thus determined by the decisions of the corporate sector regarding capital accumulation (g) and regarding the financing of capital accumulation (s_C and f). Note that, if corporations issue no new shares and $f = 0$, equation (4.27) is the same as Pasinetti's equation (4.23). In Kaldor's neo-Pasinetti theorem the decisions of the household sector have no effect whatsoever on income distribution. For these results to hold it has to be assumed that the new shares issued by the corporations are absorbed by the household sector, that is that net saving of the household sector exactly equals the value of new shares issued by the corporate sector. Net saving is the difference between households' saving from wages, given by the households' propensity to save from wages (s_W) and the sum of wages (W), and households' consumption from capital gains, determined by their propensity to consume (c) and their capital gains (G_K). Therefore we obtain for the equilibrium in the market for shares:

$$fgpK = s_W W - cG_K. \tag{4.28}$$

Capital gains are given by the difference between the market value of shares and the book value of shares. Kaldor introduces a 'valuation ratio' into the model, which is the 'relation of the market value of shares to the capital employed by corporations (or the "book value" of assets)' (Kaldor 1966b, p. 95).[18] Using q for the valuation ratio, capital gains are given as:

$$G_K = qgpK - fgpK = (q - f)gpK. \tag{4.29}$$

If $q > 1$, the market value exceeds the book value and we have positive capital gains, and, if $q < 1$, the market value falls short of the book value and households suffer capital losses. Inserting equation (4.29) into equation (4.28) we obtain:

$$fgpK = s_W W - c(q - f)gpK. \tag{4.30}$$

Since in our closed economy model total income is distributed between wages and profits such that $pY = W + \Pi$ and the rate of profit in long-period equilibrium is supposed to be determined as in equation (4.27), we obtain from equation (4.30) for the valuation ratio in long-period equilibrium:

$$q^* = \frac{1}{c}\left[\frac{s_W}{g}\frac{Y}{K} - \frac{s_W}{s_C}(1 - f) - f(1 - c)\right]. \tag{4.31}$$

This 'valuation ratio' is the balancing mechanism, which makes sure that spending out of capital gains is just equal to saving from current income minus new issues of securities by corporations (equation (4.30)).

> Consumption out of capital or capital gains is an offset to personal savings, and in . . . the 'Neo-Pasinetti Theorem' I attempted to show how the level of share prices in the capital market will tend to generate a 'valuation ratio' for shares at which the net savings of individuals equals the proportion of business investment which enterprises decide to finance through the issue of new securities. This leads to results similar to Dr. Pasinetti's, but by a different route. (Kaldor 1978, p. xvii)

In Kaldor's neo-Pasinetti theorem the behaviour of households has no effect on the rate of profit in long-period equilibrium (equation (4.27)), which is exclusively determined by the decisions of corporations. Households' saving and consumption decisions (c, s_W), together with the corporations' accumulation and finance decisions (g, s_C, f) and the prevailing technology (Y/K), affect the equilibrium valuation ratio (equation (4.31)).

Although Kaldor (1966b) added some institutional reality to the model and claimed that his neo-Pasinetti theorem does not only apply to steady state full employment growth rates, his approach, as well as Pasinetti's, which definitely is a full employment steady growth approach, are quite restrictive when it comes to the explanation of real world distribution and growth processes. This is due, in particular, to the exclusion of any quantity adjustments in long-period analysis, and the exclusive reliance on (relative) price adjustments leading towards the long-period equilibrium.

These are the general price level in the goods market relative to the nominal wage rate in the labour market, and hence functional income distribution, and/or the price level in financial markets relative to the price level in the goods market, and hence the valuation ratio. In order to overcome these limitations, post-Keynesians such as Dutt (1990b), Lavoie (1996a) and Palley (2012c, 2013b) have examined the Pasinetti theorem or Kaldor's neo-Pasinetti theorem in a Kaleckian framework, which we will introduce in detail in Chapter 5 of this book. In this framework functional income distribution is basically determined by firms' mark-up pricing, and the rate of capacity utilization and the rate of capital accumulation, and thus the rate of growth of the economy, are endogenous variables. These models contain investment functions independent of any steady state full employment growth requirement, and usually they do not generate steady state full employment equilibrium growth rates, which will only be obtained by a fluke.

Linked to these considerations is a further limitation of the Kaldor–Pasinetti approach. This is the omission of the consideration of a non-interest-bearing highly liquid asset, money, endogenously created by a developed banking system at (close to) zero production costs, as an alternative to interest-bearing securities issued by corporations or to profit generating capital stock, as a means of holding wealth in a monetary production economy prone to fundamental uncertainty (Davidson 1978, chap. 12). This would also require a clear distinction between the decisions of households regarding flows, that is regarding the use of income for consumption and saving, and regarding stocks, that is the decision of allocating wealth to holding money, on the one hand, and bonds, securities or capital stock, on the other hand. From this it follows that in a monetary production economy the full employment assumption in the Kaldor–Pasinetti models cannot necessarily be sustained, because saving is not necessarily a demand, directly or indirectly via financial markets, for additional real capital stock, that is for investment goods to be produced. Therefore, an independent investment function is required, and the resulting model will generate steady state full employment equilibrium growth only by a fluke.

4.2.4 Growth, Technical Progress and Distribution in Kaldor's Approach

In the previous subsections on Kaldor's and Pasinetti's theories of distribution it was assumed that the full employment rate of growth, that is the natural rate of growth, is exogenously given and that changes in functional income distribution adjust saving to full employment investment. The models thus did not include any behavioural investment function.

However, this is not where Kaldor's contributions in the 1950s and early 1960s stopped. He provided different attempts at including investment functions in models, which then nonetheless gave rise to steady state full employment growth paths.[19] In 'A model of economic growth' (Kaldor 1957) and 'Capital accumulation and economic growth' (Kaldor 1961), Kaldor assumed that investment in capital stock depends on the capital stock in existence relative to demand and output and on the expected profit rate.[20] Since Kaldor used somewhat complicated explicit functions, below we will present a simplified version with a simple implicit investment function. The second invention of Kaldor's distribution and growth models is the introduction of a 'technical progress function', which endogenizes technological progress and hence the natural rate of growth.

As we have already mentioned in the introduction to Kaldor's approach in Subsection 4.2.1, his distribution and growth models are meant to relate to and to explain 'stylized facts'. In Kaldor (1961, pp. 178–179) he suggests six stylized facts as a starting point for constructing theoretical models:

1. a steady trend rate of output and labour productivity growth;
2. continued increase in the capital–labour ratio;
3. a steady rate of profit on capital in the developed capitalist economies, which is substantially higher than the 'pure' long-term rate of interest;
4. a steady capital–output ratio over long periods;
5. a steady share of profits in income and a high correlation with the share of investment in output, which implies a steady share of wages in income, too, and thus real wages increasing with labour productivity; and
6. appreciable differences in the rates of growth of labour productivity and of output between different societies, which are associated with corresponding differences in the investment–output ratios and in the profit shares.

Let us now outline a simple model explaining these stylized facts. Following the considerations in Kaldor (1957, pp. 600–601, 1961, pp. 210–214), we assume that the decisions to increase the capital stock depend on the development of demand and output relative to the capital stock in existence and, in particular, on the expected profit rate. Simplifying Kaldor's expositions, we assume here that the rate of capital accumulation (g) is dominated only by the expected rate of profit (r^e):[21]

$$g = g(r^e). \tag{4.32}$$

We assume that the expected profit rate (r^e) in the present period is given by the realized profit rate of the previous period. This rate can then be decomposed into the profit share (h) and the capital–output ratio (v):

$$r_t^e = r_{t-1} = \frac{\left(\frac{\Pi}{pY}\right)_{t-1}}{\left(\frac{K}{Y}\right)_{t-1}} = \frac{h_{t-1}}{v_{t-1}}. \tag{4.33}$$

Kaldor (1961) assumes that the expectations regarding the profit share are based on average past values, which makes this determinant rather constant, so that the expected profit rate is mainly determined by the capital–output ratio in the previous period. However, assuming that the expected profit share is also determined by its previous-period value and taking into account that the profit share is uniquely affected by investment and capital accumulation as in equation (4.15) will not change the model results. As will be seen below, it will rather accelerate the adjustment process towards the equilibrium.

From equations (4.33) and (4.32) it becomes clear that changes in the capital–output ratio determine the accumulation rate through the impact on the expected profit rate. For Kaldor, the capital–output ratio is not an exogenously given variable, and there are also no systematic direct effects of changes in the profit rate on the firms' choice of technique and thus on the capital intensity of production. Technological progress and productivity growth are rather dependent on the accumulation process through the technical progress function (TPF), 'which postulates a relationship between the rate of increase of capital and the rate of increase in output and which embodies the effect of constantly improving knowledge and know-how, as well as the effect of increasing capital per man, without any attempt to isolate the one from the other' (Kaldor 1961, pp. 207–208).

The relationship of the TPF with the long-period growth equilibrium can be shown as follows. The capital–output ratio can be decomposed into the capital–labour ratio (k) and labour productivity (y):

$$v = \frac{K}{Y} = \frac{\frac{K}{L}}{\frac{Y}{L}} = \frac{k}{y}. \tag{4.34}$$

The capital–output ratio will rise if the growth rate of the capital–labour ratio exceeds labour productivity growth, and it will fall if the growth rate of the capital–labour ratio falls short of the growth rate of labour productivity:

$$\hat{v} = \hat{k} - \hat{y}. \tag{4.35}$$

If the capital–labour ratio and labour productivity grow at the same rate, the capital–output ratio will stay constant. Thus, there will be no effect on the profit rate in equation (4.33) and hence no effect on the accumulation rate in equation (4.32). In other words,

$$\hat{k} = \hat{y} \quad \Rightarrow \quad \hat{v} = 0 \tag{4.36}$$

is the long-period equilibrium condition.

Kaldor's TPF relates the growth rate of labour productivity to the growth rate of the capital–labour ratio in a systematic way, as is shown in Figure 4.2 (see Kaldor 1957, p. 597, 1961, p. 208). If we assume a constant working population, the growth rate of the capital–labour ratio will be equal to the growth rate of the capital stock, the rate of capital accumulation ($\hat{k} = g$), so that productivity growth will be directly related to the rate of capital accumulation:

$$\hat{y} = \hat{y}(g). \tag{4.37}$$

As can be seen in Figure 4.2, Kaldor assumes that, even with a constant capital–labour ratio and thus zero net investment, a positive labour productivity growth rate can be achieved through an improvement of the organization of the labour process, 'learning by doing', but also by

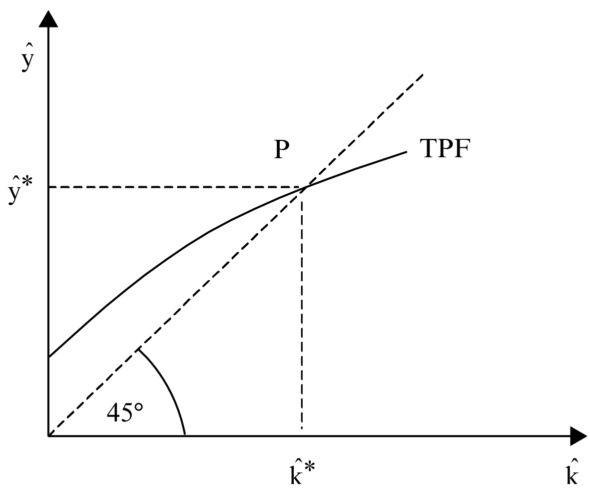


Figure 4.2 Kaldor's technical progress function

the introduction of new technologies through the replacement of worn-out capital. A higher productivity growth rate requires net investment in capital stock, thus a positive growth rate of the capital–labour ratio and hence capital accumulation. According to Kaldor (1961, p. 207), technical progress is capital embodied, because 'improved knowledge is, largely if not entirely, infused into the economy through the introduction of new equipment'. However, the effect of capital accumulation on productivity growth is not given by a purely technical relationship, as Kaldor (1961, p. 207, emphasis in the original) makes clear:

> Hence, whether the increase in output will be more or less than proportionate to the increase in capital will depend, not on the state of knowledge or rate of progress in knowledge, but on the *speed* with which capital is accumulated, relatively to the capacity to innovate and to infuse innovations into the economic system. The more 'dynamic' are the people in control of production, the keener they are in search of improvements, and the readier they are to adopt new ideas and to introduce new ways of doing things, the faster production (per man) will rise, and the higher is the rate of accumulation of capital that can be profitably maintained.

Furthermore, it has to be noted that in Kaldor's TPF, in which technological progress and capital accumulation are intimately linked, it does not make sense to separate changes in the capital–labour ratio, on the one hand, and increases in technological knowledge, on the other hand, as in the neoclassical approach: 'It follows that any sharp or clear-cut distinction between the movement *along* a "production function" with a given state of knowledge, and a *shift* in the "production function" caused by a change in the state of knowledge, is arbitrary and artificial' (Kaldor 1957, p. 596, emphasis in the original).

> In a world in which technology is embodied in capital equipment and where both the improvement of knowledge and the production of new capital goods are continuous, it is impossible to isolate the productivity growth which is due to capital accumulation *as such* from the productivity growth which is due to improvements of technical knowledge. (Kaldor 1978, p. ix, emphasis in the original)

Let us come back to the shape of the TPF in Figure 4.2. As can be seen, a constant increase of the growth rate of the capital–labour ratio is associated with continuous increase in the growth rate of labour productivity, but with falling marginal gains. Kaldor (1957, 1961) explains this as follows. With a certain basic technology and specific social and institutional conditions for the implementation of innovations a certain set of (potential) ideas of improving productivity is available, and firms will make use of the most productive and profitable ideas first. Speeding up capital accumulation will raise productivity growth but with decreasing marginal gains because of the limits in generating new ideas of improving the production process and of inventing new products. However, the invention of new basic technologies, as well as institutional changes which improve the translation of innovations into the production process, would mean an upwards shift of the TPF. But, if the 'flow of ideas' at a given rate of capital accumulation is exhausted, the technical progress function might also shift downwards. Of course, this will cause lower growth or even periods of stagnation.

In point P in Figure 4.2, the intersection of the TPF with the 45-degree line, labour productivity and the capital–labour ratio grow at the same rate. Here, the capital–output ratio will thus stay constant in the growth process. For all points on the TPF to the left of P, the capital–output ratio will fall; for all points to the right of P, it will rise.

According to equation (4.33), a falling capital–output ratio implies that capitalists expect a rising profit rate and will thus increase capital accumulation (equation (4.32)), which will itself feed back positively on the profit rate via redistribution, according to equation (4.16). The rate of capital accumulation and the growth rate of the capital–labour ratio will increase until the capital–output ratio stops falling and the expected profit rate stops increasing. Here, the long-period equilibrium accumulation and growth rate is reached.

A rising capital–output ratio, which is obtained on the TPF to the right of P, triggers the opposite process. Capitalists will expect a decreasing profit rate and thus reduce their rate of capital accumulation according to equations (4.32) and (4.33). This will feed back negatively on the profit rate via redistribution in favour of the wage share according to equation (4.16). Capital accumulation will thus fall until the capital–labour ratio and labour productivity grow in line and the capital–output ratio, the expected profit rate and hence the rate of capital accumulation will remain constant.

Summing up, Kaldor (1955/56, 1957, 1961) has presented a model framework in equation (4.16) (or equation (4.14)) determining functional income distribution, equation (4.32) determining capital accumulation, and equation (4.37) determining productivity growth, which endogenously generates constant full employment rates of capital accumulation and growth, constant profit and wage shares, constant growth in the capital–labour ratio, constant productivity growth, and a constant capital–output ratio.[22] Furthermore, this model provides an explanation for persistent productivity growth differentials between different economies or regions. This is based on the shape of the TPF, which itself not only reflects the technological relationship between capital accumulation and productivity growth but also includes social and institutional factors relating to entrepreneurship and the diffusion of innovations in the production process. Therefore, the model framework seems to be able to explain the six stylized facts mentioned above.

Finally, comparing Kaldor's results to Harrod's, Kaldor showed the possibility of a stable equilibrium growth path at full employment. However, in his approach the natural rate of growth is not exogenous, as in Harrod's theory, but is endogenized through the TPF. Moreover, the warranted rate of growth rate is not a constant, as in Harrod, but is also endogenized through the distribution dependent saving–income ratio. Kaldor contrasts his results with Harrod's in the following way:

> In fact, the implication of our model in terms of Mr. Harrod's terminology could be summed up by saying that the system tends towards an equilibrium rate of growth at which the 'natural' and the 'warranted' rates are equal, since any divergence between the two will set up forces tending to eliminate the difference; and these forces act partly through an adjustment of the 'natural' rate, and partly through an adjustment of the 'warranted' rate. (Kaldor 1957, p. 612)

4.2.5 Assessing the Kaldor–Pasinetti Approach to Steady Growth and Distribution

The Kaldor–Pasinetti approach presented so far in this chapter has raised several critical responses and controversies; some of them have already been touched on in the presentation above. The most important limitation of the approach is, of course, that the model only works in what Joan Robinson used to call a 'golden age', that is steady growth at full employment. We will deal with Robinson's approach in detail in Section 4.3 of this chapter. Let us here just quote Peter Skott (1989a, p. 25), as one example of many others questioning the Kaldor–Pasinetti assumption of full employment growth as an appropriate one for a Keynesian distribution and growth model:

> As a Keynesian theory of growth and distribution, Kaldor's model has several shortcomings, but undoubtedly the most puzzling aspect of the model is the full-employment assumption. Even if one were to assume that somehow the warranted and natural growth rates are equalised in the long run, it is still not clear why a Keynesian model should produce continuous full employment at all times.

As we have outlined above, full employment growth is indeed just an assumption being made and not the outcome of the model. What the Kaldor–Pasinetti approach attempts to show is the long-run stability of full employment growth. This requires further extreme assumptions and is burdened with several problems, if the model is meant to explain real world phenomena, as in particular Kaldor claimed – whereas Pasinetti did not make this claim.

Since capital and labour are always fully utilized or employed by assumption, changes in investment decisions of firms have to cause flexible changes in the price level in the goods market, with nominal wages in the labour market being more rigid. This is required for the necessary redistribution of income between profits and wages to take place, which then keeps the economy on the full employment growth path. However, according to Kaldor (1957) the flexibility of prices and profit margins, and hence profit shares, is a long-period phenomenon, whereas in the short period profit margins can be assumed to be rather rigid. This means that adjustments required for the long-period full employment growth equilibrium do not take place, at least not to a sufficient degree, in the short period:

> [I]n the short period profit margins are likely to be inflexible, in both an upward and a downward direction, around their customary levels – which means that they are largely historically determined . . .
>
> This means that in the short period: (i) when investment falls significantly *below* some 'normal' level, profit margins will not fall sufficiently to set up a compensating increase in consumption; instead, total income and employment will be reduced, in accordance with the Keynesian multiplier theory; (ii) when investment demand rises significantly *above* some 'normal' level, profit margins will not rise sufficiently to allow a corresponding increase in real investment; instead, some kind of investment rationing will take place by lengthening of the order books, and/or a tight credit policy, etc., or simply by the rise in the prices of investment goods in relation to consumption goods. (Kaldor 1957, p. 622, emphasis in the original)

However, it is not quite obvious how these short-period disequilibria should lead back to the long-period full employment equilibrium and the associated growth path.[23]

In the case of investment above its 'normal' level, it also remains unclear why workers, in a situation of full employment, should accept a permanent change of functional income distribution to their disadvantage. Kaldor (1957, p. 622, emphasis in the original) acknowledges that workers will not accept a cut in real wages, and that rising prices will thus trigger rising nominal wages:

> Though over a longer period the *share* of wages is flexible in both an upward and downward direction through *real* wages rising more or less than in proportion to the rise in productivity, in the short period an *absolute* cut in real wages is likely to entail a severe inflationary wage–price spiral; and hence an increase in investment which would entail such a cut is likely to be prevented, if by nothing else, by measures of monetary policy. The speed with which an increase in the proportion of current production devoted to investment can be brought about

> will therefore be limited by the rate of increase in productivity, as well as by other factors, such as the limited capacity of investment-goods industries.

Therefore, Kaldor seems to assume that with positive productivity growth redistribution at the expense of wages will finally be accepted by workers and trade unions if real wage cuts are avoided. But this requires some productivity illusion on the part of workers and trade unions which is difficult to swallow. If workers and trade unions have no such productivity illusion and try to defend their share in national income, it is very likely that the economy will suffer from a price–wage–price spiral, which can then only be stopped by central bank interventions, raising interest rates and putting a brake on investment.[24] The system would thus hit the inflation barrier at any real wage rate – and not only at a subsistence real wage – for which the accumulation rate intended by firms is not compatible with the real wage demands by workers and their possibility of defending a specific real wage rate.

In the case of investment falling below its 'normal' level and prices not falling immediately, which would prevent a required increase in real wages, the economy will suffer from a lack of aggregate demand and hence from excess capacity and unemployment. This might have negative feedback effects on firms' investment plans, because, also according to Kaldor, investment is co-determined by expected demand and output in relation to the existing capital stock. Therefore, capacity utilization below the firms' target rate might cause investment to fall even further.

Finally, the absence of monetary factors in the Kaldor growth models is surprising. In Kaldor (1957) it is assumed that monetary policy plays a purely passive role and the rate of interest is assumed to follow the rate of profit. If we follow the later Kaldor (1970a, 1982, 1985b) in his critique of monetarism, and acknowledge that the interest rate is mainly determined by monetary policies and that the volume of credit and the quantity of money adjust endogenously to credit and money demand, it is difficult to see how the interest rate should endogenously follow the profit rate. If there is no such automatism, a positive deviation of the profit rate from the interest rate will lead to a further acceleration of investment activities, triggering an increase in the profit rate and thus in the gap between the profit rate and the interest rate. The Kaldor mechanism will then not generate a stable distribution equilibrium, despite the adjustment of saving to investment via the redistribution of income from wages to profits (Riese 1981). Rather, cumulative processes will be generated in which the profit rate deviates further and further from the interest rate, capital accumulation will accelerate and the redistribution pressure on wages will increase.

4.2.6 Kaldor's Applied Economics of Growth, Cumulative Causation, Export-Led Growth and Thirlwall's Balance-of-Payments-Constrained Growth Rate

As already pointed out above, in the mid-1960s, starting with *Causes of the Slow Rate of Economic Growth in the United Kingdom* (Kaldor 1966a), Kaldor abandoned steady state growth theory and highly abstract 'single sector' growth models and started to focus on sectoral and regional differences and divergences in growth rates, dynamic returns to scale, cumulative causation and path dependence in economic development and growth.[25] This also meant the abandoning of the concept of predetermined equilibria to which the economy will adjust in the long period, as is particular stressed in 'The irrelevance of equilibrium economics' (Kaldor 1972) and *Economics without Equilibrium* (Kaldor 1985a). In particular the latter publications, focusing on demand-constrained economies with hidden and disguised unemployment, increasing returns, endogenous technological progress, path dependency and the historical specificity of economic development, come close to Joan Robinson's views on growth and equilibrium modelling, which we will discuss in Section 4.3 of this chapter. In the present section we will rather focus on the conclusions from Kaldor's 'applied economics of growth' with respect to the principal determinants of economic growth in the long run and the growth differentials between countries in the world economy and between regions within a country.[26]

Kaldor's 'applied economics of growth' in this latter period consist of several key propositions, according to Thirlwall (1987, pp. 184–186). Disaggregating the economy and taking a sectoral approach, it is argued that higher growth of manufacturing will induce higher growth of the overall economy. Manufacturing is thus considered to be the 'engine of growth'. The major reason for this is found in the positive effects of manufacturing output growth on labour productivity growth in this sector, due to static and dynamic economies of scale or increasing returns.[27] The positive effect of output growth on productivity growth in manufacturing became known as 'Verdoorn's law', because it was first discovered by Verdoorn (1949).[28]

Furthermore, the faster the growth of manufacturing output, the faster will be the transfer of labour from other sectors of the economy with diminishing returns or disguised unemployment to manufacturing. This transfer of labour will thus also increase productivity (growth) in these other sectors and thus in the economy as a whole. As soon as the transfer of labour towards the manufacturing sector slows down and dries up, overall productivity growth in the economy will slow down, too. Therefore, developed and mature economies with little or no surplus labour in agriculture or non-manufacturing sectors in general will face deceleration tendencies of productivity growth.

Finally, manufacturing output, and overall output of the economy, is not constrained by labour supply but is determined by aggregate demand, which feeds back positively on labour productivity and hence on the conditions of supply. Export demand is considered to be the ultimate autonomous component of aggregate demand and thus determines overall demand, output and growth. Most importantly, high export and output growth will be conducive to a cumulative process or to a virtuous circle through the effects of demand and output on productivity growth. Therefore, there will be strong tendencies towards differences in productivity growth between countries or between regions.

> To explain why certain regions have become highly industrialised, while others have not we must introduce quite different kinds of considerations – what Myrdal called the principle of 'circular and cumulative causation'. This is nothing else but the existence of increasing returns to scale – using that term in the broadest sense – in processing activities. These are not just the economies of large-scale production, commonly considered, but the cumulative advantages accruing from industry itself – the development of skill and know-how; the opportunities for easy communication of ideas and experience; the opportunity of ever-increasing differentiation of processes and of specialisation in human activities. (Kaldor 1970b, p. 143)

The key propositions outlined above can be summarized in three 'Kaldor growth laws' (Thirlwall 1987, pp. 186–193, 2013, chap. 3). Kaldor's first law states that manufacturing is the 'engine of growth',[29] because manufacturing itself displays static and dynamic economies of scale and because it can draw on labour resources from lower productivity (growth) sectors. Kaldor's second law is Verdoorn's law, which postulates a positive effect of output growth on productivity growth in manufacturing. And Kaldor's third law states that the faster the growth of manufacturing, the faster will be the rate of labour transfer from agriculture or other non-manufacturing sectors towards manufacturing, which will feed back positively on overall productivity growth in the economy. The overall conclusion regarding Kaldor's applied economics of growth can thus be summarized as follows:

> Manufacturing growth is the engine of GDP growth. The higher the rate of manufacturing growth the faster the overall rate of productivity growth. Labour is necessary for growth to take place, but manufacturing output is not constrained by it because there are more fundamental demand constraints which operate long before supply constraints bite. Labour is very adaptable and elastic, and even in mature economies more labour used in manufacturing

> need not be at the expense of growth elsewhere. The fundamental demand constraint on the growth of output in an open economy is the balance of payments. (Thirlwall 1987, p. 195)

Following the verbal outline in Kaldor's (1970b) 'The case for regional policies', Thirlwall (1987, pp. 196–199, 2002, chap. 4) has presented an export-led growth model along Kaldor's lines.[30] Since export growth is considered to be the most important component of autonomous demand in the long period, the growth rate of real domestic output (Y) becomes a function of the growth rate of exports (X), with hats again denoting growth rates:

$$\hat{Y} = \lambda\hat{X}, \ \ \lambda > 0. \tag{4.38}$$

The variable λ denotes the dynamic foreign trade multiplier. Exports are determined by foreign GDP and the price competitiveness of domestic producers:

$$X = Q\left(\frac{p}{p_f e}\right)^{\eta} Y_f^{\varepsilon}, \ \ \eta < 0, \varepsilon > 0, \tag{4.39}$$

with p denoting domestic prices, p_f foreign prices in foreign currency, e the exchange rate, Y_f foreign income, Q a constant, η price elasticity of demand for exports, and ε the world or foreign income elasticity of demand for exports. From equation (4.39) we get for the growth rate of exports:

$$\hat{X} = \eta(\hat{p} - \hat{p}_f - \hat{e}) + \varepsilon\hat{Y}_f. \tag{4.40}$$

Foreign income growth and foreign inflation are taken to be exogenous. Domestic prices are determined by the mark-up pricing of firms. It is assumed that firms apply a constant mark-up (m), reflecting the intensity of competition in the goods market, to unit labour costs, which are determined by the nominal wage rate (w) and labour productivity (y):

$$p = (1 + m)\frac{w}{y}, m > 0. \tag{4.41}$$

Writing equation (4.41) in growth rates provides the determination of domestic inflation:

$$\hat{p} = (1 \hat{+} m) + \hat{w} - \hat{y}. \tag{4.42}$$

According to Verdoorn's law, or Kaldor's second law, productivity growth depends on domestic output growth:

$$\hat{y} = \hat{y}_a + \rho\hat{Y}, \ \rho > 0, \tag{4.43}$$

with $\hat{y}_a$ representing autonomous productivity growth or 'learning by doing'. The Verdoorn equation (4.43) is the key to cumulative causation or a virtuous circle of growth. Domestic output growth speeds up productivity growth, which, *ceteris paribus*, reduces domestic inflation (equation (4.42)) and thus improves the price competitiveness of domestic producers and thus export growth (equation (4.40)), which will then feed back positively on domestic output growth (equation (4.38)) and hence on productivity growth (equation (4.43)). Once this virtuous circle has started for a particular country or region, it is hard to see how productivity growth rates between countries or regions should converge.

Substituting equations (4.43), (4.42) and (4.40) into equation (4.38) yields the equilibrium growth rate of domestic output:

$$\hat{Y}^* = \lambda\frac{\eta[(\widehat{1+m}) + \hat{w} - \hat{y}_a - \hat{p}_f - \hat{e}] + \varepsilon\hat{Y}_f}{1 + \lambda\eta\rho}. \tag{4.44}$$

Since $\eta < 0$, the long-period equilibrium growth rate of a country will be positively affected by autonomous productivity growth ($\hat{y}_a$), foreign inflation ($\hat{p}_f$) and the rate of change of the exchange rate ($\hat{e}$), that is by a continuous devaluation of the domestic currency. Nominal wage growth and increases in the mark-up have a negative effect on long-period equilibrium growth. Foreign GDP growth ($\hat{Y}_f$) and the income elasticity of demand for exports (ε) have a positive impact on domestic equilibrium GDP growth. The Verdoorn coefficient (ρ) increases the effects of the other variables. Equation (4.44) thus includes those factors which explain long-run differences in growth rates among countries or regions. According to Thirlwall (2002, p. 59), these differences are mainly due to differences in the income elasticities for exports: 'Growth rates between countries differ not because we observe countries in the process of divergence but because the equilibrium growth rates differ, associated mainly with differences in the income elasticity of demand for exports.'

If relative prices and exchange rates are held constant and the feedback mechanism via the Verdoorn coefficient is switched off, equation (4.44) simplifies to:

$$\hat{Y}^* = \lambda\varepsilon\hat{Y}_f, \tag{4.45}$$

and clearly shows the dependence of domestic growth on foreign growth and the income elasticity of demand for exports.[31]

Thirlwall (1979) further developed this approach and explicitly modelled imports, which were left out of the picture in the export-led growth model above. Thirlwall argues that in the long run countries are facing a balance-of-payments constraint and cannot persistently import more than they export, unless they manage to generate continuous streams of capital imports to finance their current account deficits. However, according to Thirlwall (2002, p. 66), '[t]here is a limit to the deficit to GDP ratio . . . and a limit to the debt to GDP ratio beyond which the financial markets become nervous and a country is unable to borrow more'. McCombie (2012, pp. 19–20) summarizes the basic idea of the balance-of-payments-constrained growth model as follows:

> The central tenet of the balance-of-payments-constrained growth model is that a country cannot run a balance-of-payments deficit for any length of time that has to be financed by short-term capital flows and which results in an increasing net foreign-debt-to-GDP ratio. If a country attempts to do this, the operation of the international financial markets will lead to increasing downward pressure on the currency, with the danger of a collapse in the exchange rate and the risk of a resulting depreciation/inflation spiral. There is also the possibility that the country's international credit rating will be downgraded. Consequently, in the long run, the basic balance (current account plus long-term capital flows) has to be in equilibrium. An implication of this approach is that there is nothing that guarantees that this rate will be the one consistent with the full employment of resources or the growth of productive potential.

Applying a balance-of-payments constraint to the export-led growth model outlined above in this subsection will give the export multiplier λ in equations (4.38) or (4.45) a specific meaning, as will be seen below. Following the presentation in Thirlwall (2002, chap. 5), we can derive the 'balance-of-payments-constrained growth rate' in a simple model without capital flows financing long-run current account deficits in the following way.[32] It goes without saying that the balance-of-payments-constrained growth rate is by definition a demand-constrained growth rate, because an increase in export growth will relax the balance-of-payments constraint and will allow for faster growth of demand and output. We start with a current account equilibrium, disregarding the flows of factor incomes between countries:

$$pX = p_f eM, \tag{4.46}$$

where M represents imports and the other variables are defined as above. With the current account in equilibrium, the domestic economy is able to pay for its imports with the proceeds from its exports to the rest of the world. Equation (4.46) in growth rates gives:

$$\hat{p} + \hat{X} = \hat{p}_f + \hat{e} + \hat{M}. \tag{4.47}$$

Exports are determined as in equation (4.39) and the growth rate of exports as in equation (4.40). Imports are given as:

$$M = R\left(\frac{p_f e}{p}\right)^{\psi} Y^{\pi}, \psi < 0, \pi > 0, \tag{4.48}$$

with Ψ denoting the price elasticity of demand for imports, and π the domestic income elasticity of demand for imports, and R being a positive constant. From equation (4.48) we get for the growth rate of imports:

$$\hat{M} = \psi(\hat{p}_f + \hat{e} - \hat{p}) + \pi\hat{Y}. \tag{4.49}$$

Substituting equations (4.49) and (4.40) into equation (4.47) yields the domestic rate of growth which is consistent with a current account equilibrium or the balance-of-payments-constrained growth rate ($\hat{Y}^b$):

$$\hat{Y}^b = \frac{(1 + \eta + \psi)(\hat{p} - \hat{p}_f - \hat{e}) + \varepsilon\hat{Y}_f}{\pi}. \tag{4.50}$$

The balance-of-payments-constrained growth rate is thus affected positively by the price competitiveness of domestic producers, provided that $1 + \eta + \Psi < 0$ holds, which is the so-called 'Marshall–Lerner condition'. Foreign inflation and a continuous devaluation of the domestic currency, that is a positive growth rate of the nominal exchange rate, have positive effects on price competitiveness of domestic producers, whereas domestic inflation has a negative effect. According to Thirlwall (2011), changes in price competitiveness will only have short-run temporary effects on the balance-of-payments-constrained growth rate, either because of arbitrage ('law of one price') or because inflation differentials between countries will trigger compensating movements in the nominal exchange rate, so that in the long run relative purchasing power parities seem to hold.[33] And raising the balance-of-payments-constrained growth rate by means of changing the exchange rate would require a continuous process of devaluation of the domestic currency. Therefore it is argued that, in the long run, the main determinants of the balance-of-payments-constrained growth rate are foreign GDP growth and the income elasticities of exports and imports, which are considered to reflect non-price competitiveness. A long-run version of the balance-of-payments-constrained growth rate or 'Thirlwall's law' can therefore be derived by simplifying equation (4.50), assuming constant domestic and foreign price levels and a constant nominal exchange rate:

$$\hat{Y}^b = \frac{\varepsilon \hat{Y}_f}{\pi} = \frac{\hat{X}}{\pi}. \tag{4.51}$$

Comparing equation (4.51) with equations (4.38) and (4.45) of the export-led growth model reveals that the multiplier effect of export growth on domestic GDP growth is the reciprocal of the income elasticity of imports ($\lambda = 1/\pi$) if a balance-of-payments constraint is introduced into the model.[34] Graphically, the balance-of-payments-constrained growth rate can be derived as in Figure 4.3, which shows export growth as determined in equation (4.40) and thus exogenous to domestic GDP growth, and import growth as a function of domestic GDP growth as in equation (4.49), assuming constant domestic and foreign price levels and a constant nominal exchange rate.

Regarding long-run growth differentials between countries or regions, equation (4.51), and hence Thirlwall's law, comes up with clear-cut conclusions: 'It is differences in the income elasticity of demand for exports

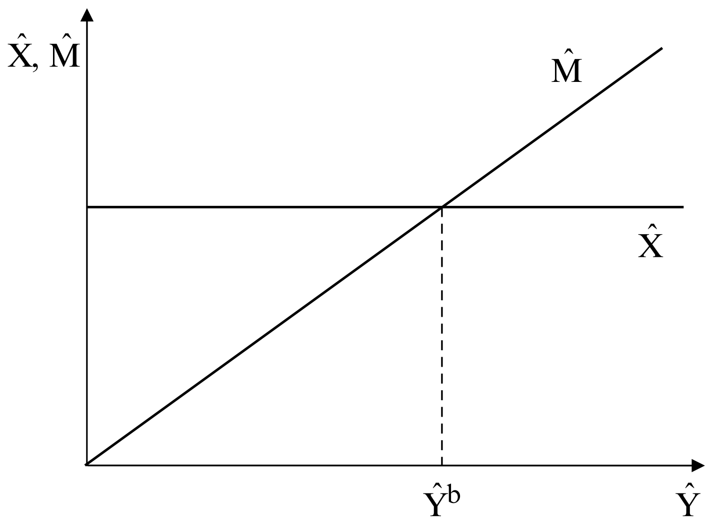


Figure 4.3 The balance-of-payments-constrained growth rate

and imports that lie at the heart of growth differences between regions within countries and between countries in the world economy' (Thirlwall 1987, p. 199). Therefore, in order to improve long-run growth perspectives countries will have to improve their balance-of-payments-constrained growth rate, because usually this becomes binding before supply constraints become relevant. And, since the balance-of-payments-constrained growth rate is determined by the income elasticities of exports and imports in the long run, export promotion and import substitution strategies are considered to be complementary and most promising strategies, according to Thirlwall (2002, p. 77), with post Second World War Japan and South Korea reported as successful examples:[35] 'The only sure and long-term solution to raising a country's growth rate consistent with balance of payments equilibrium on current account is structural change to raise ε and to reduce π' (Thirlwall 2002, p. 78).

It should be noted that export-led growth strategies, following from Kaldor's export-led growth model and Thirlwall's balance-of-payments-constrained growth approach, have to be distinguished from mercantilist strategies focusing on (increasing) export surpluses. Export-led growth strategies focus on stimulating exports through the improvement of product qualities and the income elasticities of exports, which increases demand for domestic output, generates domestic income and raises the imports and thus the exports of the rest of the world – in Thirlwall's approach growth at the balance-of-payments-constrained rate implies that exports and imports move in step. Following this approach does not therefore entail a 'fallacy of composition', as McCombie (2011b) and Setterfield (2011, 2013a) have pointed out. However, export-led mercantilist strategies, focusing on the generation of increasing export and current account surpluses by means of constraining domestic demand growth and by wage moderation in order to improve the price competitiveness of domestic producers, suffer from such a fallacy of composition. Obviously such a strategy cannot be followed by all countries, because it requires counterpart countries which accept rising deficits in their trade balance and current accounts. Furthermore, if export-led mercantilist strategies are followed by major countries in the world economy they will impose a dampening effect on overall demand growth and hence on world output growth.

Finally, Thirlwall (2002, p. 78) acknowledges that countries might be inclined to encourage capital inflows in order to finance import growth in excess of export growth and to allow for faster overall growth. Long-term direct investment is considered to be an appropriate form, because it is not associated with fixed debt-service payments. However, foreign direct investments might cause problems nonetheless, because it is by no means clear that they will flow into areas which are beneficial for long-run sustainable overall growth of the economy. Furthermore, the outflow of profits associated with foreign direct investments might be problematic as well and has to be taken into account when relying on such a development strategy.[36]

As reviewed in Setterfield (2011) and Thirlwall (2011, 2013, chap. 5), the concept of a balance-of-payments-constrained growth rate has been generalized in multi-country frameworks, it has been disaggregated in multi-sector models, capital flows and interest payments on debt have been included, and the sustainability of foreign debt has been examined. Furthermore, the model has been extensively tested econometrically, with the vast majority of the studies supporting the balance-of-payments-constrained growth hypothesis, as is shown by McCombie (2011b) and Thirlwall (2011, 2013, chap. 5).[37]

Apart from the critique of some authors directed towards some of the econometric studies and estimations, reviewed and rejected by McCombie (2011b), Thirlwall's theoretical approach has been criticized by Palley (2002). He argues that the model lacks an adjustment mechanism towards the growth rate of potential output and would thus predict increasing excess capacity or excess supply as soon as the balance-of-payments-constrained growth rate falls short of potential growth. Palley (2002) introduces an endogenous adjustment of the income elasticity of demand into the model. It falls when excess capacity grows and, conversely, it rises when capacity utilization increases. This allows for an adjustment of the balance-of-payments-constrained growth rate to potential growth and thus in effect removes the relevance of the balance-of-payments constraint in favour of a supply constraint to growth. McCombie (2011b) has criticized that, firstly, there is no empirical support for the mechanism introduced by Palley to work and that, secondly, from a Keynesian perspective it is difficult to see how potential growth should be determined without any reference to aggregate demand growth and how, therefore, increasing excess capacity or excess supply should arise. Setterfield (2011) has addressed the same issue, and argues in a Keynesian fashion that potential growth becomes endogenous to the balance-of-payments-constrained growth rate via induced technological change and other mechanisms, which make productivity growth endogenous to aggregate demand and output growth.[38] This is exactly in line with Kaldor's and Thirlwall's approach outlined in this section.

Although Kaldor's export-led growth approach and, in particular, Thirlwall's concept of balance-of-payments-constrained growth seem to have several merits in terms of explaining long-run growth processes and differences in productivity growth rates among regions or countries, there remains an open question and problem, as Palumbo (2009) has pointed out. If export is considered to be the main determinant of growth, and countries in the long run cannot grow beyond their balance-of-payments constraint, this implies that private investment and private saving have to passively adjust without any impact on the growth process, if a government sector is excluded from the analysis. Of course, with a government sector the positive or negative difference between private saving and private investment would have to be exactly compensated by the government financial balance. From national accounting, by definition the excess of private saving (S) over private investment (pI) at a given level of economic activity is equal to the excess of nominal exports (pX) over nominal imports ($p_f eM$) (including the balance of primary income and the balance of income transfers, thus the current account balance) plus the excess of government spending (G) over tax revenues (T):

$$S - pI = pX - p_f eM + G - T. \tag{4.52}$$

And with $pX - p_f eM = 0$, as in balance-of-payments-constrained growth, this reduces to:

$$S - pI = G - T. \tag{4.53}$$

What is important in the context of this section is that the investment decisions of the business sector and the resulting growth rate of the capital stock have no longer any significant impact on the growth process – there is no autonomous investment and no independent investment function any more. Investment is completely determined by the requirements of export driven GDP growth. Long-period growth is determined by exports and the balance-of-payments constraint, and domestic demand and hence domestic investment adjust passively such that the condition in equation (4.53) is met at the level of economic activity or the growth of economic activity determined by exports and the balance-of-payments constraint. Insufficient investment is not regarded as a serious obstacle to the growth process any more – business investment and its determinants as the driving force of growth disappear from the model.

4.3 JOAN ROBINSON'S REJECTION OF THE STEADY STATE GROWTH EQUILIBRIUM APPROACH

4.3.1 Introduction to Robinson's Approach

Joan Robinson's main contributions to post-Keynesian distribution and growth theory can be found in *The Accumulation of Capital* (Robinson

1956) and in her *Essays in the Theory of Economic Growth* (Robinson 1962), which she herself regarded as a necessary introduction to *The Accumulation of Capital*.[39] According to Harcourt and Kerr (2009, p. 76), the major influences on her writings in the area of distribution and growth were, of course, Keynes's works, in particular the *General Theory*, which she attempted to generalize from the short period to the long period.[40] But she was also heavily influenced by the contributions and the problems raised by Harrod, which we have treated in Chapter 2 of this book, and by the works of Kalecki, which will be dealt with in Chapter 5.[41]

Generally, Joan Robinson became extremely critical of the use of equilibrium models in economics in the course of her writings.[42] On the one hand, she was fully aware of the usefulness of aggregation and abstract modelling and argued: 'A model which took account of all the variegation of reality would be of no more use than a map at the scale of one to one' (Robinson 1962, p. 33). But, on the other hand, she insisted on the historical specificity of economic problems, which requires that highly aggregate models have to be made historically and institutionally specific in order to draw conclusions. And, most importantly, she insisted on taking time seriously in economic reasoning and acknowledging that economic processes take place in 'historical time' as compared to the 'logical time' used in neoclassical general equilibrium modelling.[43]

> In a model depicting equilibrium positions there is no causation. It consists of a closed circle of simultaneous equations. The value of each element is entailed by the values of the rest. At any moment in *logical time*, the past is determined just as much as the future. In an *historical model*, causal relations have to be specified. Today is a break in time between an unknown future and an irrevocable past. What happens next will be the result from the interactions of the behaviour of human beings within the economy. Movement can only be forward. (Robinson 1962, p. 26, my emphasis)

Therefore, in contrast to Kaldor and his early models, outlined in the previous section, Joan Robinson does not attach any descriptive relevance or realistic importance to the concept of an equilibrium and equilibrium growth path. Rather, at best she uses equilibrium growth paths as standards of reference in order to be able to analyse different disturbances of the growth process.[44] Hence, in Robinson's understanding, equilibrium growth paths do not imply in any way that the real economic process taking place in historical time will tend toward such a growth path. This also precludes that there will be any tendency towards full employment growth in the real world.

> There is much to be learned from *a priori* comparisons of equilibrium positions, but they must be kept in their logical place. They cannot be applied to actual situ-

> ations; it is a mortal certainty that any particular actual situation which we want to discuss is not in equilibrium. Observed history cannot be interpreted in terms of a movement along an equilibrium path nor adduced as evidence to support any proposition drawn from it. (Robinson 1962, p. 25, emphasis in the original)

Therefore, Robinson's method can be characterized by the use of equilibrium models as logical constructs for the purpose of identifying causal relations without attaching any historical relevance to these models. Historical processes are taking place outside of equilibrium, and the results of these processes depend on the process itself. In *The Accumulation of Capital* she argues that 'in most economic reactions the path the market follows, while it is adapting itself to a change, has a long-persisting effect upon the position that it reaches' (Robinson 1956, p. 58). The results of historical processes are thus path dependent and cannot be derived as equilibrium solutions of a logical model which follow definitely from a given parameter constellations. Bhaduri (1987, p. 535) describes Robinson's position in the following way: 'Economic equilibrium is something that we can never observe in reality, at best, it has to be recognized as a "thought experiment" designed to facilitate analysis.' And Kregel (1973, pp. 187–188) contrasts Robinson's and Kaldor's early approaches as follows:

> For Kaldor stability is a natural property of long-period analysis, for Professor Robinson it is a myth. In Joan Robinson's models a number of quasi-golden-age situations are possible at less than full employment of the labour force. In Kaldor's approach, if the system is in a position of long-run steady growth, full employment is a necessary outcome.

Having clarified these methodological characteristics of Robinson's approach, we will discuss the relationship between capital accumulation and the rate of profit in the next subsection and will then outline several potential growth paths, or 'ages' as Robinson called them, in Subsection 4.3.3.

4.3.2 Accumulation and the Rate of Profit

According to Robinson, the essence of the Keynesian approach in economics is that firms determine the accumulation process through their investment decisions.

> The Keynesian models (including our own) are designed to project into the long period the central thesis of the *General Theory*, that firms are free, within wide limits, to accumulate as they please, and that the rate of saving of the economy as a whole accommodates itself to the rate of investment that they decree. (Robinson 1962, pp. 82–83)

Generally, in her opinion, an adjustment of saving to investment can take place in terms of quantity changes of output and income as well as in terms of changes of the functional income distribution through price reactions. As will be seen below, however, in her formal model in the *Essays in the Theory of Economic Growth* (1962) the adjustment takes place via a change in income distribution and thus in a similar manner to that in Kaldor's Keynesian theory of distribution discussed in the section above. She thus applies the same mechanism as Kaldor when it comes to tackling the instability problem associated with Harrod's approach discussed in Chapter 2 of this book.[45] However, as we will see below, this does not mean that the economy will smoothly converge towards a full employment equilibrium growth path in her view. Neither full employment nor stable and steady growth can be deduced from her approach.

In Chapter II of her *Essays in the Theory of Economic Growth*, Robinson (1962, pp. 22–87) outlines a simple model of a closed private capitalist economy, that is an economy without a government and a foreign sector.[46] She distinguishes seven determinants of equilibrium in this model: 1) technical conditions of production; 2) investment policy; 3) thriftiness conditions; 4) competitive conditions; 5) the wage bargain; 6) financial conditions; and 7) the initial stock of capital goods and the state of expectations determined by past experience. The model economy consists of a firm sector producing investment and consumption goods, rentiers' households receiving distributed profits in terms of interest and dividend payments (R), and workers' households receiving wages. It is assumed that firms retain a part of total profits (Π) and distribute the rest to the rentiers, who spend part of their income on consumption goods and save the remainder (S_R). Rentiers hold their wealth in obligations issued by the firm sector and/or in bank deposits. Workers as a social class are assumed not to save but spend their wages completely on consumption goods. From these assumptions it follows that '[t]he normal proportion of total profits saved, then depends upon two factors – the proportion of profits distributed by the firms and the proportion of their receipts that rentiers save' (Robinson 1962, p. 39). If the firms' retention ratio ($s_C = (\Pi - R)/\Pi$) and the rentiers' propensity to save ($s_R = S_R/R$) are given, the proportion of total profits saved (s_Π) is determined as follows:

$$s_\Pi = \frac{s_\Pi}{\Pi} = \frac{\Pi - R + s_R R}{\Pi} = s_C + s_R(1 - s_C). \tag{4.54}$$

With this determination of the total propensity to save from profits, the saving rate (σ), relating total saving (S) to the value of the capital stock (pK), is given as follows, with r as usual denoting the profit rate:

$$\sigma = \frac{S}{pK} = \frac{S_\Pi}{pK} = \frac{s_\Pi \Pi}{pK} = s_\Pi r. \tag{4.55}$$

In this context, the value of the capital stock has to be determined. Given her involvement in the Cambridge capital controversies (see Chapter 3 of this book), Robinson was well aware of the dependence of the prices of capital goods on the rate of profit and the related problems for determining the value of capital and treating the choice of techniques. But she makes clear that this is not a problem in a historical model:

> Economies with different rates of profit must exist either at different dates or in different regions. Between two dates technical knowledge has altered. Between two regions there are differences in natural and human resources. The comparison of different economies with the same technical possibilities and different rates of profits is an exercise in pure economic logic, without application to reality.
>
> In an historical model, the stock of capital goods at some base date is taken to be simply whatever it happens to be. It can be valued at historic costs or at current reproduction cost, or in terms of its prospective earning power discounted at whatever is considered to be the appropriate rate of interest. (Robinson 1962, pp. 32–33)

Investment decisions of the firm sector cannot be captured by a universally valid investment function, but are determined by complex historical, political and psychological factors, the 'animal spirits', which, following Keynes (1936, p. 161), describe the 'spontaneous urge to action rather than inaction'. For the purpose of Robinson's model investment decisions are expressed by an accumulation function which, as in Kaldor's models, makes the desired rate of capital accumulation of the firm sector (g) an increasing function of the expected profit rate (r^e) (Robinson 1962, p. 38):

$$g = g(r^e). \tag{4.56}$$

Profits and thus the profit rate are considered to have a positive influence on investment decisions, because on the one hand profits provide internal funds for investment and on the other hand profits alleviate the access of firms to external funds, that is credits, because the firm's own means of finance and thus profits determine its creditworthiness: 'In our model, profits are desired for the sake of growth rather than growth for the sake of profits' (Robinson 1962, p. 45).

Robinson (1962, pp. 42–44) assumes that, in principle, the financial system passively accommodates the financing needs of the firm sector and assumes that firms, depending of course on the creditworthiness and borrowing power of the individual firm, generally have access to credit made available by the banking sector at a given interest rate. Interest rates will only be raised under inflationary conditions.[47]

The general level of prices in her model is determined by nominal wages. She assumes nominal wages to be constant, except for two kinds of situations (Robinson 1962, p. 42). First, nominal wages will rise if there is excess demand for labour in the labour market. Second, nominal wages will rise if aggregate demand in the goods market triggers rising prices such that the real wage rate is forced below a certain level workers are willing to accept, and organized labour then resists this real wage loss (Robinson 1962, pp. 70–74).

In equilibrium, the rate of profit included in the saving equation (4.55) has to be equal to the rate of profit inducing capital accumulation in equation (4.56). This can be formulated as follows:

$$g(r^*) = \sigma(r^*) \Rightarrow r^* = \frac{g(r^*)}{s_\Pi}. \tag{4.57}$$

With this simultaneous determination of the equilibrium rates of profit, accumulation and saving, and with given technical conditions of production and full or normal utilization of the capital stock, respectively, both the real wage and the wage share become residual values (Robinson 1962, p. 70).

Robinson (1962, p. 47) thus receives a 'double-sided relationship between the rate of profit and the rate of accumulation'. The expected profit rate determines the accumulation rate, which in turn determines the realized profit rate, which then sets the expectations for the next period. The equilibrium or desired accumulation rate is the rate which leads to a profit rate which then exactly triggers this accumulation rate. Therefore, with this accumulation rate, firms' expectations are fulfilled. Figure 4.4, following Robinson (1962, p. 48), shows possible equilibrium or desired constellations of accumulation rate and profit rate in points A and B. The $g(r^e)$ curve represents the effect of the profit rate on the accumulation rate from equation (4.56). Robinson assumes this relationship to be non-linear. A certain minimum rate of profit, probably given by the risk-free rate of interest plus some compensation for the risks and the troubles of real investment, is required for positive capital accumulation to take place. Then small increases in the expected rate of profit cause large increases in the rate of accumulation. However, with higher rates of accumulation ever larger increases in the rate of profit are required to induce firms to speed up with capital accumulation. The σ curve shows the effect of the rate of accumulation on the rate of profit from equation (4.55). This curve thus assumes that in each period saving immediately adjusts to investment, via

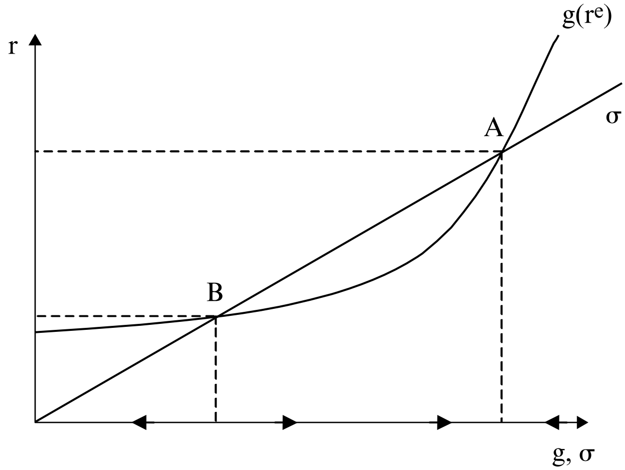


Figure 4.4 Rate of capital accumulation and rate of profit

a change in prices relative to the nominal wage rate, which then gives the related rate of profit. This rate of profit can then be compared to the rate of profit which has triggered the rate of accumulation.

Let us start with the equilibrium in point B. To the right of point B each rate of capital accumulation will generate a rate of profit which will then trigger a higher rate of capital accumulation, and the economy will thus move further away from point B. And, to the left of point B, each rate of capital accumulation will generate a rate of profit which will then cause a lower rate of accumulation and the economy will again further diverge from point B. In other words, the equilibrium in point B is highly unstable. Let us compare this to the equilibrium in point A. To the right of point A, each rate of capital accumulation will generate a rate of profit which will then trigger a lower rate of capital accumulation and the economy will move towards point A. To the left of point A, each rate of capital accumulation will generate a rate of profit which will then cause a higher rate of accumulation and the economy will also converge from below towards point A. The equilibrium in point A will thus be stable in the sense that, if out of equilibrium, no changes in the behavioural functions of the model, the saving and the accumulation functions, occur, and the system will return to the equilibrium in A. Point A thus describes the 'desired rate of accumulation, in the sense that it is the rate which makes the firms satisfied with the situation in which they find themselves' (Robinson 1962, p. 49). However, given Robinson's considerations about out-of-equilibrium processes in historical time, it is by no means warranted that the saving and investment functions remain stable if, by a fluke, the economy deviates from point A. Saving and investment curves may get shifted and the equilibrium will move and will then depend on the out-of-equilibrium path of the economy.

A change in animal spirits of the firm sector would shift the accumulation function in Figure 4.4. More optimistic animal spirits would shift the function to the right, and the new equilibrium would be associated with a higher rate of accumulation and a higher rate of profit. More pessimistic animal spirits would shift the accumulation function to the left and would thus have the opposite effects. An increasing saving ratio out of profits (s_{Π}), caused either by a higher retention ratio or by a higher propensity to save from rentiers' income (equation (4.54)), would rotate the saving function clockwise and would thus mean lower equilibrium rates of profit and accumulation. A decrease in the saving ratio out of profits would cause the saving function to rotate counter-clockwise and would thus have the opposite effects. In other words, Robinson's model also validates Keynes's paradox of thrift in long-period analysis (Robinson 1962, p. 60). So far, the partial effects of movements of either the investment function or the saving function have been addressed. However, Robinson (1962, pp. 60–62) also discusses the case in which faster accumulation due to improved animal spirits, that is a rightward shift of the accumulation function, is associated with a higher retention ratio of firms in order to finance a higher pace of accumulation, and thus a clockwise rotation of the saving function. Since these movements have opposite effects on the equilibrium, the total effect will depend on the relative strengths of the partial effects. Therefore, one might observe an increase in the equilibrium rates of accumulation and profits associated with a higher propensity to save (Asimakopulos 1991, pp. 178–179). However, this should not be interpreted as a refutation of the paradox of thrift, because the partial effect of higher thriftiness is still dampening in this case. It might only be overcompensated by the expansionary effect of improved animal spirits.

If the economy is in an accumulation equilibrium at some point, that is firms accumulate at the desired rate as derived above, there is no reason to believe that the economy will stay in that equilibrium, according to Robinson (1962, pp. 50–51). First, changing time lags between the distribution of profits and their spending by rentiers can lead to disturbances in the consumption goods markets, that is to shifts or rotations in the saving function. Second, the capital stock may not contain a smooth and regular vintage structure, so that replacement investment occurs irregularly and the accumulation function starts to move. Similarly, a burst of new innovations may shift the accumulation function as well (Robinson 1962, p. 63). Hereby, past fluctuations of the accumulation process transfer to present expectations, whereby the fluctuations can be increased. Therefore, '[t]he model is inherently unstable and fluctuates even in otherwise tranquil conditions' (Robinson 1962, p. 67). The final result is not a movement on an equilibrium accumulation path, but 'investment takes place in a series of rushes, each of which leaves behind traces which affect the conditions in which the next occurs' (Robinson 1962, p. 69).[48]

4.3.3 Possible Growth Paths

In Robinson's work, the equilibrium or desired growth rate is not necessarily identical with the potential rate of growth, which is given by the growth rate of the labour force plus the growth rate of labour productivity. According to Robinson, the latter growth rate is, in contrast to the case in the neoclassical theory of growth, not an exogenous variable but, similarly to the case in Kaldor, is endogenized through the dependence of productivity growth on the accumulation rate and on the demand for and supply of labour. If firms' desire to expand runs against labour supply constraints, they will speed up the rate of labour saving technical progress (Robinson 1962, pp. 51–52).[49] However, the desired rate of growth does not need to correspond to the potential rate of growth, nor are there any kinds of adjustment mechanisms. In this way, and owing to the explicit consideration of expectations and their feedback effects, the Robinson approach differs from the one by the early Kaldor. In contrast to the early Kaldor models, there is an infinite number of potential equilibrium accumulation paths in the Robinson approach. This justifies the characterization of this approach as historically open, because no adjustment toward a predetermined full employment equilibrium growth path can be predicted (Cohen 1993).

Robinson emphasizes this view by sketching certain accumulation scenarios ('ages') based on the distinction between desired accumulation and growth rates and potential or natural accumulation and growth rates, respectively.[50] An equilibrium growth path with full employment of workers is called a 'golden age'. Here, desired and maximum possible accumulation and growth rates coincide (Robinson 1962, pp. 52–53). The golden age requires structurally steady growth, which means Harrod neutral technological progress, equal productivity growth in all sectors, and a growth rate of the real wage corresponding to the productivity growth rate. This guarantees a constant rate of profit and constant profit and wage shares. However, there will be no adjustment mechanism towards this maximum possible rate of growth if it is missed by the decentralized accumulation decisions of firms (Bhaduri 1987). Furthermore, a golden age becomes extremely unlikely when non-reproducible resources and a primary sector of production are introduced into the model (Robinson 1962, p. 76). Therefore, and given all the preconditions and requirements mentioned above, Robinson (1956, p. 99) considers the golden age as a 'mythical state of affairs not likely to obtain in any actual economy'.

Equilibrium growth below full employment is called a 'limping golden age' (Robinson 1962, pp. 53–54). Here the desired rate of capital accumulation, owing to a lack of animal spirits, is too low to provide full employment. Employment would rise over time if output growth exceeds productivity growth, and it would fall in the opposite case.

A 'restrained golden age' is given if the desired accumulation rate exceeds the maximum possible accumulation rate, even taking into account the positive effects of capital accumulation on productivity growth (Robinson 1962, pp. 54–56). Such an accumulation rate cannot be maintained and has to be restricted. Two different ways are sketched. First, when labour demand exceeds labour supply and rising money wages cause rising prices, the rate of interest will go up and cause a slowdown in capital accumulation, because credit costs increase and access to credit will decrease. Second, firms may react by excessive mechanization of the production process as a reaction toward the scarcity of labour, which then reduces the profit rate and thus the propensity to accumulate.

A 'bastard golden age' prevails in a situation in which an inflation barrier is reached (Robinson 1962, pp. 58–59).[51] Under the conditions of full utilization of the productive capacities given by the capital stock, but not necessarily full employment, organized workers may resist a reduction of their real wage rates during a rise of the desired accumulation rate, so that the equilibrium profit rate cannot be obtained. Therefore, the system hits the inflation barrier, where firms' desire to accumulate and workers' real wage resistance generate cumulative inflationary pressure, which is fed both from the labour market and from the goods market. The inflation barrier will be discussed in more detail in Section 4.4 in the context of a simplified 'Kaldor–Robinson model'.

Let us finally point out in this section that Robinson (1962, pp. 76–78) draws a rather pessimistic picture about the perspectives of the 'near-golden age', obviously the developed capitalist economies in the late 1950s and early 1960s. She argues that this near-golden age contains an inherent tendency towards stagnation for several reasons. First, technological change leads to an increase in the minimum size of the firm and to a higher degree of specialization, which each increase the riskiness of investment and thus dampen animal spirits. Second, with increasing size, power and maturity of the firms, the motivation to accumulate and to cut unit costs is weakened. This is associated with redistribution of profits among firms, in favour of old powerful firms and at the expense of young and small firms. Whereas the former lack the motivation to accumulate and invest, the latter lack the means of finance to expand. Third, related to these tendencies, economic concentration will increase, and oligopolies and price leadership will become more dominant. This leads to an increase in profit margins and thus to a decrease in the wage share, which will have a dampening effect on consumption and hence on aggregate demand. Fourth, with rising average income per household there may be a behavioural tendency of the overall propensity to consume to decline and the propensity to save to rise. This will dampen the demand for consumer goods and will feed back negatively on firms' investment. As will be seen in Chapter 5 of this book, this rather sketchy outlook about the stagnation tendencies in modern capitalism has broad similarities with some work in the Kaleckian tradition, in particular with Josef Steindl's (1952) *Maturity and Stagnation in American Capitalism*.

4.4 A KALDOR–ROBINSON MODEL

4.4.1 Presentation of the Model

In this section we present a simple model which captures the basic elements of the approaches of the early Nicholas Kaldor and of Joan Robinson towards distribution and growth, without being able to take into account all the differences between these two approaches. As mentioned in the introduction to this chapter, in the distribution and growth literature, the approach to be outlined in this section has been termed 'post-Keynesian' (Kurz and Salvadori 1997, p. 485), 'neo-Keynesian' (Marglin 1984a, p. 69, 1984b; Dutt 1990a, p. 31; Lavoie 1992, p. 284) or 'Keynesian-type' (Amadeo 1986a).[52] We will call this model the 'Kaldor–Robinson' or the 'post-Keynesian' model, and will distinguish it from those models in the tradition of Michal Kalecki and Josef Steindl that are discussed in the following chapters of this book.

We assume a closed economy without a government sector, which is composed of two classes, workers and capitalists. Workers offer labour power to capitalists and receive wages, which they use in order to purchase consumption goods. We assume a classical saving hypothesis so that there is no saving from wages. Labour power is usually in excess supply, such that production is generally not constrained by the available labour force. In this respect we follow Robinson's approach and not the early Kaldor models. Capitalists own the means of production and receive profits, which are partly consumed and partly saved – buying assets issued by the corporate sector and thus the capitalists themselves or depositing parts of the profits with the financial sector, which is also owned by the capitalists and not explicitly modelled here. Therefore, in this simple version of the model we do not distinguish between active industrial capitalists and rentiers living from the proceeds of financial wealth, nor between the rates of return on capital stock and on financial wealth, that is interest or dividend rates.[53] Capitalists own the capital stock, hire labour, organize the production process, and decide about the investment and thus the expansion of the capital stock. For the latter they draw on their own means of finance, issue corporate bonds or draw on credit granted by the financial sector, which is not explicitly modelled here. By assumption all these transactions take place within the capitalist class.

We assume that in our economy a homogeneous output (Y) is produced combining direct labour and a non-depreciating capital stock in the production process. The homogeneous output can be used for consumption and investment purposes. For the sake of simplicity we abstract from overhead labour, depreciation of the capital stock, as well as raw materials and intermediate products. The technical conditions of production, that is the capital–potential output ratio ($v = K/Y^p$) and the labour–output ratio ($a = L/Y$), are each assumed to be constant, which means we also exclude technical progress from the model. Y^p denotes potential output determined by full or normal utilization of the capital stock, and u stands for the rate of utilization of productive capacities given by the capital stock. Remember that we assume that labour power is usually in excess supply and hence does not constrain output.

For such an economy, the relation between the real wage (w^r), the profit rate (r) and the rate of capacity utilization (u), with constant production coefficients (a, v), can be written as follows:

$$r = \frac{\Pi}{pK} = \frac{\Pi}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = \frac{pY - wL}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = \frac{Y - w^r L}{Y}\frac{Y}{Y^p}\frac{Y^p}{K} = (1 - w^r a)u\frac{1}{v}. \tag{4.58}$$

The sum of profits is denoted by Π, the real capital stock by K, output by Y and potential output by Y^p. As usual, the general price level is represented by p.

In the Kaldor–Robinson model a flexible price level is assumed which is affected by supply and demand variations in the goods market. The real wage rate is given by the nominal wage rate (w) and the price level, so that $w^r = w/p$. It is assumed that the nominal wage rate is less flexible – or more rigid – than the price level in the goods market. Furthermore, in both Robinson's and Kaldor's work the long-period full or normal utilization of the productive capacities given by the capital stock is assumed, so that the rate of capacity utilization in equilibrium will be at its normal level, which for the sake of simplicity we have set equal to one:

$$u^* = u_n = 1. \tag{4.59}$$

As will be seen in the following chapters of this book, these two features are what distinguish the Kaldor–Robinson model from the Kaleckian models discussed in the following chapters. First, the Kaleckian models are set in an oligopolistic/monopolistic competition framework in which firms have price setting power and in which the price level in the goods market does not flexibly respond to changes in demand and supply. Second, the rate of capacity utilization in these models is not exogenously fixed at some normal rate, but may diverge from the normal rate, which itself may become endogenous with respect to the actual rate.

In the Kaldor–Robinson model, assuming equation (4.59) to hold, equation (4.58) simplifies to:

$$r = (1 - w^r a)\frac{1}{v}, \tag{4.60}$$

which describes the supply side or the supply constraint of the model, and clearly represents an inverse relationship between the rate of profit and the real wage rate, given the assumption of a constant production technology (a, v).

Functional income distribution in the model is determined by Kaldor's 'Keynesian theory of distribution' or Robinson's 'double-sided relationship between the rate of profit and the rate of accumulation', as discussed above. Investment, and hence capital accumulation, is independent of saving, and saving adjusts to investment through the redistribution of income. Since we assume a classical saving function, the saving rate (σ), which relates total saving to the nominal capital stock, is given by the profit rate (r) and the saving ratio out of profits (s_Π):

$$\sigma = \frac{S}{pK} = \frac{s_\Pi \Pi}{pK} = s_\Pi r, \quad 0 < s_\Pi \leq 1. \tag{4.61}$$

Capitalists' investment decisions depend on their expected profit rate, which is given by the realized rate of profit in the previous period ($r_t^e = r_{t-1}$).[54] Hence, in a linearized form, the accumulation function (g) can be written as:

$$g = \frac{pI}{pK} = \alpha + \beta r^e, \quad \alpha,\beta > 0. \tag{4.62}$$

In this function, α represents those factors which have an impact on capital accumulation independent of the profit rate. It can thus be taken to represent the animal spirits of the capitalists with respect to real investment. The variable β represents the direct influence of the expected profit rate on the accumulation rate. Animal spirits might also affect the intensity of the reaction of capital accumulation with respect to profits and might thus also have an impact on β, as Lavoie (1992, p. 286) argues. However, we will here interpret animal spirits rather to be the shift variable in our accumulation function.

In each period, the saving rate (equation (4.61)) flexibly adjusts to the accumulation rate (equation (4.62)) through a variation in the rate of profit (equation (4.60)). A change in the accumulation rate causes a change in demand in the goods market, triggering a change in the price level, in the real wage rate, in the rate of profit and hence in the saving rate. In equilibrium, the rate of capital accumulation has to be constant, and therefore, with the assumption of adaptive expectations, the realized rate of profit included in equation (4.61) has to be equal to the expected rate of profit included in equation (4.62):

$$r^* = r_t = r_t^e = r_{t-1}. \tag{4.63}$$

Therefore, from equations (4.61) and (4.62) we obtain for the equilibrium profit rate:

$$g(r^*) = \sigma(r^*) \quad \Rightarrow \quad r^* = \frac{\alpha}{s_\Pi - \beta}. \tag{4.64}$$

Inserting the solution for the equilibrium profit rate into equation (4.61) for the saving rate or into equation (4.62) for the accumulation rate, one receives the following expression for the equilibrium accumulation and saving rate:

$$g^* = \sigma^* = \frac{s_\Pi \alpha}{s_\Pi - \beta}. \tag{4.65}$$

In order for such an equilibrium to be stable, the saving decisions have to react more elastically than the investment decisions towards a variation of the endogenous variable, the profit rate. Hence, the Kaldorian–Robinsonian stability condition has to hold, in order to obtain stable equilibria:

$$\frac{\partial\sigma}{\partial r} - \frac{\partial g}{\partial r} > 0 \quad \Rightarrow \quad s_\Pi - \beta > 0. \tag{4.66}$$

If the condition (4.66) is not met, potential equilibria will be unstable, and as soon as the model economy diverges from equilibrium we should see cumulative processes which move it further away from equilibrium. For the further discussion of the model we assume the equilibria to be stable, which however does not imply that in real world economies this has to be so.

Graphically, the accumulation equilibrium of the Kaldor–Robinson model can be derived as in Figure 4.5. The left-hand quadrant represents the inverse relationship between the real wage rate and the rate of profit, the wage–profit frontier, with the assumptions of a given production technology and a normal rate of capacity utilization prevailing (equation (4.60)). The right-hand quadrant represents the saving rate (equation (4.61)) and the accumulation rate (equation (4.62)), each as functions of the rate of profit. The intersection of the saving and the accumulation function in the right-hand quadrant simultaneously determines the equilibrium rates of profit and capital accumulation. From the wage–profit curve in the left-hand quadrant, the real wage rate is determined as a residual variable. As can easily be checked, applying the considerations already outlined in Subsection 4.3.2 when discussing Figure 4.4, the stability of the equilibrium requires that the slope of the saving function with respect to the rate of profit has to exceed the slope of the accumulation function (condition (4.66)).

An increase of the propensity to save out of profits reduces the

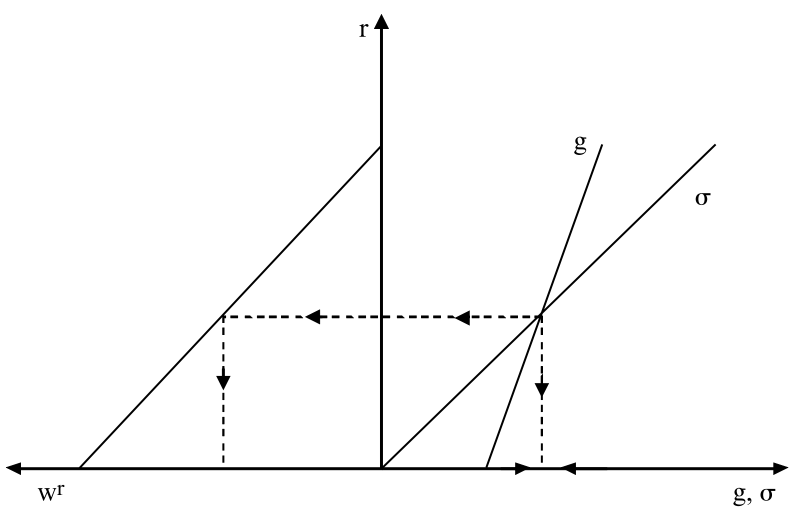


Figure 4.5 The accumulation equilibrium in the Kaldor–Robinson model

equilibrium rates of profit and capital accumulation – and raises the equilibrium real wage rate, as can be obtained from equations (4.64) and (4.65):

$$\frac{\partial r^*}{\partial s_\Pi} = \frac{-\alpha}{(s_\Pi - \beta)^2} < 0, \tag{4.64a}$$

$$\frac{\partial g^*}{\partial s_\Pi} = \frac{-\alpha\beta}{(s_\Pi - \beta)^2} < 0. \tag{4.65a}$$

Thus, the paradox of saving is valid in the long-period context, too. This can also be shown graphically in Figure 4.6. An increasing propensity to save from profits means a clockwise rotation in the saving function, from σ_1 to σ_2, and thus an equilibrium with lower rates of profit and capital accumulation, but a higher real wage rate.

As we have already outlined above, the adjustment towards the new equilibrium takes place via a variation of the price level, which, with rigid nominal wages, means a change in the real wage rate and in the rate of profit. Let us follow the process once again. If for example, starting from an equilibrium, animal spirits improve and the accumulation function gets shifted to the right, from g_1 to g_2 in Figure 4.7, aggregate demand in the goods market increases, prices rise and the rate of profit increases. A higher rate of profit will then increase profit expectations and thus further boost capital accumulation, prices increase even further and raise the rate

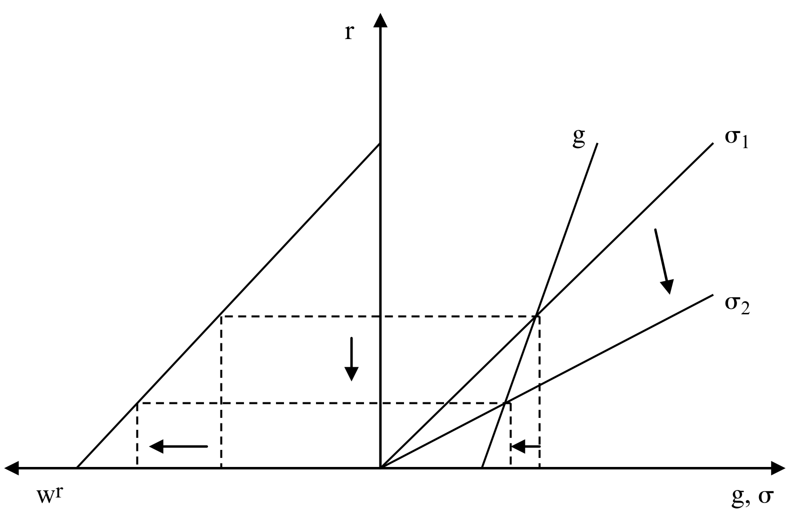


Figure 4.6 The paradox of saving in the Kaldor–Robinson model

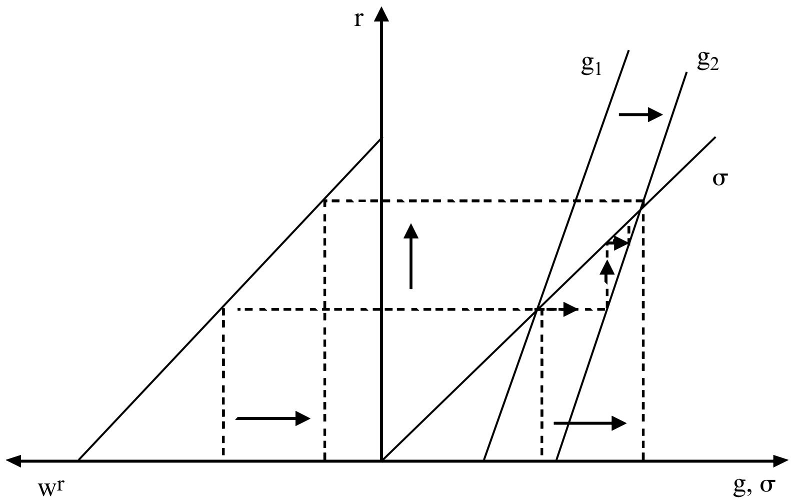


Figure 4.7 An increase of the propensity to accumulate in the Kaldor–Robinson model

of profit, and so on, until realized and expected rate of profit are equal. In this process the real wage rate gradually declines towards its new equilibrium level.

The adjustment mechanism toward a new equilibrium only works if there is no constraint imposed by the inflation barrier. However, if workers defend a certain 'conventional' real wage (w^k), as shown in Figure 4.8, an accumulation equilibrium will not be reached if the real wage rate associated with this notional equilibrium falls short of the conventional real wage rate. The result will be a price–wage–price spiral, mutually fed from inflationary demand pressure in the goods market and real wage resistance in the labour market, and the system will be constrained by the inflation barrier.

As Robinson (1956, pp. 48–50, 1962, pp. 58–59) discussed, when the inflation barrier is reached an accumulation equilibrium can only be obtained via a reduction of the propensity to accumulate, that is through a leftward shift or a counter-clockwise rotation of the accumulation function, or via an increase in the propensity to save, that is through a clockwise rotation of the saving function.[55] Therefore, in order to avoid cumulative inflation, either monetary and interest rate policies would have to restrict the firms' willingness and ability to accumulate by raising the interest rate (Gram and Walsh 1983, p. 540), or the propensity to save needs to be raised, for example through an encouragement of firms to increase the retention ratio

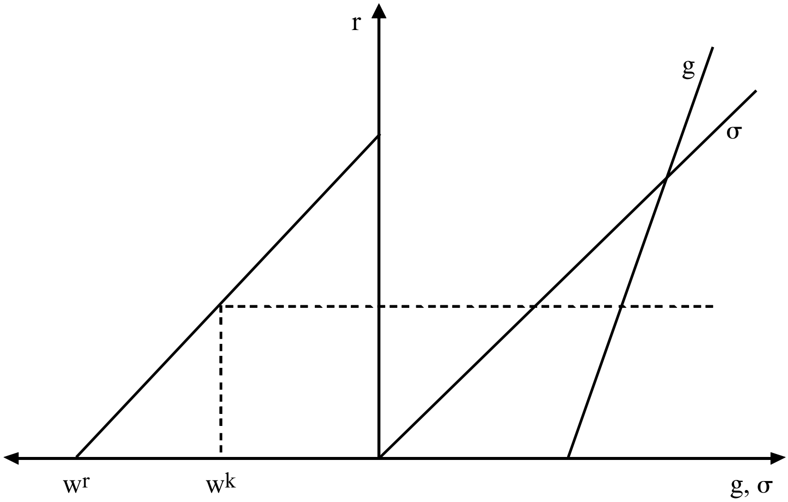


Figure 4.8 The inflation barrier in the Kaldor–Robinson model

of profits.[56] Therefore, at the inflation barrier, higher thriftiness would make a higher accumulation rate possible and thus invalidate the paradox of thrift: 'When it is the real wage (whether at a miserable or a comfortable level) which limits the rate of growth, greater thriftiness makes more investment possible in a perfectly straightforward and unambiguous sense' (Robinson 1962, p. 63).

In particular Asimakopulos (1991, pp. 180–181) has underlined this conclusion from Robinson's work and has stressed that, in certain constellations, Robinson's 'restrained' and 'bastard golden ages', a higher degree of thriftiness would result in a higher rate of capital accumulation.

But does workers' real wage resistance necessarily lead to cumulative inflation which then requires the remedies outlined above? Marglin (1984b) has presented a model, which he calls a 'hybrid model' including Marxian and Kaldorian–Robinsonian features.[57] In the model workers try to defend a conventional real wage rate, the Marxian feature, and capitalists' accumulation is independent of saving, the Kaldorian–Robinsonian or post-Keynesian feature. Generally, the model is overdetermined, with Robinson's inflation barrier being the typical constellation. As shown in Figure 4.9, in Marglin's model an equilibrium rate of inflation is the way out of this overdetermination. He derives an equilibrium in which nominal wage and price inflation are exactly equal so that the real wage rate and the rate of profit are each constant in this equilibrium, but workers are

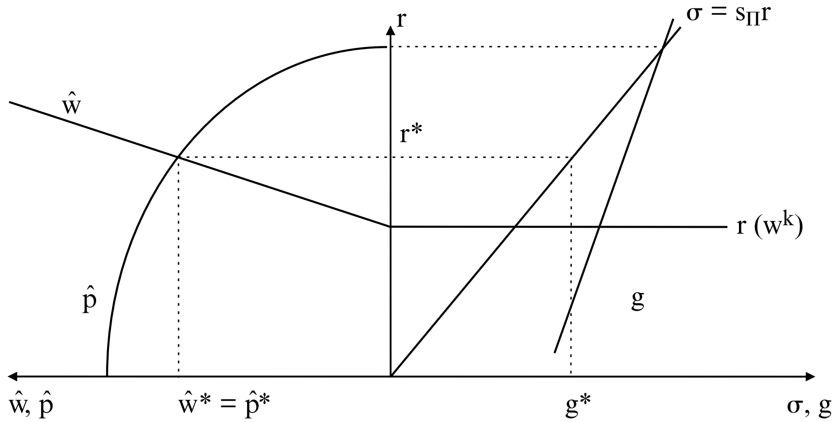


Figure 4.9 Accumulation and growth equilibrium in Marglin's model

not able to obtain their target or conventional real wage rate and nor are capitalists able to realize their accumulation plans in real terms:

> Indeed equilibrium may be described in terms of a balance between the pressure of aggregate demand on aggregate supply and the pressure of workers on wages: inflation measures both the frustration of workers trying to maintain a conventional wage and the frustration of capitalists trying to carry out their investment intentions. (Marglin 1984b, p. 131)

In Marglin's (1984b) model, an improvement in firms' animal spirits, and thus a higher propensity to accumulate at a given rate of profit, leads to a new equilibrium with a higher constant rate of wage and price inflation, a higher rate of profit and a higher rate of capital accumulation. A higher level of the workers' conventional real wage rate leads to a higher equilibrium rate of wage and price inflation, but to lower rates of profits and capital accumulation. Interestingly, an increase in the propensity to save from profits has no unique effects in this model, and the overall impact on the equilibrium depends on the slope of the accumulation function. With a profit rate inelastic accumulation function, a higher propensity to save may be expansionary and lead to a lower rate of inflation and a lower rate of profit but a higher rate of capital accumulation. However, with highly elastic responses of capital accumulation towards a change in the profit rate, a higher propensity to save will cause a lower equilibrium rate of inflation, a lower rate of profit, but also a lower rate of capital accumulation. Therefore, in this case the paradox of thrift would also be valid when the model economy reaches the inflation barrier.

Although Marglin's approach may provide an alternative to cumulative inflation as derived from Robinson's inflation barrier and presents a more differentiated view regarding the paradox of thrift in this case, the approach has been criticized by Nell (1985) and Dutt (1987) for two major reasons. First, the model requires quite special assumptions regarding nominal wage and price inflation if the economy is out of equilibrium in order to adjust it towards the equilibrium constellation of a constant rate of nominal wage and price inflation. For example, if the accumulation rate is too high for the equilibrium, nominal wages have to rise faster than prices in order to increase the real wage rate and lower the rate of profit and thus bring the accumulation rate down. However, if the accumulation rate is too low for the equilibrium, prices have to rise faster than nominal wages, in order to lower the real wage rate, raise the rate of profit and thus stimulate the rate of accumulation. Marglin presents no rationale as to why these particular wage and price reactions should prevail. Second, Marglin, following both Kaldor and Robinson, assumes that productive capacities given by the capital stock are utilized at their normal or full degree. This assumption precludes quantity adjustments towards changes in aggregate demand from long-period analysis and restricts the focus on price adjustment. This is not fully convincing, as will be explained in the next subsection, assessing the Kaldor–Robinson model.

4.4.2 Problems of the Kaldor–Robinson Model of Distribution and Growth

The Kaldor–Robinson model of distribution and growth outlined in the previous subsection is an important didactical and pedagogical tool for presenting some Keynesian principles for long-period analysis. Of course, the model outlined here is a very simple one with highly restrictive assumptions. Therefore, it would need further 'realism' in order to derive economic policy implications and conclusions from the model, for example the introduction of a government and a foreign sector and the explicit modelling of the relationships between a production and a financial sector. However, before making the model more realistic the very foundations have to be carefully scrutinized. Basically, three partly interrelated issues have to be touched on.

First, the model is set in a flexible price framework regarding the goods market, in which changes in aggregate demand trigger immediate price reactions. With respect to the labour market, rigid nominal wages have to be assumed for the required changes in distribution and adjustments towards the respective long-period equilibrium to take place. Whereas for the short period more rigid nominal wages than prices is a plausible assumption, it is difficult to accept why this assumption should also hold in the long period, when workers and trade unions have time to adjust their expectations, claims and behaviour. Therefore, in constellations with soaring capital accumulation, successful short-period redistribution generated by surprise inflation and fixed nominal wage contracts might occur. However, distribution conflict and thus the inflation barrier could be more than just an exceptional case in the long period. In other words, the role of distribution conflict may be seriously underestimated in the Kaldor–Robinson approach, in particular in situations with high or rising employment. In constellations with weak or falling capital accumulation it is again questionable whether prices are generally more flexible than nominal wages. Why should firms not respond by means of lowering their rates of capacity utilization and keep prices constant, in particular, if the economy is dominated by oligopolistic or monopolistic competition? This leads us to a second major problem.

Second, the Kaldor–Robinson model assumes that long-period analysis should treat the rate of utilization of productive capacities given by the capital stock as fixed at some normal or full level. This assumption implies that, with a given production technology, a higher rate of capital accumulation and a higher rate of profit require a lower real wage rate, because the economy is always exactly on the wage–profit frontier. In other words, the model includes a strictly inverse relationship between capital accumulation and the real wage rate and between the profit rate and the real wage rate. Adjustments of the rate of capacity utilization, and therefore the option of increasing both, the rates of accumulation and profit, on the one hand, and the real wage rate, on the other hand, are ruled out by the assumption.

Third, if quantity adjustments were also considered to be relevant in long-period analysis, they should be made visible in the accumulation function, too. Of course, for a capitalist economy the determination of the decisions to invest and to expand the capital stock should be governed by actual and expected profitability. However, profitability or the rate of profit is itself composed of different elements, which – with the assumed constancy of the technical conditions of production – determine the rate of profit from the cost side (the real wage rate or the profit share) and from the demand side (the rate of capacity utilization). Therefore, these determinants should be made visible in the accumulation function, because they contain different types of information for the firm.

Given these problems and restrictions inherent to the Kaldor–Robinson model, we will turn to an alternative post-Keynesian approach based on the works of Michal Kalecki and Josef Steindl in the following chapters. However, in Chapter 11, dealing with the critique of the Kaleckian–Steindlian approach towards distribution and growth, we will also come back to the Kaldor–Robinson approach.

NOTES

1. On Kaldor's life and work, see the intellectual biographies by Thirlwall (1987), Targetti (1992) and King (2009), as well as the contributions by Wood (1987), Thirlwall (1996, 2012), Harcourt (2006, pp. 172–176) and Pasinetti (2007, chap. V). See also Kaldor's (1980) overview of his own work in his 'General introduction to *Collected Economic Essays*', as well as in his 'Introduction' to his *Further Essays on Economic Theory* (Kaldor 1978). On a discussion of Kaldor's contributions to economics see the edited book by Nell and Semmler (1991) and the special issues of *Kyklos*, 1981, **34** (4) and the *Review of Political Economy*, 2009, **21** (3). Overviews of the Kaldorian approach to distribution and growth can be found in the publications mentioned above and furthermore in Kregel (1971, chap. 9), Pasinetti (1974, chap. V), Kromphardt (1977, pp. 113–120), King (2002, chap. 3, 2010) and Kurz and Salvadori (2010), among others.
2. King (2010, p. 165) points out that Kaldor did not attempt to synthesize his different approaches in order to obtain a coherent approach to distribution and growth: 'Kaldor's writings did not add up to a comprehensive and coherent alternative to mainstream economic theory, and indeed he himself never really aspired to anything of the sort. But he did supply a large set of rich and provocative ideas, positive as well as negative, to be used in the construction of an alternative economics of growth.'
3. This assumption has made Paul Samuelson (1964, p. 345) call him a 'Jean-Baptiste Kaldor'.
4. Skott (1989a, p. 23) also holds that Kaldor considered the full employment assumption as a 'stylized fact'.
5. On Kaldor's 'Keynesian theory of distribution' see Kregel (1971, chap. 9), Pasinetti (1974, pp. 103–107), Kromphardt (1977, pp. 113–120), Thirlwall (1987, chap. 6), Asimakopulos (1988), Targetti (1992, chap. 5), Krämer (1996, chap. VII.B), Kurz and Salvadori (1997, chap. 15.4, 2010), King (2002, chap. 3, 2010) and Harcourt (2006, pp. 6–11).
6. Targetti (1992, pp. 109–110) points out that Kaldor was also influenced by Hanns-Joachim Rüstow (1951, 1984), a German Keynesian, who, against the background of a differential productivity structure within the economy as a whole, argued that investment as the exogenous variable determines not only output and employment but also functional income distribution. On Rüstow in comparison to Keynes and Kalecki, see Kaldor (1983).
7. See Kalmbach (1972, pp. 154–162) for an extensive discussion. Kaldor (1955/56, p. 95) is not precise in this regard. He talks about the 'marginal propensities to save from profits' and 'from wages', but also about 'the wage-earners' and the capitalists' propensities to save'.
8. This argument underlines that equation (4.3) was meant to include the propensities to save from wages and from profits and not the saving propensities of workers and capitalists. See also Kaldor (1959/60) on this interpretation.
9. We assume that firms' target rate of capacity utilization $u_n = 1$. See Chapter 2 on this.
10. Kaldor (1955/56) also discusses a similar restriction given by the 'degree of monopoly' determining a minimum rate of profit owing to imperfections of competition, collusive agreements, etc. However, this seems to violate his assumption of demand determined prices at the very beginning of his model. As we will see in Chapter 5 of this book dealing with Kalecki's theory of distribution, imperfect competition and a positive 'degree of monopoly' are associated with cost determined prices and quantity adjustments towards changes in demand instead of price adjustments.
11. Kaldor was highly critical of the neoclassical aggregate marginal productivity theory of distribution, not only in the 'Alternative theories of distribution'. There he summarizes the conceptual problems of this approach as follows: 'In fact the whole approach which regards the share of wages and of profits in output as being determined by the marginal rate of substitution between Capital and Labour – with its corollary, that the constancy of relative shares is evidence of a unit-Elasticity of Substitution between Capital and Labour – is hardly acceptable to present-day economists. Its inadequacy becomes

evident as soon as it is realised that the "marginal rate of substitution" between Capital and Labour – as distinct from the marginal rate of substitution between labour and land – can only be determined once the rate of profit and the rate of wages are already known' (Kaldor 1955/56, p. 91). Furthermore, he adds: 'Quite apart from all conceptual difficulties, the theory focuses attention on a relatively unimportant feature of a growing economy. For accumulation does not take the form of "deepening" the structure of capital (at a given state of knowledge) but rather in keeping pace with technical progress and the growth in the labour force' (Kaldor 1955/56, p. 91).

12. On the classical distribution and growth theory see, for example, Pasinetti (1974, chap. 1), Harris (1987) and Kurz and Salvadori (2003). On Marx's and Marxian theories of distribution and capital accumulation see, for example, Shaikh (1978a), Marglin (1984a, chap. 3, 1984b), Levine (1988) and Catephores (1989).
13. On the so-called 'Pasinetti theorem' or 'Pasinetti paradox' see also the outlines and discussions in Kregel (1971, chap. 10, 1973, chap. 14), Asimakopulos (1988), Skott (1989a, chap. 3.5), Targetti (1992, chap. 6), Kurz and Salvadori (1997, chap. 15.4, 2010) and King (2002, pp. 70–71).
14. This is the constellation Pasinetti (1974, pp. 116–118) attributes to a socialist economy, in which the capital stock is owned by the state and the workers, and there are no capitalists, and hence there is no capitalist consumption. The surplus in excess of wages, which is not paid out to the workers as profits, is thus retained and hence saved by definition.
15. Note that this is the condition when the Kaldor (1955/56) approach reaches its limit, too. See also Kaldor's (1966b) response to the critique by Samuelson and Modigliani (1966a) in their so-called 'anti-Pasinetti theorem'.
16. Baranzini and Mirante (2013) have recently presented a comprehensive review of several further extensions of the Kaldor–Pasinetti Cambridge post-Keynesian school of income and wealth distribution.
17. For outlines and discussions of Kaldor's neo-Pasinetti theorem, see Skott (1989a, chap. 3.6), Targetti (1992, chap. 6.4), Lavoie (1996a) and Panico (1997).
18. As noted by Lavoie (1996a, p. 418, emphasis in the original), 'Kaldor's *valuation ratio* is no different from Tobin's better-known *q-ratio*, which appears in many neoclassical models'.
19. For overviews and discussions of Kaldor's growth models see Kregel (1971, chap. 9), Kromphardt (1977, pp. 113–120), Kaldor (1978), Thirlwall (1987, chap. 6), Skott (1989a, chap. 3.4), Targetti (1992, chap. 5), King (2002, chap. 3, 2010) and Harcourt (2006, pp. 114–119).
20. In 'A new model of economic growth', Kaldor and Mirrlees (1962) avoid the concept of a quantity of capital and its rate of growth, but rather apply a vintage approach and focus on the flows of current gross investment and their respective determinants. Technological progress is only embodied in the latest vintage of investment in capital stock, and the productivity effects are related to workers operating on new equipment. The full employment assumption is maintained in this model, too.
21. As Robinson (1962, p. 86) has pointed out, the explicit introduction of the capital–output ratio into Kaldor's investment functions leads to some problems and implausible conclusions.
22. 'One of the merits of the present model is that it shows that the constancy in the capital/output ratio, in the share of profit and in the rate of profit can be shown to be the consequence of endogenous forces operating in the system, and not just the result of some coincidence' (Kaldor 1957, p. 593).
23. According to King (1998) this was the fundamental disagreement between Nicholas Kaldor and Joan Robinson, which contributed to the erosion of their personal relationship.
24. See Hein and Stockhammer (2010, 2011b) for a model in which workers and trade unions have a target wage share when it comes to wage bargaining, and in which inconsistent targets of workers and firms lead to accelerating (or decelerating) inflation.

25. On Kaldor's applied economics of growth, see in particular Thirlwall (1987, chap. 7), Targetti (1992, chap. 7), King (2009, chap. 4, 2010) and Palumbo (2009). For an explanation of the changes in his distribution and growth approaches in the course of the 1960s and 1970s see also Kaldor (1978, 1980).
26. For further extensions towards an explicit discussion of development issues, which is far beyond the scope of this chapter, see Thirlwall (1987, chap. 8), Targetti (1992, chaps 8–9), Kaldor (1996), Skott (1999) and King (2009, chap. 6, 2010).
27. Static increasing returns to scale are related to the level of output, whereas dynamic increasing returns to scale are related to the rate of growth of output.
28. On Verdoorn's law see also the contributions in McCombie et al. (2002a).
29. 'It is the growth of demand for the products of manufacturing industry, and not the constraints on supply, which determines how fast overall productivity and hence total output will grow in an advanced industrial economy' (Kaldor 1978, p. xxi).
30. The formal presentation of the model goes back to Dixon and Thirlwall (1975). For alternative presentations and extensions of the model, including institutional change and path dependence issues, i.e. feedback effects of the disequilibrium process on the initial conditions and the behavioural coefficients determining the equilibrium, see Setterfield (2002b, 2013a), Setterfield and Cornwall (2002) and Blecker (2013).
31. See McCombie (2011b) for a review of empirical literature supporting the notion of export-led growth.
32. For an extension of the model including capital flows (for example long-term credit or foreign direct investment) financing current account deficits see Thirlwall and Hussain (1982) and Thirlwall (2002, pp. 74–78). For a comparison of the balance-of-payments-constrained growth model with the export-led cumulative causation growth model see Blecker (2013).
33. See also Setterfield (2011, p. 404, emphasis in the original), who argues that empirically '*both* the Marshall–Lerner condition *and* RPPP [relative purchasing power parities, E.H.] are more likely to assert themselves in the long run'. If relative purchasing power parities and the Marshall–Lerner condition both do not hold in the short run, changes in relative price competitiveness would not have the expected effect on the balance-of-payments-constrained growth rate in the short run either. See also Blecker (2013) on this issue.
34. Thirlwall's law is therefore considered to be the dynamic version of Harrod's (1933) static foreign trade multiplier which established a multiplier relationship between the levels of exports and GDP: $Y = X/\mu$, with μ denoting the propensity to import or the import share in GDP ($\mu = M/Y$).
35. And these economic policy conclusions are considered to be fully in line with Kaldor's recommendation: 'The distinguished development economist Ajit Singh tells how, when he first went to Cambridge to study economics, Nicholas Kaldor taught him three things: first, the only way for a country to develop is to industrialize; second, the only way for a country to industrialize is to protect itself; and third, anyone who says otherwise is being dishonest!' (Thirlwall 2002, p. 77).
36. See Hein, Truger and van Treeck (2012) for an application of Thirlwall's concept of a balance-of-payments-constrained growth rate to a currency union, to an assessment of the imbalances which have arisen in the Euro area since its inception and a discussion of policy alternatives based on this concept.
37. For theoretical developments and empirical tests of the balance-of-payments-constrained growth model see also the essays in McCombie and Thirlwall (2004).
38. For further contributions on this issue see Setterfield (2013a, 2013b).
39. Overviews of the life and work of Joan Robinson can be found in Gram and Walsh (1983), Pasinetti (1987, 2007, chap. IV), Harcourt (1995, 2005, 2006, pp. 166–169), Harcourt and Kerr (2009) and Marcuzzo (2012). See also the contributions to the edited book by Gibson (2005) and to the special issue of the *Review of Political Economy*, 2003, **15** (4). Summaries of her contributions to distribution and growth theory can be found in the publications mentioned above and in Kregel (1971, chap. 11), Asimakopulos (1991, chap. 8) and King (2002, chap. 3), among others.

40. An early attempt had already been made in 'The long-period theory of employment' (Robinson 1937b), which however contained a static long-period equilibrium with zero net investment and the rate of interest determining the equilibrium capital stock. Another attempt going beyond static long-period equilibrium reasoning was presented in 'The generalisation of the *General Theory*' (Robinson 1952).
41. In the acknowledgements in her *The Accumulation of Capital*, we can read: 'My debt to Keynes, Wicksell and Marshall is the debt we all owe to our progenitors . . . Michal Kalecki, though a contemporary, comes into the same category' (Robinson 1956, p. vi).
42. See Cohen (1993), Dutt (2005a), Harris (2005) and Skott (2005) on Robinson's view on history and equilibrium and the related implications.
43. On the title page of Robinson (1962), we find the following quotation: 'Time is a device to prevent everything from happening at once (Bergson).'
44. As Gram and Walsh (1983) have pointed out, there was a tendency in Robinson's later work to identify equilibrium models per se with neoclassical theory and, therefore, to reject any type of formal modelling. See Dutt (2005a) and Skott (2005) on the problems of such an attitude.
45. On Robinson's assessment of Harrod's approach see Robinson (1956, pp. 404–406, 1962, pp. 82–87).
46. See also the treatment of the issues in Chapters 7–8 of *The Accumulation of Capital* (Robinson 1956).
47. On the role of finance for investment see also more extensively Robinson (1956, pp. 50–53, 243–244). There she concludes: 'The rate of investment (given the general state of expectations and the level of interest rates) thus very much depends upon the relation between the distribution of borrowing power among entrepreneurs to the distribution of lethargy or optimism amongst them. And the distribution of borrowing power depends partly upon legal rules and technical conditions in the capital market and partly upon the subjective attitude of potential lenders. Psychological factors come in on both sides of the account, and there is no way (even for the purpose of our model) of reducing the complexities of the inducement to invest to a simple formula. We must be content with the conclusion that, over the long run, the rate of accumulation is likely to be whatever it is likely to be' (Robinson 1956, p. 244).
48. If one includes exogenous shocks in the analysis, cumulative instabilities are also not excluded from the Robinson approach (Robinson 1962, pp. 63–69; Asimakopulos 1991, pp. 183–185).
49. On Robinson's views on (different types of) technological progress see Robinson (1956, chap. 9, 1962, chap. III).
50. The 'leaden age', the 'galloping platinum age', the 'creeping platinum age' and the 'bastard platinum age' (Robinson 1962, pp. 54–59) are not dealt with in this book. See Asimakopulos (1991, p. 182) for a short outline.
51. On the inflation barrier, see also Robinson (1956, pp. 48–50). There she also argues that, in an economy with extremely low real wages and weak workers and trade unions, employers might offer rising nominal wages in the face of rising prices in order to maintain the efficiency of labour in the production process, and thus enforce the inflation barrier.
52. For alternative presentations of this type of model – partly in comparison to other approaches, i.e. neoclassical, Marxian or Kalecki–Steindl models – see, for example, Marglin (1984a, chap. 4, 1984b), Amadeo (1986a), Dutt (1987, 1990a, chaps 2–3) and Lavoie (1992, chap. 6.2, 2014, chap. 6.1).
53. For an extension of the model presented in this section including a rentiers' class and an interest rate see, for example, Lavoie (1995a), Smithin (2003b) and Hein (2008, chap. 11).
54. See Lavoie (1992, p. 288) for a partially adaptive process in an otherwise similar model.
55. Gram and Walsh (1983) point out that Robinson does not regard the real wage claims of workers as the actual cause of inflation in such a situation. She considers the claims on distributed profits on the part of the rentiers as the central cause of the inflation pressure, because the saving ratio out of total profits is too low in such a situation.

56. If one dropped the assumption that workers do not save, an increase of the propensity to save out of wages would of course also contribute to the establishment of an equilibrium.
57. Harcourt (2006, chap. 6) has used this model in order to explain the different periods of growth and inflation after the Second World War.

5. Post-Keynesian distribution and growth theories II: Kalecki and Steindl

5.1 INTRODUCTION

An alternative post-Keynesian approach to distribution and growth to the one drawing on the contributions by Kaldor and Robinson can be based on the works of Michal Kalecki[1] and Josef Steindl[2]. As acknowledged, in particular by Robinson (1965, 1969, 1977), Klein (1975) and King (2002, chap. 2) among other authors, Kalecki had invented the 'principle of effective demand', that is the idea that the level of output and employment in an economy is governed by aggregate demand and that aggregate supply will adjust towards this level, even before Keynes, in a series of papers originally published in Polish.[3] Revised and translated versions became available in English only in the late 1930s (Kalecki 1939), and the English translations of the original versions were only published in the late 1960s (Kalecki 1969a). Kalecki's approach towards aggregate demand was highly influenced by Karl Marx's (1885) schemes of reproduction in *Capital, Volume 2*, and in particular by Rosa Luxemburg's (1913) *The Accumulation of Capital*.[4] Kalecki's approach differed from Keynes's in that Kalecki developed the theory of effective demand in a dynamic context and explicitly considered distributional issues right from the start. Kalecki's theory of effective demand is therefore inseparably linked with the theory of distribution and growth.

In contrast to the distribution and growth approaches by Kaldor and Robinson discussed in Chapter 4 of this book, Kalecki's approach assumes that the industrial sector of the economy is generally characterized by excess capacity, also in the medium to long run. And, in contrast to the early steady state equilibrium growth models by Kaldor, Kalecki also holds that capitalist economies are generally characterized by unemployment, such that the labour supply cannot generally be considered a constraint to growth. Therefore, in Kalecki's work there is no long-run tendency towards a predetermined full employment equilibrium growth path, and the long run is considered to be just a succession of short runs:

> In fact, the long-run trend is but a slowly changing component of a chain of short-period situations; it has no independent entity, and the two basic relations mentioned above [first, the effect of investment on aggregate demand, profits and national income and, second, the effect of the level and the rate of change of economic activity on investment decisions, E.H.] should be formulated in such a way as to yield the trend cum business-cycle phenomenon. (Kalecki 1971, p. 165)

Furthermore, Kalecki's theories are set in an oligopolistic or a monopolistic competition framework with respect to the industrial sector of the economy. Therefore, in this sector prices are not determined by demand but by the active cost determined price setting of firms. For the primary sector, however, with an inelastic supply in the short run it is assumed that changes in demand cause changes in prices. But, in the industrial sector, demand fluctuations lead to quantity adjustments of the firms and thus to variations in output and the degree of capacity utilization. According to Kalecki, firms set prices depending on the 'degree of monopoly' and calculate a mark-up on unit variable costs, that is the sum of unit material and unit labour costs. The mark-up has to cover fixed costs (including salaries for overhead labour) and the different types of aggregate profits (retained profits, dividends, interest, rent). Hereby it is assumed that the variable average costs are more or less constant up to full capacity output. Hence, Kalecki turns his approach explicitly against the neoclassical model of perfect competition and tries to present a concept of price determination closer to capitalist reality: 'Monopoly appears to be deeply rooted in the nature of the capitalist system: free competition, as an assumption, may be useful in the first stage of certain investigations, but as a description of the normal state of capitalist economy it is merely a myth' (Kalecki 1939, p. 41). As will be seen below, Kalecki's theory of mark-up pricing also provides a theory of functional income distribution and thus a link between micro- and macroeconomics.

Kalecki did not publish any definite treatise on the economics of modern capitalism, but presented his views on pricing, distribution, aggregate demand, investment, economic dynamics and growth (and several other issues) in journal papers and book chapters, which he then collected and published in several books. The important book publications for our purpose are the following. It started with *Essays in the Theory of Economic Fluctuations* (Kalecki 1939), *Studies in Economic Dynamics* (Kalecki 1943) and *Theory of Economic Dynamics* (Kalecki 1954). In *Studies in the Theory of Business Cycles, 1933–1939*, Kalecki (1969a) then published the English translations of his early Polish studies on the theory of the business cycle. A final collection was published posthumously as *Selected Essays on the Dynamics of the Capitalist Economy, 1933–70* (Kalecki 1971).

In what follows we will concentrate on Kalecki's theory of pricing, distribution, aggregate demand, investment, economic dynamics and growth in a developed capitalist economy. This implies that we will not get into Kalecki's contributions to the theory of growth either in a socialist economy or of a developing mixed economy, as outlined for example in his *Introduction to the Theory of Growth in a Socialist Economy* (Kalecki 1969b) or in his *Selected Essays on the Economic Growth of the Socialist and the Mixed Economy* (Kalecki 1972). These contributions were more concerned with supply-side problems and appropriate sectoral proportions in the production of investment and consumption goods in the process of economic growth.

In Section 5.2 we will start with Kalecki's pricing and distribution theory, which will be followed by Section 5.3 on the determination of national income and the level of profits. Section 5.4 will then deal with some debates on Kalecki's theory of pricing and distribution and will clarify some of the issues being raised, and in Section 5.5 we will deal with some further developments of mark-up pricing and distribution theories as proposed by Eichner (1976), Harcourt and Kenyon (1976), Wood (1975), Steindl (1952), Sylos-Labini (1969) and others. Section 5.6 will then address the determination of investment in Kalecki's theory and will outline his view on economic dynamics and growth. In Section 5.7 we will turn to Steindl's approach to distribution and growth and will sketch his theory of stagnation in mature capitalist economies. In Section 5.8, the final section of this chapter, we will then summarize the main elements of the Kaleckian–Steindlian approach to distribution and growth, to be modelled in more detail in the following chapters of this book.

5.2 KALECKI'S PRICING AND DISTRIBUTION THEORY

Kalecki's theory of functional income distribution is derived from his theory of pricing (Kalecki 1939, chap. 1, 1954, chaps 1–2, 1971, chaps 5–6).[5] Generally, Kalecki distinguishes between price determination of finished goods and of raw materials. In the primary sector of the economy (agriculture, fishing, mining) producing raw materials and agricultural products with inelastic supply in the short run, changes in demand cause changes in prices and thus in income distribution. However, in the manufacturing sector producing finished goods, changes in demand trigger changes in output and thus in the rate of capacity utilization, with prices being more or less rigid in the face of roughly constant unit variable costs up to full capacity output. The same is supposed to hold true for the construction, transportation and service sectors of the economy (Kalecki 1954, p. 30, 1971, p. 64). The rate of capacity utilization in these sectors therefore becomes endogenous in the Kaleckian approach.[6] Functional income distribution in the economy as a whole is thus mainly determined by active cost-plus or mark-up pricing of firms in incompletely competitive markets (monopoly, oligopoly, monopolistic competition, etc.), where firms have price setting powers to different degrees. Changes in aggregate demand, apart from directly affecting income distribution in the primary sector of the economy, might only have an indirect impact on distribution in the industrial and service sectors of the economy through effects on (the composition of) unit costs, as we will show below.

Focusing on the latest stage of development of Kalecki's pricing theory in Kalecki (1954, chap. 1, 1971, chap. 5),[7] we assume that firms in manufacturing, construction, transportation and services mark up marginal costs, which are assumed to be roughly constant up to full capacity output given by the available capital stock. Beyond full capacity output, marginal and average variable costs will be steeply rising. This implies that up to full capacity output the mark-up is applied to constant unit variable costs. This is shown in Figure 5.1, where mc represents marginal costs, uvc unit variable costs, p price, Y real output, and Y^p potential output given by the capital stock of the firm and the conventions regarding working hours, etc[8].

Unit variable costs are composed of unit direct labour costs and unit raw material costs. To the extent that raw materials are imported from

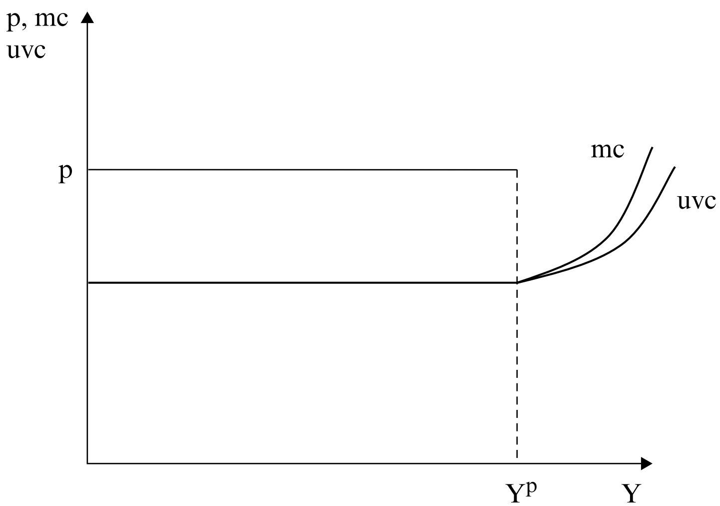


Figure 5.1 Output, costs and prices at the firm level

abroad, international trade can thus easily be included in the model, as will be shown in Chapter 7 of this book. In this approach, the mark-up has to cover overhead costs, that is depreciation of fixed capital and in particular salaries of overhead labour, on the one hand, and the different types of firms' profits, that is interest, dividend and rent payments as well as retained profits, on the other hand. Therefore, the price being set by a single firm (p) is composed of unit direct labour costs (W/Y), unit raw material costs (M/Y) and unit gross profits (Π/Y), including depreciation, overhead labour costs and the different types of profits (interest, dividends, rents, retained profits):

$$p_i = \left(\frac{W}{Y}\right)_i + \left(\frac{M}{Y}\right)_i + \left(\frac{\Pi}{Y}\right)_i. \tag{5.1}$$

Kalecki starts his analysis with the price setting of a single firm which usually operates below full capacity output given by its capital stock. Because of uncertainties, including those related to the price elasticity of demand, in his later work Kalecki (1954, p. 12, 1971, p. 44) does not assume 'that the firm attempts to maximize its profits in any precise sort of manner'.[9] This means he does not apply the orthodox profit maximizing condition of the equality of marginal cost and marginal revenue to determine price and output of the single firm.[10] Firms rather set prices by applying a constant mark-up to unit variable costs, which Kalecki called unit prime or unit direct costs, irrespective of the level of demand for their output, provided demand falls short of full capacity output. The mark-up of the single firm is determined by the interaction with other firms in the same industry, that is by competition with firms producing 'similar products':[11]

> 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. (Kalecki 1954, p. 12, 1971, pp. 44–45)

The price fixing policy of the individual firm, and hence the mark-up over unit variable costs (prime costs), 'reflect[s] what may be called the degree of monopoly of the firm's position' (Kalecki 1954, p. 13, 1971, p. 45). Changing Kalecki's exposition for our purposes, the individual firm will therefore set its output price as follows:[12]

$$p_i = (1 + m_i)(wa_i + p_m\mu_i), \quad m_i > 0, \tag{5.2}$$

with p_i denoting the output price of firm i, m_i the mark-up reflecting its price setting power or its degree of monopoly, w the uniform nominal wage rate, a_i the labour–output ratio, p_m the unit price of raw materials, and μ_i raw materials per unit of final output. The mark-up has to cover overhead costs (salaries, selling costs, depreciation of capital stock) and the different types of profits (interest, dividends, retained earnings). Interest and dividends can be considered to be overhead costs, too, from the perspective of the firm. Unit overhead costs and hence unit total costs decrease with the level of output and capacity utilization.

Taking weighted average values for unit variable costs, mark-ups and hence prices set by the individual firms within an industry, with the weights being given by the individual firm's share in nominal output of the industry as a whole, Kalecki arrives at an average price equation for industry j as a whole.[13] Kalecki (1954, pp. 14–15, 1971, pp. 47–49) is well aware that changes in unit prime costs or in the mark-up, and hence in the price set by a single firm, will change the weights for individual firms, which will then have an additional effect on the average price of the industry. In order to be able to abstract from inter-sectoral input–output relations with respect to intermediate products and to simplify the further analysis, we assume that each industry j is vertically integrated and uses fixed capital, labour and raw materials as inputs, but produces all the intermediate products within the industry.[14] For the average price in industry j we therefore obtain:

$$p_j = (1 + m_j)(wa_j + p_m\mu_j), \quad m_j > 0, \tag{5.3}$$

with the variables with subscript j denoting respective industry averages. The average price in an industry is thus determined by average unit direct labour costs, average unit raw material costs and the average mark-up of the industry. Below full capacity utilization, changes in demand will only affect average industry prices in the manufacturing, construction, transport and service sectors of the economy if there is an effect on unit variable costs, in particular on unit raw material costs, or if changes in demand cause a shift in the weights of the individual firms in the industry average.

Before discussing the determinants of the degree of monopoly and the mark-up further, let us derive the implications of Kalecki's price theory for functional income distribution, following Kalecki (1954, chap. 2, 1971, chap. 6). Since the relationship between unit raw material costs and unit labour costs (z_j) is given by:

$$z_j = \left(\frac{p_m \mu_j}{wa_j}\right), \tag{5.4}$$

the price equation for each industry can also be written as:

$$p_j = (1 + m_j)\left[wa_j\left(1 + \frac{p_m \mu_j}{wa_j}\right)\right] = (1 + m_j)\left[wa_j(1 + z_j)\right]. \tag{5.5}$$

Since unit gross profits $(\Pi/Y)_j$, including overheads, in each industry are given by:

$$\left(\frac{\Pi}{Y}\right)_j = m(wa_j + p_m \mu_j) = mwa_j(1 + z_j), \tag{5.6}$$

the gross profit share (h_j), including overhead costs and thus also management salaries, in gross value added of industry j is given by:

$$h_j = \frac{\Pi_j}{\Pi_j + W_j} = \frac{mwa_j(1+z_j)}{mwa_j(1+z_j)+wa_j} = \frac{(1+z_j)m_j}{(1+z_j)m_j+1} = \frac{1}{1+\dfrac{1}{(1+z_j)m_j}}, \tag{5.7}$$

with Π denoting gross profits including overhead costs and W representing wages for direct labour. For the corresponding share of wages for direct labour in gross value added $(1-h)_j$ we obtain:

$$(1 - h)_j = \frac{W_j}{(\Pi + W)_j} = \frac{1}{(1 + z_j)m_j + 1}. \tag{5.8}$$

The gross profit share (h), including overhead costs, for the economy – strictly speaking only for the manufacturing, construction, transport and service sectors of the economy – is given by the weighted average of the industry profit shares:[15]

$$h = \frac{\Pi}{(\Pi + W)} = \frac{(1 + z)m}{(1 + z)m + 1} = \frac{1}{1 + \dfrac{1}{(1 + z)m}}. \tag{5.9}$$

The wage share of direct labour $(1-h)$ for the economy is given by the weighted average of the industry wage shares:

$$(1 - h) = \frac{W}{(\Pi + W)} = \frac{1}{(1 + z)m + 1}. \tag{5.10}$$

Functional income distribution is thus determined by the mark-up in pricing of firms, by the relationship of unit raw material costs to unit direct labour costs, and by the industry or sector composition of the economy: 'broadly speaking, the degree of monopoly, the ratio of prices of raw materials to unit wage costs and industrial composition are the determinants of the relative share of wages in gross income of the private sector' (Kalecki 1954, p. 30, 1971, p. 64). With constant technical conditions of production (constant a and μ), an increasing gross profit share including overhead costs (a decreasing wage share of direct labour) can be caused by rising mark-ups, a falling nominal wage rate, rising prices of raw materials and/or a change in the industry or sector composition of the economy in favour of high profit share industries or sectors.[16] The change in demand for goods may have an impact on functional income distribution through the effects on prices of raw materials and through the effects on the composition of output, affecting the weights of single firms within an industry and the weights of single industries or sectors in the economy.[17]

What remains to be discussed in detail is the determinants of the degree of monopoly and hence of the mark-up in Kalecki's approach. According to Kalecki (1954, chap. 1, 1971, chap. 5) the degree of monopoly, and hence the mark-up, has mainly four determinants.

First, the mark-up is positively related to the degree of concentration within the respective industry or sector (Kalecki 1954, p. 17, 1971, pp. 49–50). A high degree of concentration within an industry makes price leadership by the most important firms, tacit agreements or more or less formal cartels more likely. The degree of concentration has thus a positive impact on the degree of monopoly and the mark-up, *ceteris paribus*.

Second, the degree of monopoly and the mark-up are negatively related to the relevance of price competition relative to other forms of competition, for example product differentiation, marketing and so on (Kalecki 1954, p. 17, 1971, p. 50). If price competition is replaced by other types of competition, the mark-up will therefore have a tendency to rise. The first two determinants of the mark-up can be summarized as the 'degree of price competition among firms in the goods markets'.

Third, Kalecki (1954, pp. 17–18, 1971, pp. 50–15) argues that overhead costs may affect the degree of monopoly and hence the mark-up. Since a rise in overhead costs squeezes profits, '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' (Kalecki 1954, p. 17, 1971, p. 50). However, Kalecki (1954, p. 18, 1971, p. 51, emphasis in the original) adds that '[t]he degree of monopoly *may*, but need not necessarily, increase as a result of a rise in overheads in relation to prime costs'.

Making the mark-up elastic with respect to different types of overheads and gross profit claims means that firms need to have a notion of normal or long-run average levels of output (Y_n) or rates of utilization of capacity given by the capital stock, because unit overhead costs or unit fixed costs (ufc) and hence unit total costs (utc) decrease with output, as is shown in Figure 5.2. Note that the long-run normal or target level of output may, but need not, fall short of the minimum of unit total costs, because firms may want to hold reserve capacities in order to be able to respond flexibly to changes in demand or to deter market entry by competitors, as we will explain in more detail below when dealing with the contributions by Steindl (1952) and Sylos-Labini (1969). The mark-up over unit variable costs at the target output level [$m_n = (p - uvc_n)/uvc_n$] can thus be seen as being determined by unit profits at the target output level ($u\Pi_n = p - utc_n$) required to obtain some target rate of return. Whenever unit fixed costs increase at

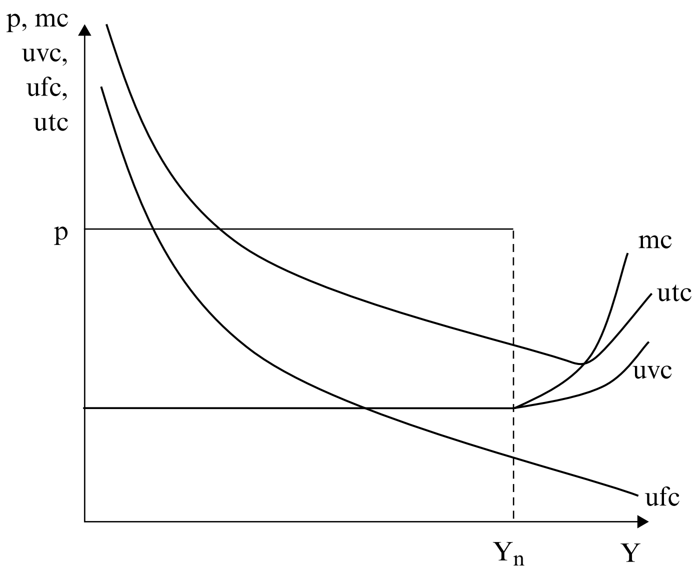


Figure 5.2 Target mark-up pricing given by the target rate of return at some target or normal level of output

the target level of output, which implies an upward shift in the ufc curve, firms will attempt to increase the mark-up over unit variable costs and hence increase prices. The mark-up approach thus becomes equivalent to a target rate of return approach, as Lavoie (1992, p. 135) has argued,[18] and the mark-up in equations (5.2) and (5.3) can be understood as being determined by a target rate of return at long-run average or normal levels of output or rates of capacity utilization.

Fourth, Kalecki (1954, p. 18, 1971, p. 51) claims that the power of trade unions has an adverse effect on the degree of monopoly and the mark-up. In a kind of strategic game at the firm level, firms anticipate that strong trade unions will demand higher wages if the mark-up and hence profits exceed 'reasonable' levels, so that the mark-up can only be sustained at the expense of ever rising prices and finally a loss of competiveness of the respective firm relative to other firms. This will induce the firm to constrain the mark-up in the first place. The same argument holds true for an industry relative to other industries. In Chapter 14 on 'Class struggle and distribution of national income', Kalecki (1971) elaborates on the effect of trade union power on the degree of monopoly and the mark-up, focusing explicitly on the industry level. In particular, if 'an increase in bargaining capacity is demonstrated by spectacular achievements' (Kalecki 1971, p. 162), trade unions will be successful in squeezing the mark-up and shifting income distribution in favour of workers. However, Kalecki (1971, p. 162) concedes that '[t]he rise in wages is to a great extent "shifted to consumers"', so that the distributional effect will be small.[19]

What is important for powerful trade unions to be successful in squeezing the mark-up is some heterogeneity on the part of the firms which limits their price setting power in the goods market.[20] Either wage bargaining takes place at the firm or the industry level, which implies that competing firms or competing industries are not facing an equivalent rise in wages and nominal unit labour costs, and therefore the ability of firms or industries facing wage hikes to shift the respective increase of unit labour costs to prices is constrained by the competition of other firms or industries, or there is foreign competition which constrains the power of domestic firms to shift domestic wage increases to prices, even if wage bargaining takes place at the national level.

Furthermore, it should be kept in mind that, even if trade unions have no effect on the mark-up charged by firms, they may, nonetheless, have an impact on functional income distribution by means of raising nominal wages and hence nominal unit labour costs relative to unit raw material costs, as can be seen from equations (5.4) and (5.10). In this case, as in the cases discussed above, an increasing wage share will be accompanied by rising prices, with the increase in output prices falling short of the increase in nominal unit labour costs.

Kalecki (1971, pp. 163–164) therefore concludes that 'the day-by-day bargaining process is an important co-determinant of the distribution of national income', but it 'is not the only way of influencing the distribution of national income to the advantage of the workers'. There are several alternatives, in particular price controls in order to keep the prices for wage goods low or subsidies of these prices financed by direct taxation of profits. The effects of such political interventions on the level of profits and national income will be briefly touched on in Section 5.3. Before that, let us address Kalecki's empirical work on income shares. For this purpose, Table 5.1 summarizes the determinants of functional income distribution for the manufacturing, construction, transport and service sectors of the economy, which dominate income distribution for the economy as a whole, according to Kalecki, as shown above.

Short- and long-run developments of functional income distribution are affected by the development of these determinants. Therefore, according to Kalecki (1954, p. 31, 1971, p. 65, emphasis in the original): 'No *a priori* statement is therefore possible as to the long-run trend of the relative share of wages in income.' Kalecki (1954, chap. 2, 1971, chap. 6) provides some considerations regarding the short- and long-run changes in the distribution of income in the UK and the US. We will focus here on the long-run trends. For US manufacturing in the period from 1879 until 1937, Kalecki finds an increasing degree of monopoly and hence rising mark-ups, indicated by a rising ratio of proceeds to prime costs. The ratio of raw material costs to wage costs shows a declining trend in this period. However, the increase in the degree of monopoly dominates the development of income distribution, so that the wage share in US manufacturing shows a falling trend, also when corrected for changes in the industry composition of manufacturing. For the distribution of national income in the UK in the

Table 5.1 Determinants of the gross profit share (including overhead costs) in a closed economy according to Kalecki

1. Degree of monopoly determining the mark-up in the price setting of firms
    a) degree of market concentration
    b) relevance of price competition
    c) overhead costs
    d) bargaining power of trade unions
2. Ratio of raw material costs to labour costs
3. Industry or sector composition of the economy

period from 1881 until 1924, Kalecki finds a roughly constant wage share. While the degree of monopoly has a tendency to rise in this period, its impact on the wage share is more or less compensated by a decline in the ratio of raw material costs to wage costs. Kalecki (1954, p. 34, 1971, p. 69, my emphasis) concludes:

> 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 material prices to unit wages costs.

From Kalecki's approach no general laws regarding the development of functional income distribution can be derived, neither a long-run constancy of the wage share, as in 'Bowley's law' and Kaldor's work discussed in Chapter 4 of this book,[21] nor a tendency of the wage share to fall, as in some interpretations of Karl Marx's theory.[22] Kalecki's approach to distribution is open to different long-run empirical tendencies. These depend on how the essential determinants of functional income distribution, the degree of monopoly, the ratio of unit raw material costs to unit wage costs and the industry or sector composition of the economy, evolve over time.

5.3 THE DETERMINATION OF PROFITS AND NATIONAL INCOME

Let us now consider the determination of the levels of national income and of profits in Kalecki's approach, as presented in Kalecki (1954, chaps 3–5, 1971, chaps 7–8).[23] If we abstract, as in the following discussion, from the explicit consideration of raw material costs and from changes in the industry or sector composition of the economy, the 'profit share' will be determined exclusively by the mark-up in the pricing procedure of firms, as outlined in the previous section. According to Kalecki, investment of the firm sector then determines the 'level of profits' and of national income, as will be shown below. Kalecki's theory of distribution and profits hence contains a dualism: Functional income distribution, and hence the profit share, is mainly determined by the degree of monopoly and mark-up pricing, whereas the levels of profits, wages and national income are determined by expenditure decisions, mainly of firms and capitalist households, as long as workers do not save.

Let us follow Kalecki (1954, chap. 3, 1971, chap. 7) and first assume a closed economy without government activity. Production takes place in three departments of the economy: department 1 produces investment goods, department 2 consumption goods for capitalists, and department 3 consumption goods for workers. Each department is vertically integrated, and hence produces all required raw materials and intermediate products within the department.

Total gross national income (pY) is divided between workers and capitalists. 'Gross' refers to the inclusion of depreciation in this context. In what follows we assume that depreciation is equal to the drop out of capital goods in order to simplify the analysis. Workers receive wages (W) and capitalists receive profits (Π), including depreciation, retained earnings, dividends, interest and rent. Since the gross national product is equal to the sum of gross investment expenditures ($p_K I$), consumption out of profits ($p_C C_\Pi$) and consumption out of wages ($p_C C_W$), it follows that:

$$pY = W + \Pi = p_C C_W + p_C C_\Pi + p_K I. \tag{5.11}$$

The respective price levels for consumption goods (p_C) and investment goods (p_K) and the weighted average price level for aggregate output (p) are determined by mark-up pricing, as outlined in the previous section, and are hence constant as long as the sectors of the economy operate below full capacity utilization. Subtracting wages from both sides of the equation, we obtain:

$$\Pi = p_C C_\Pi + p_K I - S_W. \tag{5.12}$$

Profits are hence equal to consumption out of profits plus investment minus saving out of wages ($S_W = W - p_C C_W$). If workers do not save and hence spend their income entirely on consumption goods:

$$W = p_C C_W, \tag{5.13}$$

equations (5.11) and (5.12) become:

$$\Pi = p_C C_\Pi + p_K I. \tag{5.14}$$

Profits are thus equal to consumption out of profits plus investment in capital stock. Kalecki reads the causality of this equation from right to left: The individual capitalists are not able to decide on the size of their respective profits, but solely on their expenditures on consumption and investment goods. 'Now, it is clear that capitalists may decide to consume or 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' (Kalecki 1954, p. 46, 1971, pp. 78–79). Therefore, Kaldor (1955/56, p. 96) has summarized

Kalecki's theory of distribution as follows: 'Mr. Kalecki's theory of profits . . . can be paraphrased by saying that "capitalists earn what they spend, and workers spend what they earn"'.

With given prices, the expenditures of workers determine the output of department 3 producing consumption goods for workers, whereas the expenditures of the capitalists determine the outputs of departments 1 and 2, producing investment goods and consumption goods for capitalists, respectively. The value of the output of department 3 is equal to the sum of wages, and the value of the outputs of departments 1 and 2 is equal to total profits in the economy.

Kalecki (1954, chap. 3, 1971, chap. 7) assumes that capitalists' consumption expenditures consist of a stable or autonomous part and a part which is proportionate to profits, according to the marginal propensity to consume out of profits (c_Π). In order to simplify the presentation we ignore autonomous consumption as well as the time lags included by Kalecki.[24] Therefore, we obtain the following simple function for consumption out of profits:

$$p_C C_\Pi = c_\Pi \Pi, \quad 0 \leq c_\Pi < 1. \tag{5.15}$$

Inserting equation (5.15) into equation (5.14) yields the following determination of the equilibrium level of profits in the economy as a whole:

$$\Pi = \frac{p_K I}{1 - c_\Pi} = \frac{p_K I}{s_\Pi}, \quad 0 \leq c_\Pi < 1, 0 < s_\Pi \leq 1. \tag{5.16}$$

Profits are thus determined by capitalists' investment in capital stock, which is assumed to be given by decisions in the past and is hence taken to be exogenous in the present context, and by the propensity to consume or the propensity to save out of profits ($s_\Pi = 1 - c_\Pi$). We will discuss Kalecki's theories of investment decisions further below in this chapter. As equation (5.16) shows, we arrive at a first Kaleckian multiplier, which contains the sum of profits realized by the firms as a multiple of their investment expenditures. The size of the multiplier is given by the inverse of the propensity to save out of profits.

It is hence capitalists' investment expenditures which determine the goods market equilibrium level of profits, taking the propensity to save out of profits as given and constant in the short run. Any change in investment expenditures will hence cause a change in the level of profits without affecting the profit share. Since income distribution, and hence the share of profits in national income, is mainly determined by the mark-up in firms' price setting, the change in profits takes place through a change of aggregate production, thus the degree of utilization of the capital stock, and in national income. Taking into account that the share of gross profits in national income is defined as $h = \Pi/pY$, equation (5.16) becomes:

$$pY = \frac{p_K I}{(1 - c_\Pi)h} = \frac{p_K I}{s_\Pi h},\ \ 0 \leq c_\Pi < 1, 0 < s_\Pi \leq 1. \qquad (5.17)$$

Equation (5.17) can also be derived from the equilibrium condition of the goods market ($p_K I = S$). Since the saving function is the complement of the consumption function in equation (5.15) ($S_\Pi = \Pi - C_\Pi$), and still assuming that workers do not save, we obtain for the goods market equilibrium:

$$p_K I = S = s_\Pi \Pi = s_\Pi \frac{\Pi}{pY} pY = s_\Pi hpY. \qquad (5.18)$$

Solving equation (5.18) for equilibrium income (pY) yields equation (5.17). In this context, it has to be remembered that the profit share, which is mainly determined by the degree of monopoly or the mark-up, is the gross profit share including overhead costs and hence management salaries. Therefore, for equations (5.17) and (5.18) to hold we either have to abstract from management salaries or have to assume that managers have the same propensity to consume as the profit recipients.

Equation (5.17) displays a second Kaleckian multiplier, linking capitalists' investment expenditures with nominal GDP, and, of course, also with real GDP because prices are given by mark-up pricing. The multiplier effect of exogenous investment expenditures depends inversely on the marginal propensity to save out of profits and the profit share in national income. The higher the marginal propensity to save out of profits and the higher the profit share, the smaller will be nominal and real GDP, as well as national income, with given expenditures for investment in capital stock.

An increase in investment expenditure will thus trigger an increase in aggregate output, and saving will adjust to investment through changes in real income and profits. Therefore, investment for the economy as a whole cannot be constrained by aggregate saving: 'In the present conception investment, once carried out, automatically provides the savings necessary to finance it . . . If investment increases by a certain amount, savings out of profits are *pro tanto* higher' (Kalecki 1954, p. 50, 1971, p. 83, emphasis in the original). Of course, this mechanism requires that capitalists can either draw on liquid reserves or have access to bank credit in the first place. If an increase in investment is financed by liquid reserves, profits in department 1 producing investment goods will rise and the liquid reserves spent will flow to these capitalists. If the increase in investment is financed by bank credit, the associated increase in profits in department 1 will be accumulated as bank deposits. These bank deposits can then be used to buy bonds issued by the investing firms, which will allow them to repay the initial bank credit. '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"' (Kalecki 1954, p. 50, 1971, p. 84). Kalecki has thus provided a brief outline of a monetary circuit approach, which is by now prominent and widely accepted in post-Keynesian macroeconomics. In this approach money and credit are endogenous variables and the interest rate is an exogenous variable with respect to the income generation process.[25] Kalecki (1969a, chap. 3) had already put forward such a view in 'The mechanism of the business upswing', originally published in Polish in 1935:[26]

> The financing of additional investment is effected by the so called creation of purchasing power. The demand for bank credits increases and these are granted by banks. The means used by the entrepreneurs for construction of new establishments reach the industries of investment goods. This additional demand makes for setting to work idle equipment and unemployed labour. The increased employment is a source of additional demand for consumer goods and thus results in turn in higher employment in the respective industries. Finally the additional investment outlay finds its way directly and through the workers' spending into the pockets of capitalists (we assume that workers do not save). The additional profits flow back as deposits to the banks. Bank credits increase by the amount additionally invested and deposits by the amount of additional profits. The entrepreneurs who engage in additional investment are 'propelling' into the pockets of other capitalists profits which are equal to their investment, and they are becoming indebted to these capitalists to the same extent via banks . . .
>
> It should be pointed out that the increase in output will result in an increased demand for money in circulation, and thus will call for a rise in credits of the Central Bank . . . Therefore the precondition for the upswing is that the rate of interest should not increase too much in response to an increased demand for cash. (Kalecki 1969a, pp. 28–29, 1971, pp. 29–30)

As can be seen in equation (5.17), an increase in the propensity to save from profits will make equilibrium GDP and national income decline. The same is true for the effect on the level of profits, as can be derived from equation (5.16). Therefore, the paradox of thrift is valid in Kalecki's approach, with respect both to national income and to the level of profits. However, the absolute decline in profits triggered by an increase in the propensity to save from profits will be smaller than the decline in national income, because wage income will fall as well. An increase in saving out of profits and hence a decline in consumption out of profits will mean shrinking demand for the output of department 2 producing capitalists' consumption goods, and a decline in output and employment and hence in profits and wages in this department, which will then spill over to the demand for the output of department 3 producing workers' consumption goods. It should be noted that the demand for and output of department 1 producing investment goods are not affected, because decisions to invest were assumed to have been made in the previous period and are thus exogenous for the present considerations.

A rise in the degree of monopoly and hence in the profit share will have no effect on the level of profits, as can be seen in equation (5.16), because the level of profits is determined by capitalists' expenditures. However, a rise in the profit share will mean lower output and income for the economy as a whole, as becomes clear from equation (5.17): 'The level of income or product will decline to the point at which the higher share of profits yields the same absolute level of profits' (Kalecki 1954, p. 61, 1971, p. 95). A higher profit share and thus a lower wage share will mean lower demand for the output of department 3 producing consumption goods for workers. The simultaneous increase of demand for consumption goods for capitalists produced in department 2 of the economy will not compensate for this loss in demand, because the propensity to consume from profits falls short of the propensity to consume from wages, which was assumed to be unity. Kalecki's approach therefore includes not only the familiar (post-) Keynesian paradox of thrift, but also a paradox of costs with respect to aggregate output and national income. An increase in the profit share and thus in unit profits has no effect on the aggregate level of profits, but it depresses aggregate demand, output and national income. As in the case of increasing thrift, the demand for and output of department 1 are not affected for the reasons given above.

Kalecki's approach towards profits so far contains a 'dualism' regarding the determination of the share of profits in national income, which is mainly affected by active mark-up pricing of firms in incompletely competitive goods markets, and regarding the determination of the level of profits, which is determined by capitalists' expenditures for investment and consumption purposes: 'There are two elements in Kalecki's analysis of profits, the share of gross profit in the product of industry is determined by the level of gross margin, while the total flow of profits per annum depends upon the total flow of capitalists' expenditure on investment and consumption' (Robinson 1977, pp. 13–14).

So far, we have followed Kalecki's determination of profits and national income for a closed private economy. However, the argument can easily be extended to an open economy with government activity, following Kalecki (1954, chap. 3, 1971, chap. 7). Kalecki starts again with the balance sheet equation for the gross national product, according to which the sum of profits net of taxes (Π^{net}), wages net of taxes (W^{net}) and direct and indirect taxes (T) has to be equal to the sum of investment ($p_K I$), consumption out of wages ($p_C C_W$), consumption out of profits ($p_C C_\Pi$), government expenditure on goods and services (G), and the export surplus, which is given by exports ($p_X X$) minus imports ($p_M M$). The p_i's represent again the price indices for capital goods, consumption goods, export goods and import goods in domestic currency, respectively, which are each assumed to be inelastic with respect to changes in demand and output:

$$\Pi^{net} + W^{net} + T = p_K I + p_C C_W + p_C C_\Pi + G + p_X X - p_M M. \quad (5.19)$$

Subtracting wages and taxes from both sides of equation (5.19), we obtain:

$$\Pi^{net} = p_K I + p_C C_\Pi + G - T + p_X X - p_M M - S_W. \quad (5.20)$$

Therefore, in an open economy profits net of taxes are equal to investment plus consumption out of profits plus the government's budget deficit $(G - T)$ plus the export surplus $(p_X X - p_M M)$ minus saving out of wages $(S_W = W^{net} - p_C C_W)$. An export surplus and a government budget deficit can thus increase the amount of profits above the level given by capitalists' expenditures for investment and consumption purposes (subtracting workers' saving if positive).[27] Whereas the export surplus is associated with a deficit in the financial balances of foreign countries or the external sector for the country in consideration, government expenditures exceeding tax revenues means a deficit in the financial balances of the government sector of the considered country.

> The above shows clearly the significance of 'external' markets (including those created by the 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 capitalists to make profits over and above their own purchases of goods and services. (Kalecki 1954, p. 52, 1971, pp. 85–86)

From equation (5.20) we can derive Kalecki's profit multiplier for an open economy with government activity and positive saving out of wages. In order to keep the analysis as simple as possible, we assume that taxes are fixed and are independent of the level of income and profits. First, we reformulate the capitalists' consumption function (5.15) taking into account that consumption expenditure is out of profits net of taxes:

$$p_C C_\Pi = c_\Pi \Pi^{net} = (1 - s_\Pi)\Pi^{net}. \quad (5.21)$$

Next, we assume that workers have a positive propensity to save out of wages (s_W), which however falls short of the propensity to save from profits, and we define the profit share ($h = \Pi^{net}/pY^{net}$) and the wage share [$(1 - h) = W^{net}/pY^{net}$] as proportions of net private domestic income:

$$S_W = s_W W^{net} = s_W (1-h) Y^{net} = s_W (1-h) (W^{net} + \Pi^{net}), \quad 0 < s_W < s_\Pi \leq 1. \tag{5.22}$$

Inserting equations (5.21) and (5.22) into equation (5.20) yields the following results for the level of equilibrium profits net of taxes:

$$\Pi^{net} = \frac{p_K I + G - T + p_X X - p_M M - s_W(1 - h) W^{net}}{s_\Pi + s_W(1 - h)}. \tag{5.23}$$

Starting from equation (5.19), inserting equation (5.21) for capitalists' consumption and the complement to equation (5.22) for workers' consumption ($p_C C_W = W^{net} - S_W$), we obtain for equilibrium net private income:

$$pY^{net} = \frac{p_K I + G - T + p_X X - p_M M}{h(s_\Pi - s_W) + s_W}. \tag{5.24}$$

Equation (5.24) shows that an increase in the profit share will reduce net private income and – with our assumption of a constant level of taxes – also aggregate output and national income. Therefore, the paradox of costs remains valid in the open economy with government activity and positive saving out of wages. The same is true for the paradox of thrift: An increase in the propensity to save out of profits and/or out of wages will reduce equilibrium net private income, aggregate output and national income.

However, the dualism in Kalecki's distribution theory is no longer generally valid when workers save a part of their income, as can be seen in equation (5.23). In this case, a change in the profit share will also be positively associated with a change in the level of profits. The strict dualism in Kalecki's approach would be further weakened if the potential effects of changes in income distribution on net exports or on the government's financial balances were taken into account, as Asimakopulos (1988, p. 152) has pointed out:

> In Kalecki's general model of an open economy with workers' saving, the 'class struggle' which is reflected in changing money wages and prices, could affect not only income shares by altering mark-ups in manufacturing industries but also the level of profits because of their effects on the trade balance, the government deficit, and workers' saving.

5.4 ASSESSING KALECKI'S THEORY OF DISTRIBUTION

Several issues requiring clarification have been raised and discussed in the literature on Kalecki's theory of distribution. We briefly touch on some of them in this section.[28]

Regarding the claim that price setting, and hence income distribution in the industry, construction, transport and service sectors of the economy, is independent of the demand for the output of these sectors, it has to be assumed that all firms in these sectors operate with excess capacities. Of course, this condition is not necessarily given in a multi-sectoral economy, so that price reactions are also possible, which would then affect distribution. However, this is perfectly compatible with Kalecki's approach, in which a distinction is made right from the start between sectors in which prices of output are cost determined and sectors in which prices of output are demand determined, as we have shown above. And Kalecki was well aware that demand determined prices, in particular prices for raw materials, affect cost determined prices through the input cost channel.[29] Therefore, the integration of demand determined prices into the Kaleckian price and distribution theory has already been provided by Kalecki himself and does not pose any major problem.

Even if mark-ups and prices in single industries and sectors remain unaffected by changes in demand, changes in the demand for goods may nonetheless affect income distribution in the economy as a whole through the effects on the sectoral composition of production. As the macroeconomic distribution of income in Kalecki's approach is, among other determinants, affected by the weighted average of the degree of monopoly of the different industries or sectors, a modification of these weights would also lead to a change in distribution, as we have outlined above. In this way we may receive an impact of variations in investment demand, assumed to be exogenous so far, on functional income distribution. However, unlike the case in Kaldor's theory discussed in Chapter 4 of this book, the effects of changes in investment and aggregate demand on distribution are not uniquely determined. The overall effect will depend on the income shares in the respective sectors. Similarly, within a sector or an industry, changes in demand may affect the sectoral average mark-up and hence distribution, even if the single firms keep mark-ups and prices constant. This will occur if the change in demand and output is associated with a change in the composition of output and hence in the weights of the mark-ups of the single firms in the average mark-up of the industry or sector. These effects of changes in demand on income distribution are well acknowledged by

Kalecki and have been integrated into his price and distribution theory, as we have outlined above.

Even if there are no bottlenecks, and hence no effects of demand on prices, as well as no effects of demand on the firm and sectoral composition of production, we have shown that the dualism in Kalecki's theory of profits, according to which mark-up pricing determines the profit share and aggregate demand, in particular capitalists' demand for consumption and investment goods, determines the level of profits, will only hold if workers do not save. As soon as positive workers' saving is taken into account, an increase (decrease) in the profit share will also imply an increase (decrease) in the level of profits.

Kalecki's definition of the degree of monopoly has caused some irritations, too. Kaldor (1955/56, p. 92, emphasis in the original), for example, has claimed that Kalecki has presented a tautology, 'according to which the ratio of price to prime costs is *defined* simply as "the degree of monopoly"'. This accusation is true for Kalecki's (1939, p. 19) approach, where he has defined the degree of monopoly as 'the ratio of the difference between price and marginal costs to price', following Lerner (1934). However, in his later work, in particular in Kalecki (1954, p. 13, 1971, p. 45), he argues that the price fixing policies of the firm, and hence the mark-up over unit variable costs (prime costs), 'reflect what may be called the degree of monopoly of the firm's position', as we have outlined above. Therefore, the degree of monopoly represents the institutional framework (degree of market concentration, importance of price competition, trade union power and overhead costs) in which the firm operates, and which considerably deviates from perfect competition. The degree of monopoly is thus the independent variable which then determines the mark-up and functional income distribution as dependent variables.[30]

In particular Steedman (1992) has pointed to a potential aggregation problem in the Kaleckian approach, if a multi-sectoral framework with inter-sectoral input–output relations is considered. In Kalecki's theory, prices in the industry, construction, transport and service sectors of the economy are 'cost determined', that is they are determined by wage and raw material costs as well as by the mark-up, as outlined above. Against this, Steedman argues that the costs in a particular sector themselves are 'price determined' in turn, because they consist of raw materials and intermediate products produced in other sectors of the economy. Therefore, in a multi-sectoral framework with inter-sectoral input–output relations, it follows that output prices in one particular sector depend not only on the degree of monopoly in this sector, but also on the degrees of monopoly in other sectors. Hence, there is no guarantee that a rise in the mark-up m_j in the sector j will also lead to a higher price p_j in this sector, when simultaneously another sector producing intermediate goods for sector j reduces its mark-up m_i. The mutual interdependence of mark-ups and prices also becomes apparent when the average mark-up for the economy as a whole is calculated as the weighted average of mark-ups in the respective sectors of production using the share of sales of the particular sectors as weights. These weights, however, depend on the prices in the respective sectors, which in turn are determined by the mark-ups.

As we have noted above, Kalecki (1954, pp. 14–15, 1971, pp. 47–49) was well aware of this aggregation problem when he discussed average mark-ups and average prices within a sector or an industry. Furthermore, he considered inter-sectoral relations and the issue that the costs of one firm are the prices of another firm producing the intermediate product (Kalecki 1954, p. 25, 1971, pp. 58–59). And, of course, Kalecki's framework as outlined above has also taken into account that a rise in the mark-up in a specific industry will not necessarily raise the price in that industry if the price of raw materials used as an input falls simultaneously.

Some of the complications associated with inter-sectoral relations can be avoided if the concept of 'vertically integrated sectors', which produce all the intermediate products within the sector, is used for the analysis. However, as is generally acknowledged, such a vertically integrated sector is only an analytical construct which includes the shares of different industries or sectors producing the intermediate and the final output of a certain product. A vertically integrated sector has no exact counterpart in the real capitalist environment.

Sawyer (1992) considers Steedman's fundamental critique to be valid to the extent that it describes the shortcomings of Kalecki's approach with regard to a general theory of prices. But Sawyer argues that, apart from the industrial interdependences stressed by Steedman, a general theory of prices would need to incorporate the problem of effective demand, too. Furthermore, according to Sawyer, the formulation of a general theory of prices was not Kalecki's concern. His interest was primarily the partial analysis of price setting (or of pricing) in certain sectors or industries with different intensities of competition. And Kalecki was interested in a simple microeconomic foundation for his macroeconomic analysis based on stylized facts. In the case of a long-run underutilization of productive capacities, mark-up pricing offers a connection between micro- and macroeconomics, with the implications for income distribution discussed above. For this purpose, that is linking microeconomic and macroeconomic analysis, Sawyer considers the use of vertically integrated sectors to be an appropriate analytical tool: 'The concept of a vertically integrated industry is a theoretical one for the purpose of macroeconomic analysis in which the interrelationships between industries are suppressed. It has never been intended to have some empirical counterpart, nor has it been appropriate for other than macroeconomic theorizing' (Sawyer 1992, p. 159).

In a similar vein, Kriesler (1992) has pointed out that Kalecki was not concerned with formulating a rigorous general equilibrium price model, from which it would be more or less impossible to draw any conclusions about causal relationships. Kalecki rather intended to conduct a rough approximation of reality in partial models following the principle that 'it is better to be approximately right than to be precisely wrong!' (Kriesler 1992, p. 166). Steindl (1993, p. 121) seems to share this view when he compares Kalecki's approach with Steedman's in the following way: 'Kalecki wanted his concepts to be applicable ("operational") and he wanted to buy this advantage at the cost of drastic simplification. Steedman is concerned with logical and mathematical precision, with formal neatness and comprehensiveness.'

Let us conclude this section with the observation that Kalecki's pricing and distribution approach seems to resemble the approach of Weintraub (1959), who has presented an empirically oriented macroeconomic assessment of pricing and distribution. Weintraub (1979, 1981/82) claims that his theory fits with different post-Keynesian theories of distribution and hence contains Kalecki's theory, too. In Weintraub's approach, the general price level (p) for the (private) economy as a whole is given by:

$$p = k_W \frac{w}{y}, \quad k_W > 1, \tag{5.25}$$

with w denoting the average nominal wage, y the average labour productivity and k_W the wage-cost mark-up, which is considered to be approximately constant over longer periods of time. From equation (5.25) we get the profit share (h):

$$h = \frac{\Pi}{W + \Pi} = \frac{(k_W - 1)\frac{w}{y}}{\frac{w}{y} + (k_W - 1)\frac{w}{y}} = \frac{k_W - 1}{k_W}, \tag{5.26}$$

and also the wage share $(1 - h)$:

$$(1 - h) = \frac{W}{W + \Pi} = \frac{\frac{w}{y}}{\frac{w}{y} + (k_W - 1)\frac{w}{y}} = \frac{1}{k_W}. \tag{5.27}$$

An increase in Weintraub's wage-cost mark-up thus means an increase in the profit share and a decrease in the wage share. Weintraub considers k_W to be empirically constant and does not present an in-depth analysis of the determinants of the wage-cost mark-up. His approach is thus less comprehensive than Kalecki's, which presents a theory of the determination of the mark-up and a theory of income distribution, and which does not necessarily imply any long-run constancy of income shares, as we have outlined above.[31]

5.5 FURTHER DEVELOPMENTS OF MARK-UP PRICING AND DISTRIBUTION THEORIES: EICHNER, HARCOURT AND KENYON, WOOD, STEINDL, SYLOS-LABINI AND OTHER AUTHORS

According to Kriesler (1987, p. 105), further developments in post-Keynesian economics on the determinants of the mark-up and income distribution following Kalecki's approach basically fall into two groups. The first group deviates from Kalecki's initial approach and relates the mark-up to firms' financing requirements for investment in capital stock in a growing economy. The second group, however, follows Kalecki in locating the determinants of the mark-up in the competitive environment of the respective firm or industry. We will add a third group, which focuses on the role of overhead costs and their impact on the mark-up and on income distribution.[32]

Of course, the authors in all these groups assume that some sort of monopolistic or oligopolistic competition dominates the markets. Firms are conceived as price makers and quantity takers in the face of variations in demand. Prices are thus determined by the development of unit costs as well as the mark-up. They are not related to market clearing or profit maximization, as in neoclassical economics. Prices in the post-Keynesian–Kaleckian approach are rather 'reproduction prices', irrespective of the specific underlying market form, because they have to cover costs plus some profit margin in the medium to long run, for production to continue in the respective industry or business. Lee (1998, chap. 11) and Melmies (2010), reviewing existing empirical studies on pricing in several developed capitalist economies, report strong empirical support for the post-Keynesian cost-based theories of pricing and prices.

The post-Keynesian–Kaleckian theories of prices are thus closely linked to the classical and Marxian notion of 'prices of production' as being determined by the technical conditions of production and the general rate of profit (Semmler 1984; Lavoie 1992, chap. 3.6, 2014, chap. 3.7). However, as Lavoie (1992, p. 148) has pointed out, there is an important difference between the post-Keynesian–Kaleckian approach and the classical and

Marxian view. In the latter, prices of production, containing a general rate of profit, are considered to be centres of gravity for market prices, which are determined more concretely by supply and demand. In this tradition there is an assumed tendency of market prices, being determined by supply and demand, to adjust towards the prices of production, being determined by the technical conditions of production and a distribution parameter. These adjustments, mainly by the movement of capital from low profitability sectors to high profitability sectors and concomitant price reactions, also imply that actual profit rates in different industries have a tendency to converge towards the general rate of profit in the economy as a whole in the long run. In the post-Keynesian–Kaleckian view, however, the prices set by firms and hence the market prices are independent of supply–demand conditions even in the short run and are thus already 'cost-plus' prices. The adjustment of supply to demand does not take place via changes in prices but via changes in output and hence capacity utilization. Furthermore, these adjustments imply that there is not necessarily a tendency towards full or normal utilization of productive capacities in any medium or long run, as is predominant in the classical and Marxian approach. This issue will be discussed further when dealing with Kaleckian models of distribution and growth in the following chapters. Let us now turn to the determination of the mark-up in the contributions by the three groups of authors mentioned above.

The authors in the first group, like Wood (1975), Eichner (1976) and Harcourt and Kenyon (1976), have argued that the mark-up in firms' pricing is determined by firms' required internal means of finance for real investment purposes.[33] Under the conditions of incomplete credit markets characterized by asymmetric information, oligopolistic structures and so on, which do not allow borrowing without own means of finance, firms require internal means of finance in order to expand.

The effects of own means of finance on investment in capital stock have already been highlighted in Kalecki's (1937) 'principle of increasing risk'.[34] From the perspective of a single firm, investment will be restricted because increasing investment is associated with increasing risk, taking the amount of the firm's own capital when investment plans are made as given and constant:

> There are two reasons for the increase of marginal risk with the amount invested. The first is the fact that the greater is the investment of an entrepreneur the more is his wealth position endangered in the event of unsuccessful business.
>
> The second reason making the marginal risk rise with the size of investment is the danger of 'illiquidity'. The sudden sale of so specific a good as a factory is almost always connected with losses. Thus the amount invested k must be

> considered as a fully illiquid asset in the case of sudden need for 'capital'. In that situation the entrepreneur who has invested in equipment his reserves (cash, deposits, securities) and taken 'too much credit' is obliged to borrow at a rate of interest which is higher than the market one.
>
> If, however, the entrepreneur is not cautious in his investment activity it is the creditor who imposes on his calculation the burden of increasing risk charging the successive portions of credits above a certain amount with a rising rate of interest. (Kalecki 1937, p. 442)

Therefore, own capital and borrowed capital are no perfect substitutes, as for example Modigliani and Miller (1958) assume for a world with perfect competition. 'The enterprises started in a given industry at a given moment are not of equal size because the own capital of entrepreneurs is not equal. The "business democracy" is a fallacy: the own capital is a "factor of investment"' (Kalecki 1937, p. 443). Kalecki's 'principle of increasing risk' thus explains the coexistence of firms of different size within a particular industry. This coexistence is due to differences in entrepreneurial capital and the related capacities to borrow.

In Kalecki's (1937) 'principle of increasing risk' the lack of own capital or accumulated retained profits, if not taken into account by the entrepreneurs' investment decision in the first place, may mean higher rates of interest charged by creditors, which will then restrict investment in capital stock. In Kalecki (1954, chap. 8, 1971, chap. 9), however, it is argued that the amount of retained profits also imposes a quantity constraint on the potential external finance a firm can obtain from the supply side of finance:

> 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. (Kalecki 1954, p. 91, 1971, p. 105)

If the respective firm tried to issue corporate bonds above this amount, these bonds would not be subscribed in full. And, if the firm offered higher rates of interest, this would raise suspicion regarding the solvency of the firm and would hence reduce demand for its bonds: 'Even if the firm should undertake to issue the bonds at a higher rate of interest than that prevailing, the scale of bonds might not be improved since the higher rate in itself might raise misgivings with regard to the future solvency of the firm' (Kalecki 1954, pp. 91–92, 1971, pp. 105–106). With own capital of the single firm given, the possibility of a positive relationship between external investment finance and the rate of interest, as conceded in Kalecki (1937), is therefore abandoned, even for the single firm at the microeconomic level.

Kalecki (1954, chap. 8, 1971, chap. 9) furthermore argues that increasing risk, and hence the risk of illiquidity and insolvency in the case of the failure of certain investment projects, might induce firms not to use the full potential of their borrowing capacities in the capital market. Some firms might even keep investment below that of entrepreneurial capital and might decide rather to invest part of their capital in securities.

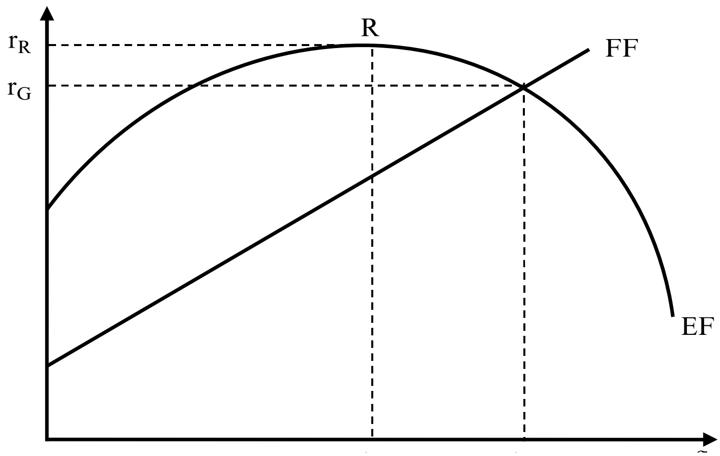
The financing constraints on investment imposed by own capital or retained profits also apply to joint stock companies issuing shares in order to finance additional investment, according to Kalecki (1954, pp. 93–94, 1971, pp. 107–109). First, issuing additional shares may restrain the influence on the firm exerted by dominant shareholders, who therefore dislike this. Second, if issuing new shares does not increase profits proportionally, the dividends of dominant shareholders will be squeezed. And, third, the market for shares of a single company is restricted, because the public tends to diversify risk. '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' (Kalecki 1954, p. 94, 1971, p. 108). Subscription of shares by the dominant and controlling group of shareholders, out of the personal savings of this group, is considered another form of accumulation of entrepreneurial capital and thus a close substitute for the accumulation of retained profits.

Several empirical papers on the determinants of firms' investment have convincingly confirmed the important role of internal means of finance for investment in capital stock and thus growth of the firm. This has already been true for the empirical work by Meyer and Kuh (1957) on the effect of firms' internal funds on investment, questioning the Modigliani and Miller (1958) theorem. More recent studies with similar results are Fazzari and Mott (1986/87), Fazzari et al. (1988) and Ndikumana (1999).[35]

It should be stressed at this point that the arguments presented so far have been microeconomic ones. Therefore, the question arises whether increasing marginal risk, independently of being associated with increasing interest rates or not, generates a long-run equilibrium at the macroeconomic level. Kalecki (1937) is pretty clear in pointing out that his 'principle of increasing risk' results only apply to a single firm but not to the economy at the macroeconomic level. His 'principle of increasing risk' defines a planned equilibrium for the single firm at a given point in time, but not a long-run equilibrium taking into account interactions at the macro level. 'We examined the planning of the entrepreneur in a given situation which in general is *not* the position of the long run equilibrium' (Kalecki 1937, p. 445, emphasis in the original). And, going beyond the planning horizon of the entrepreneur in the single period and applying a period-by-period analysis, in which investment spending feeds back on profits and saving out of profits (retained earnings), he argues: 'This accumulation of savings causes a parallel shift of the curve of marginal risk to the right. For the entrepreneur can invest the new amount without reducing his safety or increasing illiquidity' (Kalecki 1937, p. 446). Since rising investment spending triggers rising profits for the business sector as a whole, retained earnings and own capital improve. This may improve access to borrowed capital in the succeeding period without increasing marginal risk. Therefore, the result for the economy as a whole may be a cumulative process and not a stable long-run equilibrium.

The macroeconomic implications of the financing constraint for investment in capital stock at the firm level will be touched on in Chapters 9 and 10 of this book dealing with the roles of investment finance, credit and interest rates in Kaleckian distribution and growth models. Let us now turn to the implications for the determination of the mark-up. For this purpose we rely on Lavoie's (1992, chap. 3, 2014, chap. 3) account of the post-Keynesian theory of the firm. Following Eichner's (1976) *The Megacorp and Oligopoly*, the post-Keynesian firm is conceived to be 'a large firm; management is separated from proprietorship; marginal costs are approximately constant; and the firm operates in at least one industry of the oligopolistic type' (Lavoie 1992, p. 95). According to Lavoie, the objectives of the firm are power over its environment, in order to reduce uncertainty, and growth, in order to secure long-run survival among competing firms.[36] These objectives are certainly true for a period of owner controlled firms and corporations controlled by managers independently of shareholders, as in the post Second World War period until the late 1970s and early 1980s. However, these conditions may have changed in the early 1980s with the development of 'finance-dominated capitalism' or 'financialization', implying increasing dominance of shareholders' short-run profitability interests over management's long-run growth targets, as will be discussed in Chapter 10 of this book and has been dealt with more extensively in Hein and van Treeck (2010a, 2010b), Dallery and van Treeck (2011) and Hein (2012a). But let us assume here that the pre-financialization period conditions are valid and let us make use of Figure 5.3 in order to explain the post-Keynesian theory of the firm.

In the attempt to reach its power and growth objectives, the firm or corporation faces two constraints. First, there is the financing constraint, as already explained above referring to Kalecki's 'principle of increasing risk'. The finance frontier (FF) in Figure 5.3 indicates the maximum rate of accumulation (g) that firms can finance with a given profit rate (r). Seen from a different angle, it determines the gross profit rate, including depre-



Source: Based on Lavoie (1992, p. 117).

Figure 5.3 Maximum rate of profit and maximum rate of growth of the firm

ciation, overheads and different types of profit (interest, dividends, rents, retained profits), that is necessary for the firm to generate its own means of finance, that is the retained profits, in order to be able to finance the desired accumulation rate under the conditions of incompletely competitive financial markets.

The second constraint is the expansion frontier (EF). It indicates the profit rate that can be realized with a particular growth strategy. The expansion frontier is assumed to be upward sloping for low accumulation rates and downward sloping for higher rates. The upwards sloping part is caused by dynamic economies of scale and scope allowing for a higher rate of profit when accumulation is initially rising: investment in capital stock allows for the introduction of new and more productive means of production; profitability and survival of the firms in an uncertain environment will depend on sheer size; and rapid expansion in novel markets will allow for temporary monopoly profits. The negatively sloped segment of the expansion function is due to managerial inefficiencies reducing the rate of profit: at a certain speed of expansion, management will have difficulties in handling the expansion process (Penrose effect); internal expansion in a certain market may be costly because of rising advertising, product innovation and research and development costs; and external expansion and diversification into further markets, in particular foreign markets, may be limited by management's lack of knowledge about new markets and products.

Generally, with given expansion and finance frontiers, the pricing and accumulation decisions of the firm will be finally determined by the point of intersection of the finance frontier and the expansion frontier in point G. Firms do not attempt to achieve the maximum profit rate in point R and are willing to sacrifice profits for growth. Profits are only of interest to the extent that they are required for growth.

Following the arguments put forward by Wood (1975), Eichner (1976) and Harcourt and Kenyon (1976),[37] the firm will have to set its output prices such that it will achieve point G in Figure 5.3. In order to obtain the rate of accumulation g_G the firm needs the rate of profit r_G. Since r_G denotes gross profits, including depreciation, overhead costs, dividend and interest payments as well as retained earnings, over the nominal capital stock, we assume that retained earnings required for internal and external investment finance increase in proportion with gross profits and hence with the gross profit rate.[38] Therefore, the firm will have to set its prices such that the target rate of profit r_G is obtained. The rate of profit, by definition, is given as:

$$r = \frac{\Pi}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = hu\frac{1}{v}, \tag{5.28}$$

with r denoting the rate of profit, Π the level of total gross profits including retained profits, interest, dividends, depreciation of fixed capital and overhead costs, pY income, Y real output, Y^p potential output given by the capital stock, K the capital stock, h the profit share, u the rate of utilization of productive capacities given by the capital stock, and v the capital–potential output ratio. If, for the sake of simplicity, we abstract from raw material costs in equation (5.9), the profit share is exclusively determined by the mark-up (m) on unit labour costs in firms' pricing, which are again assumed to be constant up to full capacity output given by the capital stock:

$$h = \frac{m}{m + 1}. \tag{5.29}$$

Finally, in order to obtain a certain target rate of gross profits (and a certain target rate of profits net of depreciation, overheads and distributed profits), firms need to make a certain assumption about the target, average or normal rate of utilization of productive capacities (u_n) when setting their prices. As shown in Figure 5.2, this rate of utilization may be well below full utilization of productive capacities given by the capital stock, in order to meet expected cyclical changes and unforeseen fluctuations in demand, to deter the entry of new firms into the market, and so on:

$$u = u_n. \tag{5.30}$$

Therefore, in order to obtain the target rate of profit r_G, taking into consideration equations (5.28) to (5.30), firms will have to choose a mark-up (m_G) on unit variable costs equal to:

$$m_G = \frac{1}{\dfrac{1}{r_G \dfrac{v}{u_n}} - 1}. \tag{5.31}$$

If the mark-up exceeds m_G and hence prices are too high, the firm will not be able to grow at g_G, because it will lose price competitiveness and hence market shares. And, if the mark-up falls short of m_G and prices are too low, the firm will not be able to obtain the required rate of profit r_G and the internal means of finance to meet its finance constraints.

> In other words, the firm has a double objective in setting its mark-up. First, the resulting price must be such as to be consistent with its expectations, in very general terms, of demand for its product, and secondly, the price must be such as to provide sufficient retained profits to finance its investment plans. (Harcourt and Kenyon 1976, p. 453)

Summing up, in these approaches it is the combination of sales growth expectations of firms and finance constraints which determines the target rate of profit and thus the mark-up. Similar to the Kaldor–Robinson approaches discussed in Chapter 4 of this book, planned investment in capital stock also has an impact on income distribution in a model with imperfect competition and mark-up pricing, even though only an indirect one through the target rate of profit and the target mark-up of firms. With a given finance constraint and hence a given finance frontier, a higher target accumulation rate generated by an outward shift of the expansion frontier would therefore require a higher target rate of profit, hence a higher target mark-up and therefore redistribution in favour of the profit share and at the expense of the share of wages for direct labour in national income.

In the second group of authors, following Kalecki in locating the determinants of the mark-up in the competitive environment of the respective firm or industry, we find in particular the contributions by Steindl (1952) and Sylos-Labini (1969). They have elaborated on Kalecki's determinants of the mark-up related to the degree of industrial concentration, the relevance of price competition and the bargaining power of trade unions.

Steindl (1952, Part I) in his *Maturity and Stagnation in American Capitalism* has examined the interwar economic conditions in the USA during the 1920s and 1930s. His important distinction, unlike that of Kalecki, is not between demand and cost determined prices, but between pricing in competitive industries with plenty of small producers, like textiles, timber, leather and also food, and pricing in oligopolistic industries composed of a few large firms, like tobacco, transport equipment, rubber, non-ferrous metal, iron and steel, stone and glass, petrol and coal, and partly machinery (Steindl 1952, p. 80).[39] Since technological progress is mainly embodied in capital stock, each of these industries is characterized by firms producing with different unit costs and hence differential mark-ups. 'The reason for this is the relative scarcity of big units of capital, which explains why only a limited number of enterprises can make use of the most productive methods, and that side by side with them, less productive methods are always in use' (Steindl 1952, p. 38). In competitive industries there are hardly any barriers to entry and the marginal firm earns no net profit (Steindl 1952, chap. V). Output prices equal unit costs plus remuneration for the entrepreneur, and the profits of the other firms can be treated as differential rents based on higher productivity.[40] In these industries, negative demand shocks trigger a general decline in mark-ups and prices, squeezing the marginal firm out of the industry and increasing the shares of output or sales of the remaining firms.

In oligopolistic industries the marginal firm earns above economy-wide average profits, measured for example by the profit rate. The reason for this is mainly barriers to entry given by minimum capital requirements, large scale production and the strategic pricing behaviour of incumbent oligopolists. Driving marginal firms out of business by means of price cutting in the case of a negative demand shock would mean ruinous price wars. Furthermore, these industries are considered to be facing relatively low price elasticities of demand in the short run and even in the long run, and they make use of other forms and instruments of competition, in particular product differentiation and marketing. Therefore, firms in oligopolistic industries usually respond to changes in demand by changing output and supply. This implies that these firms hold desired excess capacity in the long run. Owing to indivisibilities of productive capacities (plant and equipment), excess capacity is also a normal state of affairs in competitive industries. But, in oligopolistic industries, desired excess capacity is a means to enable firms to adapt flexibly to changes in demand and also an instrument to deter new entry into the respective industry. 'Thus, a *planned* and deliberate reserve of excess capacity is at all times held by most producers, with good reason from their point of view, even though a part of it, at least, is waste from the point of view of the community' (Steindl 1952, p. 10, emphasis in the original). When demand and growth decline, oligopolists are ready to adjust by means of accepting lower rates of capacity utilization even in the medium to long run. To what extent the concomitant excess capacity can be considered to be voluntarily held remains a bit vague in Steindl's reasoning: 'The degree of utilisation actually obtaining in the long run, we must conclude, is no safe indication of the *planned* level of utilisation' (Steindl 1952, p. 12, emphasis in the original).

For the reasons regarding pricing mentioned above, technological progress has different effects in competitive and in oligopolistic industries, too. In competitive industries labour saving technological progress allows the innovating firm to lower prices, to obtain higher market shares, and to grow faster by means of 'internal accumulation', that is by reinvesting retained earnings, thus squeezing the least productive firms out of the market, a process which Steindl calls 'absolute concentration'.[41] This process will finally undermine the competitive conditions in the long run and will move formerly competitive industries towards oligopolistic industries. In the short run, however, price competition in competitive industries will cause prices and average mark-ups in these industries to fall.

> The price–cost adjustment which brought about the process of absolute concentration must have brought about also a reduction of the average profit margin in the industry which had been temporarily raised by cost reductions of the favourably placed firm. These latter firms will probably not have destroyed the additional differential advantage acquired by the new innovations entirely by their sales efforts, but they will have brought down the average profit margins in the industry, at the expense of other firms, to a level which makes the rate of internal accumulation of all firms again consistent with the rate of growth of the industry. (Steindl 1952, p. 43)

In oligopolistic industries, however, this mechanism will not work, because price cuts are not an instrument applied in the competition among oligopolies for the reasons outlined above. Therefore, labour saving technological progress and hence lower unit wage costs with rigid prices will mean rising mark-ups and hence profit shares in these industries, on the one hand, but also potentially higher wages, on the other hand.

We can therefore summarize the determinants of the mark-up and of income distribution in Steindl's approach as follows. In competitive industries the mark-ups of the non-marginal firms are determined by unit cost differentials with respect to the marginal firm. Excess capacity is only a short-run phenomenon. In the long run, 'the share of net profit at given utilisation in the product is determined in such a way as to provide sufficient funds for the investment in the industry' (Steindl 1952, p. 51). Steindl thus follows Kalecki's (1937) 'principle of increasing risk' outlined above, according to which retained profits are a main determinant for investment, because they provide internal means of finance and access to external finance. In oligopolistic industries the mark-up is determined by market concentration and in particular by the barriers to the mobility of capital. Most important for the determination of the mark-up is the barrier to entry, which is caused by minimum capital requirements and by the strategic price setting of the incumbent firms:

> If prices, and consequently profits, are sufficiently high, entry of new competitors into an industry becomes feasible even where capital requirements are great. The price in oligopolistic industries is therefore fixed on a level which just keeps potential competitors out; or, in other cases, it may be fixed at a level which is sufficient to squeeze out some existing competitors, whose markets the price leaders want to take. (Steindl 1952, p. 17)

Oligopolies hold desired excess capacity also in the long run and, in the face of rising profit shares, do not completely reinvest retained profits: 'The internal accumulation therefore tends to exceed the amount required for expansion of capital equipment in these industries' (Steindl 1952, p. 55). This will have negative repercussions on aggregate demand and growth, as we will outline further in Section 5.7.

The notion of barriers to entry is also central to Sylos-Labini's (1969) *Oligopoly and Technical Progress*.[42] Similar to the arguments put forward by Steindl, barriers to entry derive from technological indivisibilities, high minimum capital requirements, economies of scale, and the strategic price setting of incumbent firms in oligopolistic markets. These firms also hold excess capacities in the long run, in order to cover unforeseen peaks in demand and to prevent potential competitors from entering the market. For this purpose, 'entry-preventing prices' are set by the price leader in an oligopolistic market, assuming again the coexistence of firms of different size and different unit costs in one industry (Sylos-Labini 1969, chap. II). With constant unit variable costs (uvc) and hence constant marginal costs (mc), falling unit fixed cost (ufc) and thus falling unit total cost (utc) in the level of output, as in Figure 5.4, prices will be set by the price leader such that smaller firms with a lower level of output and thus higher unit total costs will not be able to earn the minimum rate of profit, and thus will be deterred from entry. Assume that Y_o is the technologically given minimum output in a specific industry or sector, and Y_i is the target output of the price leader. In the long run, the minimum price of the incumbent firm (p_i) has to cover total unit costs (utc = uvc + ufc) plus unit target

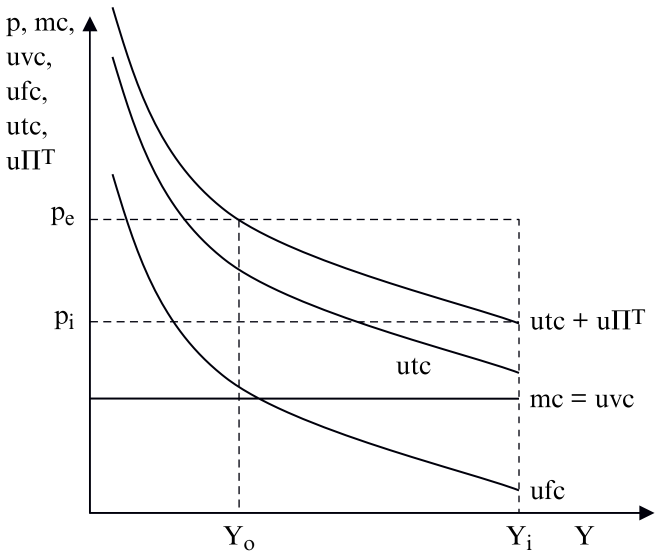


Figure 5.4 'Entry-preventing pricing'

minimum profits ($u\Pi^T$). The maximum price set by the price leading incumbent oligopolistic firm is just below the price (p_e), which a new entrant would have to charge in order to cover costs and to gain minimum profits. Accordingly, Sylos-Labini's arguments do not provide a definite price and hence a definite mark-up to be set by the price leader, but rather a range for the price and hence the mark-up: The minimum mark-up over unit variable costs is given by unit total costs at the target level of output plus the minimum target unit profits [$m_{min} = m_i = (p_i - uvc)/uvc$], which the incumbent firms, in particular the price leaders, have to obtain in order to continue production. The maximum mark-up is the one which keeps the price just below the price a new entrant would have to charge [$m_{max} \leq m_e = (p_e - uvc)/uvc$].

Apart from this development of the Kaleckian approach towards the determination of the mark-up in firms' cost-plus pricing by barriers to entry, Sylos-Labini (1979) has also provided some support for Kalecki's view that trade union bargaining power may have an impact on the mark-up and hence on income distribution. Empirically, he has found an only partial pass-through of changes in unit costs, in particular unit labour costs, to prices for manufacturing industries in several countries. Sylos-Labini (1979) provides the following explanation. It can be assumed that output prices and nominal wage rates and their respective growth rates within a sector or industry are uniform, but labour productivity and labour productivity growth among firms differ, as do therefore their mark-ups in pricing. The price setting firm is assumed to have the highest or at least an above-average growth rate of labour productivity. An increase in the uniform nominal wage rate may therefore be shifted completely to prices by this price setting firm, whereas other firms with lower productivity growth and higher unit labour cost growth than the price leader cannot completely shift their higher unit labour cost growth to prices, in order to remain competitive with the new ruling price being set by the price leader. The mark-ups of the followers and hence the average mark-up of the industry will therefore be squeezed. For the industry as a whole, nominal unit labour cost growth will exceed output price inflation, and functional income distribution will shift in favour of wages. In the reverse case, when workers' and trade unions' bargaining power is weak and uniform nominal wages or nominal wage growth declines, the price setting firm will only have to adjust prices according to the lower productivity growth of its competitors and will hence be able to raise its mark-up.[43] Average nominal unit labour cost growth will fall short of average output price inflation in this case. The average mark-up of the industry will rise, and income will be redistributed from wages to profits. Hein et al. (2006) and Stockhammer et al. (2009, 2011) have presented empirical evidence for the partial adjustment of output price inflation to changes in nominal unit labour cost growth for Germany and the Euro area, Onaran et al. (2011) for the US, and Onaran and Galanis (2012) for several G20 countries.

Finally, let us turn to the third group of authors, who have extended and elaborated on Kalecki's ideas that overhead costs may have an impact on the mark-up and on functional income distribution. In the long run, from the perspective of the firm, interest payments on debt are part of overhead or fixed costs, and thus the idea of an interest rate or interest payments elastic mark-up has been introduced into Kaleckian models of distribution and growth by Dutt (1990/91), Lavoie (1993) and Hein (2006b, 2007, 2008, chap. 13), as will be discussed in more detail in Chapter 9 of this book. A permanent increase in interest rates (or interest payments) would thus induce firms on average to increase the mark-up in order to survive.

This approach has been inspired by the treatment of interest payments as part of the costs of the firm in the neo-Ricardian monetary theory of distribution (Panico 1985; Pivetti 1985, 1991), which has referred to Sraffa's (1960, p. 33) idea of closing the degree of freedom of a system of prices of production by the interest rate, as we have already touched on in Chapter 3 of this book. According to this view, a permanent increase in the rate of interest would require an increase in the normal or the general rate of profit. As we have mentioned in Chapter 4 of this book, and as is shown in Pasinetti (1962, p. 141), an increase in the rate of interest will push up the general rate of profit. But the idea of an interest-elastic mark-up can also be found in the contributions of other post-Keynesian authors, as for example in Harrod (1973, p. 44), who argued: 'Of course if the market rate of interest rises considerably and stays up for a substantial period, as it has done recently (1971), that may cause firms to increase the mark-up.' And the late Kaldor (1982, p. 63) also subscribed to this view: 'There is evidence for believing that interest costs are passed on in higher prices in much the same way as wage costs.'

Lima and Setterfield (2010) have reviewed the recent empirical evidence for a 'cost-push channel' of monetary policy, according to which changes in the interest rate affect firms' cost of production and hence their pricing decisions. They report ample evidence for the existence of such an effect in developed capitalist economies.[44] Empirical evidence supporting the distribution effect of changes in the monetary interest rate is also reviewed in Hein and Schoder (2011) and Hein (2012a, chap. 2, 2014), who have also provided econometric support for such an effect for Germany and the US, as will be discussed in detail in Chapter 9 of this book.

Recently, the notion of overhead costs affecting mark-ups and income distribution has been further extended towards dividend payments, arguing that from the perspective of the management of the firm dividend payments are also a kind of overhead obligation (Hein and van Treeck 2010a; Hein 2012a, chap. 2, 2014). A permanent increase in dividend payments could therefore induce management to recover this drain of funds for real investment or other purposes by means of increasing the mark-up, either by raising prices or by forcing down unit labour costs if market conditions and the relative bargaining power of firms and labour unions allow. Hein (2012a, chap. 2, 2014) has reviewed some empirical evidence for such a channel. We will come back to these findings in Chapter 10 of this book, where we will introduce financialization issues into Kaleckian distribution and growth models.

As has been pointed out by Lavoie (1992, p. 140), the results of the second (and also the third) group of authors developing the Kaleckian mark-up pricing approach do not necessarily contradict the approach of the first group. In fact, they can be integrated into the analytical apparatus used for the first approach and give rise to several further cases, making use of the concepts of the expansion frontier and the finance frontier introduced above.

Following Steindl (1952) and Sylos-Labini (1969), only firms in competitive industries will make maximum use of retained earnings in order to accumulate and to grow, by means of accumulating retained profits and drawing on the access to external finance permitted by their own financial resources. However, oligopolists might not even completely reinvest their retained earnings owing to a lack of demand and to excess capacities. Therefore firms in a competitive industry can be considered to be at point G_C in Figure 5.5, to target the growth rate g_C, and the competitive mechanism will allow the setting of prices and mark-ups such that the rate of profit r_C is obtained in the long run. However, when a competitive industry, through 'absolute concentration' (Steindl 1952), moves towards an oligopolistic industry, mark-ups and target profit rates will increase, whereas utilization rates and growth rates will decline. The oligopolist will therefore move towards point G_O, and will target the growth rate g_O and set mark-ups and prices such that the profit rate r_O is obtained. It should be noted that we do not imply that the oligopolist will chose the maximum rate of profit given by the expansion frontier in Figure 5.5.

If barriers to entry to the oligopolist industry increase, for example because of technological progress requiring a higher minimum amount of capital to be invested, the incumbent oligopolist's room for manoeuvre in setting mark-ups and prices will increase. Therefore, the expansion frontier will shift upwards from EF_1 to EF_2, as is shown in Figure 5.6. With a given rate of growth g_O, the oligopolist will now target a higher rate of profit r_{O2} and thus move from G_{O1} to G_{O2}.

If there is an increase in workers' or trade unions' bargaining power and trade unions are thus able to demand and obtain nominal wage increases exceeding productivity growth, which the considered firm is only partially

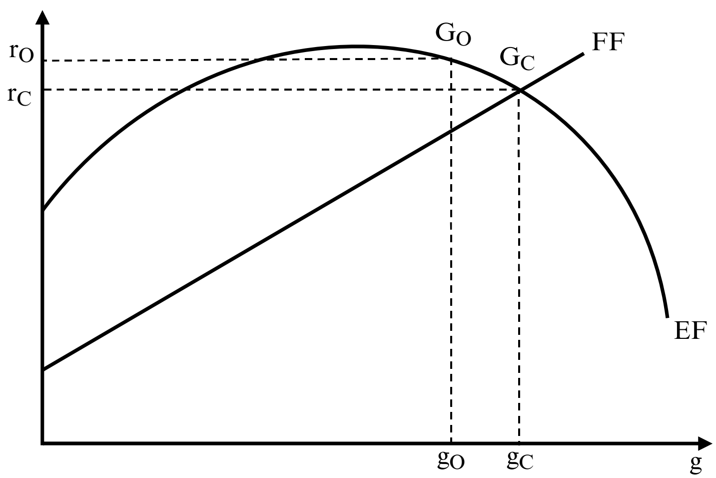


Figure 5.5 Profit rate and growth rate: competition versus oligopoly

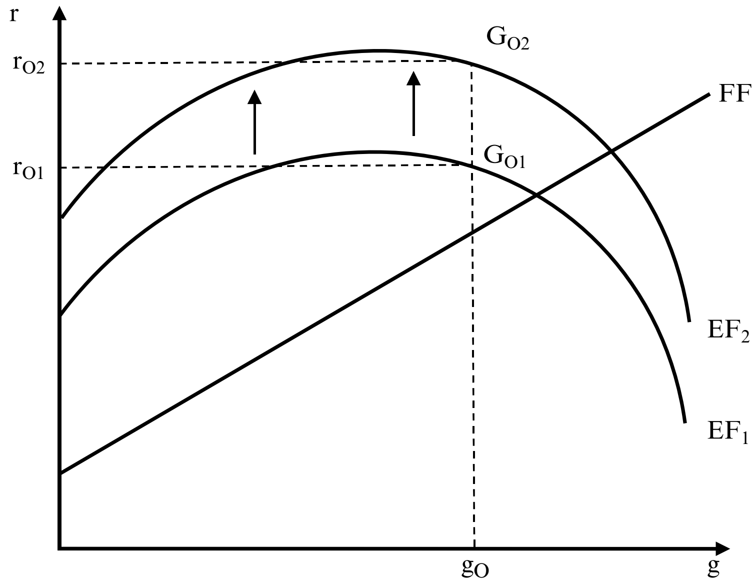


Figure 5.6 Profit rate and growth rate: increasing barriers to entry

able to pass to prices if one of the conditions outlined above is given (either competing firms may not have to face the same wage increases as the considered firm, or the productivity growth of the considered firm is lower than that of the price leading firm), the mark-up and hence the target profit rate for a given rate of accumulation and growth g_O will decline from r_{O1} to r_{O2}. The expansion frontier will thus shift downwards from EF_1 to EF_2, as shown in Figure 5.7, and the oligopolist will move from G_{O1} to G_{O2}.

Finally, if overhead costs, for example interest costs or dividend payments, increase, this means a counter-clockwise rotation of the finance frontier from FF_1 to FF_2, as shown in Figure 5.8. In order to finance a given rate of accumulation and growth a higher total rate of profit is required, because the share of distributed profits has increased and the retention ratio has decreased. If the firm is in the position to shift these increases in overheads to prices or to force down unit labour costs, the expansion frontier will shift upwards from EF_1 to EF_2 and the mark-up and the target rate of profits for a given growth rate g_O will increase from r_{O1} to r_{O2}, and the oligopolist will move from G_{O1} to G_{O2}.

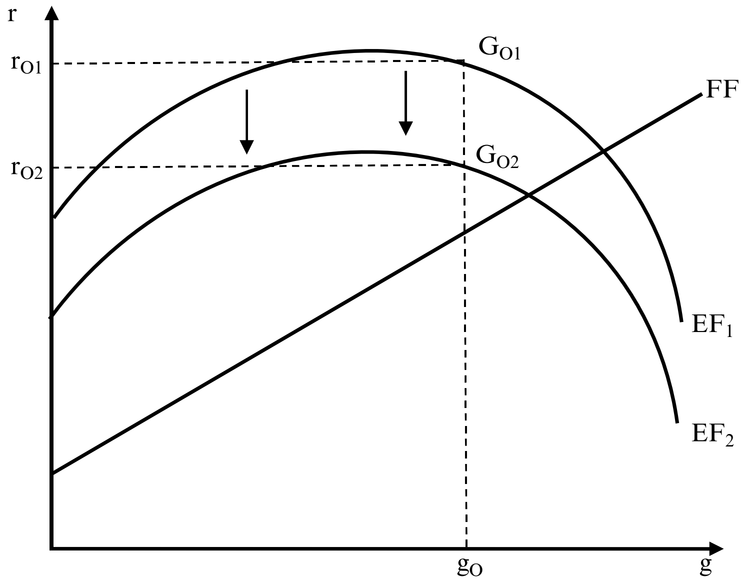


Figure 5.7 Profit rate and growth rate: increasing workers' bargaining power

5.6 DETERMINATION OF INVESTMENT, ECONOMIC DYNAMICS AND GROWTH IN KALECKI'S APPROACH

In the previous sections on Kalecki's theory we have considered investment in capital stock to be exogenous. We have followed Kalecki's argument that in a period-by-period analysis investment in each period is determined by decisions made in previous periods. In his early works on the business cycle, Kalecki (1969a, chap. 1, 1971, chap. 1) distinguished three stages in the investment activity: 1) investment orders; 2) production of investment goods; and 3) delivery of finished equipment. In this section we will deal with the determinants of investment decisions and hence investment orders and the respective implications for economic dynamics and growth.[45] Following Kalecki, in the outline we assume the price level to be constant, given by mark-up pricing as explained in the previous sections. Furthermore, a closed private economy without government activity is assumed in which workers do not save.

In Kalecki's work there can be found different investment functions, and

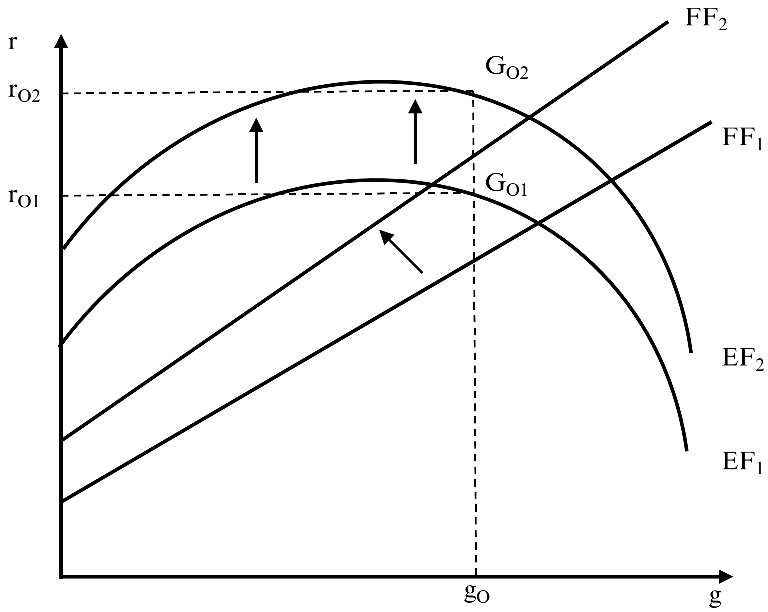


Figure 5.8 Profit rate and growth rate: increasing overhead costs triggering a higher mark-up

in his latest publications he still was looking for an adequate way of modelling firms' investment decisions. In the introduction to the *Selected Essays on the Dynamics of the Capitalist Economy, 1933–70*, only published posthumously, we can read:[46]

> 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. (Kalecki 1971, p. viii)

Before we start with an overview of Kalecki's theories of investment, let us briefly compare Kalecki's general approach towards investment with Keynes's (1936) in the *General Theory*.[47] According to Lopez G. (2002, p. 613), there is an important distinction between Kalecki's view and Keynes's and thus a major difference between the investment theories proposed by the two founding fathers of the 'principle of effective demand': 'Although Kalecki recognized that psychological factors influence investment decisions, he insisted that capitalists do not react solely on expectations, but rather make their decisions on the basis of realized profits, which provide both the finance and the stimuli for investing.'

In addition Kalecki (1936) himself was quite critical of Keynes's (1936) investment theory based on the idea of a downward sloping schedule of the marginal efficiency of capital giving rise to an 'equilibrium' level of investment for the economy as a whole as soon as the monetary rate of interest is given (Lopez G. 2002; Sardoni 2011, chap. 6). Kalecki argued that an individual firm at a given moment in time may be faced with a downward sloping schedule of the marginal efficiency of capital. However, higher investment of the firm in order to move towards its equilibrium position, contributing to higher investment, income, profits and thus profit expectation for the economy as a whole, will shift this schedule upwards and thus cause a cumulative process and not an adjustment towards an equilibrium position.

> Keynes's concept, which tells us only how high investment should be in order that a certain disequilibrium may turn into equilibrium, meets a serious difficulty along this path also. In fact, the growth of investment in no way results in a process leading the system toward equilibrium. Thus it is difficult to consider Keynes's solution of the investment problem to be satisfactory. The reason for this failure lies in an approach which is basically static to a matter which is by its nature dynamic. (Kalecki 1936, p. 231)

Let us now turn to Kalecki's alternative investment theories, which are embedded in his dynamic approach focusing on explaining the business cycle.[48]

In his early work published in 1933 in Poland, Kalecki (1969a, chap. 1, 1971, chap. 1) supposes that the rate of capital accumulation (g = I/K) depends positively on the expected gross rate of profit (r) and negatively on the rate of interest (i).

$$g = \frac{I}{K} = g(\underset{+}{r}, \underset{-}{i}). \tag{5.32}$$

Since the long-term rate of interest does not vary much over the cycle, according to Kalecki, the investment function is simplified and the rate of capital accumulation is supposed to depend positively on the rate of profit only:

$$g = \frac{I}{K} = g(\underset{+}{r}). \tag{5.33}$$

Profits under the conditions of a classical saving hypothesis are determined by capitalists' consumption and investment expenditures, as we have shown above, with investment being the main force. And the rate of profit also depends on the capital stock. Therefore, present investment decisions are positively affected by past investment decisions, leading to current investment (I) and profits, and negatively by the volume of the present capital stock (K) in existence:

$$g = \frac{I}{K} = g(\underset{+}{I}, \underset{-}{K}). \tag{5.34}$$

The positive demand and profit effects of investment stimulate further investment, on the one hand, but the capital stock and capacity effect of investment dampens further investment, on the other hand. These contradicting effects of investment are then used by Kalecki in order to generate a model of the trade cycle around a stationary state with zero net investment in capital stock on average over the cycle. A trend can then only be generated by exogenous factors.[49] We will not follow the derivation of the trade cycle in any detail.[50] Let us just notice that what is important in trade cycle theory is the endogenous generation and determination of the turning points. In this model they are given because the rising (falling) capital stock feeds back negatively (positively) on the rate of profit. And a low (high) rate of profit dampens (stimulates) investment and hence the growth of the capital stock. Kalecki (1939, pp. 148–149) summarized the problem in his follow-up model relying on a similar mechanism as follows:

> We see that the question, 'What causes periodical crises?' could be answered shortly: the fact that investment is not only produced but also producing. Investment considered as expenditure is the source of prosperity, and every increase of it improves business and stimulates a further rise of investment. But at the same time every investment is an addition to capital equipment, and right from birth it competes with the older generation of this equipment. The tragedy of investment is that it causes crisis because it is useful. Doubtless many people will consider this theory paradoxical. But it is not the theory which is paradoxical, but its subject – the capitalist economy.

In Kalecki's later work, in particular in Kalecki (1954, chap. 9, 1971, chap. 10), investment decisions are affected by firms' financial resources, and by changes in profits and in the capital stock, which together determine the movement of the rate of profit. Following his 'principle of increasing risk' (Kalecki 1937), outlined in Section 5.5 of this chapter, the effect of internal means of finance on investment is caused by the dominance of imperfect capital markets which restrict access to external means of finance (Kalecki 1954, chap. 8, 1971, chap. 9). Therefore, retained profits have a positive effect on investment through the provision of financial means. Further on, retained earnings and own capital improve access to external finance in financial markets, because firms can offer more collateral. Finally, accumulation of own capital reduces the risk of illiquidity or insolvency the firm or the entrepreneur will have to take when investing in capital stock and will thus improve the willingness to invest.

As we have already mentioned above, a compensation of a lack of entrepreneurial capital or retained earnings by the firm's willingness to pay higher interest rates is explicitly denied by Kalecki (1954, chap. 9, 1971, chap. 10). Furthermore, it should be remembered from the previous section that, according to Kalecki, entrepreneurial capital as a limit to investment finance for the single firm due to the 'principle of increasing risk' is also valid for joint stock companies' access to the market of equity.

Taking these arguments into consideration, in Kalecki (1954, chap. 9, 1971, chap. 10) an investment function is obtained in which investment decisions and thus, with a lag, the level of investment are affected positively by retained profits (Π_F) and by changes in current profits ($d\Pi$), which are mainly determined by demand and sales, and negatively by changes in the capital stock (dK). An impact of the rate of interest on investment is denied, because Kalecki holds that the long-term rate of interest is rather stable in the course of the trade cycle and therefore cannot contribute to an explanation of cyclical fluctuations in investment, which he aims at. Finally, Kalecki adds a constant to his investment function, representing '"development factors" such as innovations which prevent the system from settling to a static position and which engender a long-run upward trend' (Kalecki 1954, p. 151). The influence of innovations on investment are assumed to be proportional to the capital stock, that is 'the effect of innovations upon the level of investment can be assumed, *ceteris paribus,* to be the higher the larger is the volume of capital equipment' (Kalecki 1954, p. 158, emphasis in the original). Innovations include not only new technologies in production, but also the introduction of new products, the opening up of new sources of raw materials, and so on (Kalecki 1954, chap. 15). Therefore, the implicit version of this investment function is the following, with TC representing the rate of technical change and innovations:

$$g = \frac{I}{K} = g\left(\underset{+}{\frac{\Pi_F}{pK}}, \underset{+}{\frac{d\Pi}{pK}}, \underset{-}{\frac{dpK}{pK}}, \underset{+}{TC}\right). \tag{5.35}$$

Based on this investment function, Kalecki (1954, chap. 11, 1971, chap. 11) derives again a model of the business cycle around a stationary state, or around a rising trend determined by the effects of a continuing stream of innovations on investment. The basic mechanism is again that investment, on the one hand, has a positive repercussion effect on itself via realized profits and retained earnings, but a negative one via the change in the capital stock and in productive capacities.

In his last contribution to this subject, Kalecki (1968b, 1971, chap. 15) once again attempts to introduce technical progress into the investment function and thus to integrate cycle and trend. Here the expected profitability of the latest capital stock vintages which incorporate a higher level of technical knowledge is of importance for investment decisions. Investment decisions are determined by internal finance, by expected normal profits plus extra profits generated by innovations, and by innovations themselves. Innovations are seen as 'a slowly changing magnitude depending . . . on past economic, social and technological developments' (Kalecki 1968b, 1971, pp. 173–174), and are introduced into the model as a slowly changing function of time, which drives the system through the effects on investment in capital stock. This trend of innovations is considered to be 'semi-autonomous' (Kalecki 1968b, 1971, p. 174). The meaning of this is not quite clear. According to Steindl (1981c), Kalecki means to express that technological knowledge is an important stimulus for growth, and that the way and the speed of the economy implementing technological knowledge depend on current and recent growth, or on the 'economic climate'.[51] Finally, in this last paper, Kalecki makes clear that the 'trend degree of utilization of equipment' is endogenous and depends inversely on the degree of monopoly. Kalecki (1968b, 1971, p. 183) concludes this contribution as follows: 'It follows from the above 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.'

Regarding the trend of growth, from Kalecki's perspective, capitalist economies are generally demand-constrained in the long run, which is different from socialist economies, which usually suffer from supply constraints. In capitalist economies there are always idle productive capacities, which means unemployed labour and unused capital stock:[52] 'a *laisser faire* capitalist economy used to achieve a more or less full utilisation 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' (Kalecki 1968b, 1971, p. 169, emphasis in the original).

In Kalecki's demand-led approach towards economic dynamics, long-run trend economic growth as a 'slowly changing component of a chain of short-period situations' (Kalecki 1971, p. 165) is therefore driven by investment in capital stock, if we assume a closed private economy without government economic activity. And the main long-run determinants of investment are technological progress and innovations, as well as the speed of introduction of innovations into production. In Kalecki (1954, chap. 15) a slowdown in long-run growth of developed capitalist economies is predicted because of a declining intensity of innovations. Kalecki mentions three reasons for this. First, the importance of opening up new sources of raw materials will decline. Second, an increasing degree of monopoly will suppress the competitive pressure to introduce new technologies into the production process. And, third, he predicts that the capital intensity of innovations will decline, thus requiring less investment in capital stock, because 'technological progress is largely concentrated on a "scientific organisation" of the assembly process which does not involve heavy investment' (Kalecki 1954, p. 159).

Of course, it should come as no surprise, given our previous analysis of Kalecki's theory of distribution, profits and national income, that long-run growth is affected as well by the tendencies of income distribution. An increase in the degree of monopoly and redistribution in favour of profits will be harmful for long-run growth:

> Moreover, if the effect of the increase in the degree of monopoly upon the distribution of national income is not counteracted by other forces 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. (Kalecki 1954, p. 161)

The role of technological innovations and of the discovery of new sources of raw materials as a stimulus for investment and thus economic growth is also highlighted by Kalecki (1971, chap. 13) in his discussion of the theories of Rosa Luxemburg and Tugan-Baranovsky. Here he also addresses the effects of government deficits and export surpluses on aggregate demand and growth. On the one hand, Kalecki sides with Tugan-Baranovsky, arguing that expanded reproduction and growth in capitalism is possible, in principle, without external demand or markets, if capitalists' investment in capital stock progresses at the required rate, as was already shown by Marx (1885) in *Capital, Volume 2*. However, smooth expanded reproduction is by no means guaranteed, and he criticizes Tugan-Baranovsky for not providing a convincing theory of investment – a theory which would have to include the stimulating role of technological progress and innovations, according to Kalecki. Luxemburg is criticized for not understanding that capitalists' investment may generate sufficient demand for expanded reproduction and growth. On the other hand, however, Kalecki appreciates that Luxemburg has drawn attention to the problem of aggregate demand for explaining growth and to the potentially demand propelling role of exports and government demand. However, he corrects her view in this respect, too, arguing that it is net exports and government deficits, each of them financed by the domestic excess of private (capitalist) saving over private (capitalist) investment, which stimulate aggregate demand, as we have shown in this chapter, and also growth. Therefore, in an open economy with government economic activity, from a Kaleckian perspective long-run trend growth is also affected by the development of these two sources of demand, which are external to the private domestic sectors.

Summing up, in Kalecki's analysis of demand-led growth we find that the trend of long-run growth, as an ex post average of short-run fluctuations, is mainly determined by innovations, by income distribution and by government deficits and export surpluses. Innovations have a positive effect on private investment and growth. A higher wage share is beneficial for aggregate demand, capital accumulation and growth, which are therefore 'wage-led'. And government deficits and export surpluses each have a positive impact on aggregate demand and profits, and thus on investment and growth.

5.7 STEINDL'S THEORY OF STAGNATION IN MATURE CAPITALISM

Steindl's (1952) view on long-run growth contained in his *Maturity and Stagnation in American Capitalism*, trying to explain the interwar US development, is built on Kalecki's work on economic dynamics, on the one hand, and includes Steindl's own microeconomic analysis, outlined in Section 5.5, on the other hand. When the book appeared in the early 1950s, to the disappointment of the author, it did not attract much attention:

> The first (1952) edition of this book appeared at a time which could not have been less propitious for its success. Neoclassicism reigned in the economics profession. The advanced industrial countries had begun to establish full employment, rapidly rising living standards, and international cooperation; and in this atmosphere of confidence an analysis of the dismal experience of 1929–1939 seemed to be out of place. (Steindl 1976, p. ix)

But, when the 'golden age' period of post Second World War capitalism faltered, Steindl's approach gained prominence and had a major impact on the post-Keynesian–Kaleckian approach towards distribution and growth. But, even before, it was well received by Marxian underconsumptionist theorists of crisis in modern capitalism, and some parallels with for example Baran and Sweezy's (1966) *Monopoly Capital* are apparent (Bleany 1976, chap. 12; Cowling 1982; Lee 1998, chap. 10).[53]

As we have outlined above, unlike the case for Kalecki, Steindl's important distinction is not between demand determined and cost determined prices, but rather between pricing in competitive industries and in oligopolistic industries. In the former profit is treated as differential rent accruing to the more productive firms in the industry, usually the bigger firms because technological progress is embodied in the capital stock. In competitive industries capacity utilization will be adjusted to some normal or planned level in the long run by means of capital moving in and out, depending on the state of demand. If the industry is hit by a negative demand shock, marginal firms will be squeezed out by downward price adjustments.

Innovations will temporarily increase profits of the innovative firm, but then the diffusion of the innovation will reduce profits towards some normal level, which is mainly determined by the internal means of finance required for the expansion of the industry. In the process of the diffusion of innovations and the associated increase in output and lowering of output prices, marginal firms will again be squeezed out. These processes in competitive industries will increase the market shares of the innovative and most productive firms and will thus lead to 'absolute concentration' and a tendency towards oligopolistic industries.

In oligopolistic industries, negative demand shocks or technological innovations will not cause prices to fall and marginal firms to be squeezed out, because these firms earn above normal profits owing to barriers to entry given by the minimum capital to be advanced in order to start production in the respective industry, and owing to the strategic price setting of incumbent firms. Prices remain rigid in these industries, and a decline in demand will mean lower rates of capacity utilization. Because of downward price rigidities, labour saving technological progress will increase mark-ups or profit margins. Furthermore, other types of competition will be applied, in particular marketing efforts and product differentiation.

The tendencies towards oligopoly discovered at the microeconomic level will cause a tendency towards stagnation at the macroeconomic level (Steindl 1952, Part II). In his new introduction Steindl (1976, p. xv) neatly summarizes his main arguments in *Maturity and Stagnation in American Capitalism* as follows:

> (1) Oligopoly brings about a maldistribution of funds by shifting profits to those industries which are reluctant to use them . . .

(2) Oligopoly leads to a decline in the degree of utilization, either by a tendency to increase markups or by a rigidity of the markup in face of a decline in investment.

These two developments cause a problem of effective demand for the economy as a whole, which will be self-reinforcing and thus cause long-run stagnation. Because of excess capacity, oligopolies will be increasingly reluctant to invest in their industries, even if profits are constant or rising ('incomplete reinvestment' of retained profits), and firms in competitive industries will lack the internal funds required to expand and to compensate for the stagnative tendencies imposed by oligopolistic industries.

Any fall in investment and aggregate demand will therefore be self-reinforcing, and cause lower rates of capacity utilization and a further decline in investment and aggregate demand for the economy as a whole, as in the Harrod (1939) instability process (Steindl 1979, 1985), outlined in Chapter 2 of this book. Recall that Harrod's 'warranted rate of growth' (g_w) is given by the overall propensity to save (s), the normal or target rate of utilizations of productive capacities (u_n) and the capital–potential output ratio (v), which is considered to be technologically determined and to be independent of growth and the profit rate:

$$g_w = \frac{su_n}{v}. \tag{5.36}$$

As Steindl (1985) explains, lower growth of aggregate demand, falling short of Harrod's 'warranted rate', that is $g < g_W$, would require a lower propensity to save, and thus lower profit margins and profit rates, in order to avoid the rate of capacity utilization falling below the normal or target level and hence causing a further slowdown in growth. In other words, it would require redistribution from gross profits to wages, assuming the propensity to save out of wages falling short of the propensity to save out of gross profit. Output prices would have to fall relative to household nominal income, as in the Kaldor–Robinson adjustment mechanism with respect to output prices relative to nominal wages discussed in Chapter 4 of this book.[54] However, this does not happen, because of the price rigidity in oligopolistic industries. This is how Steindl (1985, pp. 157–158) describes it:

> I have discussed in *Maturity and Stagnation* the conditions for a mechanism by means of which $(1 - \lambda)$ [the share of profits, E.H.] would adapt itself to a lowering of the growth rate. It would work through a competitive struggle with the aim of eliminating high cost producers; this would re-establish a normal degree of utilisation and at the same time lower the profit margin. In an industry dominated by oligopolies, however, this mechanism can not easily work, because the

> risks and cost of a competitive struggle are much too high. In consequence the oligopolistically organised industry will experience permanent excess capacity if the growth rate falls, with further depressive consequences, since the excess capacity will discourage investment. Using the same assumptions it can be shown that the transition from a competitive to an oligopolistic regime, if it causes an increase in profit margins at a given rate of utilisation, will lead to excess capacity and hence a secular decline in growth.

In the case of the dominance of oligopolies, a fall in the rate of capacity utilization can only be prevented by an increase of 'external' sources of demand, hence in the government deficit or the export surpluses, as Steindl (1985) points out.

Steindl (1976, p. xv) acknowledges that the 'maldistribution of funds' argument per se is not a strong argument for lower private investment and growth, in the face of multi-branch activities of larger firms, which could invade competitive industries and invest there. However, low rates of capacity utilization on a broader scale as deterrent to investment are considered to be the important argument for the maturity and stagnation hypothesis. Another argument, which Steindl did not mention in his (1952) book, but in later publications (Steindl 1964, 1979, 1985), does not relate to oligopoly in particular but to big business in general and says 'that the preference for safety increases with size, and that profit is bartered for safety, with a resulting reluctance to go into debt and a consequent weakening of the incentive to invest' (Steindl 1976, p. xv). This could be interpreted as a decline in 'animal spirits' with the size of the firm.

What is missing in Steindl's (1952) book, as well, is a role for technological progress and innovations when it comes to the explanation of long-run trends of capital accumulation and growth. The reason for this is that Steindl wanted to present a theory in which investment is completely endogenous and 'net investment is called forth by the stimulus of economic factors, like internal accumulation of business, a high degree of utilisation, a high profit rate, or low indebtedness. Innovations, to express this view in its most extreme form, affect only the *form* which net investment takes' (Steindl 1952, p. 133, emphasis in the original).

Steindl's (1952) endogenous determination of investment thus includes several arguments which we have already seen in Kalecki's approach, like retained profits and low indebtedness, referring to the finance constraint implicit in Kalecki's 'principle of increasing risk', and the rate of profit, capturing the opposing effects of changes in profits and in the capital stock on investment. Unlike Kalecki, Steindl explicitly includes the rate of capacity utilization in his investment function. Following the explicit formulation by Steindl (1952, p. 214) we get the following implicit Steindlian investment function:

$$g = \frac{I}{K} = g\left(\underset{+}{\frac{\Pi_F}{pK}}, \underset{+}{\frac{pK_F}{pK}}, \underset{+}{u}\right). \tag{5.37}$$

The firm's decision to invest thus depends positively on retained profits (Π_F) relative to the nominal capital stock (pK), the capital stock owned by the firm (pK_F) relative to the total value of the capital stock – this is the inverse of Steindl's (1952, p. 46) 'gearing ratio' (pK/pK_F) – and the rate of utilization of productive capacities given by the capital stock in existence (u).

Technical progress and innovations are absent from this approach, because Steindl held that these are difficult to model and have hence to be treated as exogenous variables. However, in his later publications, Steindl changed his mind, in particular under the impression of Kalecki's work: 'When I wrote *Maturity and Stagnation*, I wanted to deny all influences of innovations on the accumulation of capital. I think now that this was foolish and I subscribe to Kalecki's view that innovations are capable of generating a trend' (Steindl 1979, p. 7). Consequently, Steindl (1964, 1976, 1979, 1981c, 1989) admits that the exhaustion of a long technological wave can contribute to the explanation of stagnation. However, technological change has to be integrated into a theory of demand-led growth, in particular to be able to explain the timing of the exhaustion of a technological wave.

Steindl (1952, chap. XIII) provides a mathematical model of his theory which was meant to integrate trend and cycle theory and to explain the sources of stagnation in mature capitalism. However, in his new introduction, Steindl (1976, p. xvi) considers this attempt to have failed, first, because the model does not represent his theory adequately and, second, because of the failure to rely on technological innovations or other exogenous factors to generate a long-run trend. Dutt (2005b) has presented a simplified model in order to make the logic more transparent.[55] We will not reproduce the model here, because major elements will be found in the different versions of the Kaleckian–Steindlian distribution and growth models to be presented in the following chapters.

Let us finally in this section turn to Steindl's (1976, 1979, 1989) explanations of why his postulated tendencies towards stagnation did not materialize in the golden age period of mature capitalism from the 1950s until the mid-1970s, and how the changes thereafter can be explained. In Steindl (1979) we find four reasons for high growth in the post Second World War period overcompensating the inherent stagnation tendencies:

1. Public spending increased tremendously after the Second World War, financed to a great extent by taxes on profits. This increased capacity utilization and fed back positively on firms' decisions to invest in capital stock.

2. Technological competition between east and west, the 'competition of the systems', had a strong impact on expenditures on R&D and education by the governments, which spilled over to the private sector, boosting investment and productivity growth.
3. The post-war tensions triggered close cooperation by the western countries under the leadership of the US. This included the world financial system of Bretton Woods with fixed but adjustable exchange rates, the Marshall Plan and American lending to Western European countries, which stabilized and provided the conditions for an increase in international trade. A higher level of international trade kept profit margins within limits and contributed to stabilizing wage shares.
4. European countries benefited from technological backwardness with respect to the US and could make use of technological knowledge which had been generated and applied in the US, thus making use of the 'catching-up' factor in economic growth.

Steindl (1976) mentions as a further growth enhancing factor that big corporations spread their activities to several industries. Impediments to the flow of funds between industries were reduced, which favoured aggregate investment. And the shortening of construction periods and the introduction of consumer credit on a larger scale were also favourable for growth. Steindl (1989) also adds the low indebtedness of corporations right after the Second World War as a factor which was favourable to investment in capital stock and to GDP growth, as well as the increasing bargaining power of workers and trade unions associated with full employment, which held mark-ups and profit shares in check and allowed for real wages growing in step with productivity and thus providing the required demand growth.

The faltering of the post Second World War golden age and the following stagnation starting in the mid-1970s are analysed by Steindl (1979). He relates it to the reduction of tensions between the superpowers, an increase in internal rivalries among the capitalist economies, a decay of US leadership and the collapse of the Bretton Woods international financial system, indicating an absence of the willingness and the ability for international cooperation. Further factors contributing to the re-emergence of stagnation are, according to Steindl: the tendencies towards increasing capital productivity, reducing the required amounts of net investment to increase productive capacities; a trend towards an increasing marginal propensity to save from disposable income in prospering economies, weakening aggregate demand, capacity utilization, investment and growth; the fading out of the catching-up potential of Europe towards the US associated with abnormally high rates of productivity growth in Europe over the post-war period; and increasing environmental and energy problems, with increasing energy prices putting upwards pressure on inflation rates and raising uncertainty with respect to future technological development.

However, the most important factor which explains the re-emergence of stagnation tendencies, according to Steindl (1979), is 'stagnation policy' in the major capitalist economies, which he had already briefly mentioned three years earlier: 'thus we witness stagnation not as an incomprehensible fate, as in the 1930s, but stagnation as policy' (Steindl 1976, p. xvii).

In this context, Steindl (1979) refers to Kalecki's (1971, chap. 12) 'Political aspects of full employment', in which Kalecki argues that, although governments might know how to maintain full employment in a capitalist economy, they will not do so, because of capitalists' opposition. Kalecki (1971, p. 139, emphasis in the original) presents the following reasons:

> The reasons for the opposition of the 'industrial leaders' to full employment achieved by Government spending may be subdivided into three categories: (i) the dislike of Government interference in the problem of employment as such; (ii) the dislike of the direction of Government spending (public investment and subsidising consumption); (iii) dislike of the social and political changes resulting from the *maintenance* of full employment.

Whereas, in Kalecki (1971, p. 144), the opposition of the capitalist class towards full employment policies will give rise to a 'political business cycle', Steindl (1979, p. 9) argues that business opposition towards full employment policies gives rise to a 'political trend' causing or contributing to stagnation. In the course of the 1970s governments, facing full employment and increasing rates of inflation, moved away from targeting full employment by means of active demand management towards targeting price stability and containing public deficits and debt, using higher rates of unemployment as an instrument.

In Bhaduri and Steindl (1985) these policies are associated with 'the rise of monetarism as a social doctrine', because monetarism is inherently linked with restrictive fiscal and monetary policies, which are supported by banks and the financial sector (or the rentiers). The application of monetarist policies thus indicates a shift of powers from industry to banks, or from the non-financial sector to the financial sector, which occurred in the course of national and international financial liberalization and rapidly increasing financial activity in the 1970s and early 1980s (collapse of the Bretton Woods international financial system, rise of the Eurodollar market, emergence of oil exporting countries to a class of 'international rentiers', emergence of international commercial banks).

Under the conditions of the dominance of oligopolies, these stagnation policies therefore set into force again the immanent tendencies towards stagnation in mature capitalism which Steindl had already discovered in the early 1950s.[56] Starting in the 1980s, these tendencies towards weak investment in capital stock and stagnation have then been amplified by a shift of the interest of corporations and their managers from production towards finance and an increasing role for financial investment in comparison to real investment. This tendency towards financialization was discovered at a very early stage by Bhaduri and Steindl (1985) and Steindl (1989) and will be addressed in more detail applying Kaleckian–Steindlian models in Chapter 10 of this book.

5.8 CONCLUSIONS

Let us finally summarize the main elements of the Kaleckian–Steindlian approach to distribution and growth outlined in this chapter. As we have shown, functional income distribution in this approach is mainly – but not exclusively – determined by active cost-plus or mark-up pricing of firms. On the one hand, the mark-up reflects the competitive environment of the firm and the requirements of reproduction and expansion. On the other hand, the mark-up is affected by the relative powers of capital and labour in the distribution conflict over net national income. Prices are mainly rigid with respect to changes in demand, and variations in demand cause changes in the rates of utilization of productive capacities given by the capital stock. The rate of capacity utilization is therefore treated as an endogenous variable in medium- to long-run analysis, which may or may not deviate from the firms' target rate of utilization. Furthermore, labour supply is not a constraint for growth and unemployment is a persistent feature of capitalist economies.

Investment in capital stock is the driving force of aggregate demand and growth, and saving adjusts towards investment through changes in utilization rates of the growing capital stock. Firms' decisions to invest depend on internal means of finance, because usually firms are external finance-constrained in incomplete financial markets, on capacity utilization indicating the development of sales and sales expectations, and on semi-exogenous 'development factors', in particular technological progress and innovations.

The economy is divided into different groups or classes, which receive different types of incomes and have different propensities to save. Firms retain part of the profits which are saved by definition. Rentiers receive distributed profits, mainly in terms of dividends and interest payments, consume part of this income and save the rest – their propensity to save is thus positive but below unity. Workers receive wages, of which the major part is consumed, but which may also partly be saved. The propensity to save from wages is lower than the propensity to save from rentiers' income and, of course, also lower than the propensity to save from gross profit incomes (retained profits plus distributed profits). An increase in the propensity to save from wages or from rentiers' income has a dampening effect on aggregate demand, investment and growth, *ceteris paribus*. A higher retention ratio has ambiguous effects: on the one hand it reduces consumption demand redistributing income from households to firms, but on the other hand it increases internal means of finance and thus relaxes the finance constraint on investment.

In a closed private economy, the trend of growth is demand-led and affected by functional income distribution and by innovations. In an open economy framework with government activity, long-run growth trends are furthermore affected by the growth of demand sources which are external to the private sector, the development of government expenditure and government deficits and the development of exports and export surpluses.

In the following chapters of this book this Kaleckian–Steindlian approach to distribution and growth will be modelled in a gradual manner. We will start from extremely simplified versions and gradually introduce real world features and complications, and we will survey empirical results based on these models.

NOTES

1. On Kalecki's life and work see the intellectual biographies by Feiwel (1975), Sawyer (1985), Lopez G. and Assous (2010) and Toporowski (2013). On shorter introductions to Kalecki's (life and) work see, for example, Kowalik (1964), Feiwel (1972), Robinson (1977), Steindl (1981a), Laski (1987a, 1987b), Arestis (1996a), Toporowski (2012) and Dixon and Toporowski (2013). On Kalecki's influence on Joan Robinson's approach to economics, see Harcourt and Kriesler (2011). The significance of Kalecki's work, in particular for the post-Keynesian research programme, is discussed in several edited books, for example in Sebastiani (1989), Blaug (1992), King (1996), Sawyer (1999) and Sadowski and Szeworski (2004), in special issues of the *Oxford Bulletin of Economics and Statistics*, 1977, **39** (1) and the *Review of Political Economy*, 1999, **11** (3), and in a Festschrift *Problems of Economic Dynamics and Planning*, 1964. Furthermore, Bhaduri (1986) has presented a macroeconomics textbook which is to a large extent based on Kalecki's approach towards economics.
2. On Steindl's approach towards pricing, distribution and growth (and other issues), see King (1995), Shapiro (2012) and the contributions in the edited book by Mott and Shapiro (2005), as well as in the special issues of the *Review of Political Economy*, 1994, **6** (4), *Metroeconomica*, 2006, **57** (3) and *PSL Quarterly Review*, 2012, **65** (261). On Steindl's life and work see Harcourt (1994b, 1994c), Rothschild (1994) and Guger and Walterskirchen (2012).
3. According to Robinson (1977), Kalecki himself never claimed in public that he had been the first to discover the principle of effective demand. The only exception is the introduction to his *Selected Essays on the Dynamics of the Capitalist Economy, 1933–70*, where we can read: 'The first part includes three papers published in 1933, 1934 and 1935 in Polish before Keynes' *General Theory* appeared, and containing, I believe its essentials' (Kalecki 1971, p. vii).

4. 'It is worth noticing that there is a certain affinity between these theories of mine and those of Rosa Luxemburg' (Kalecki 1969a, p. 1, fn. 1). However, Kalecki did not share Luxemburg's view on the impossibility of growth or 'expanded reproduction' in the absence of external demand or external markets (Kalecki 1971, chap. 13). See also Section 5.6 in this chapter.
5. On Kalecki's pricing and distribution theory see Feiwel (1975, chap. III), Sawyer (1985, chaps 2, 6), Kriesler (1987), Asimakopulos (1988), Krämer (1996, chap. VII.C) and Lopez G. and Assous (2010, chap. 4). See Lavoie (1992, chap. 3, 2001, 2014, chap. 3) for a broader discussion of the post-Keynesian theory of the firm and of post-Keynesian pricing theory. See also Gu and Lee (2012) for a short overview and Lee (1998) for a more detailed treatment of post-Keynesian price theory.
6. Lavoie (1992, p. 97) links the Kaleckian distinction between price determination in the primary sector and in the secondary as well as tertiary sector to the notion of reproducible goods: '[W]here products are reproducible, we should expect marginal costs to be linear up to capacity; that is, we should observe inverted L-shaped average variable cost curves. Commodities which are not reproducible, as in the case of natural resources, or which require long delays to increase their production – the case of agricultural goods – correspond to the U-shaped marginal cost curves of the standard neoclassical firm.'
7. For a careful analysis of the three stages of development of Kalecki's pricing and distribution theory, see Kriesler (1987, chaps 4–6).
8. On the graphical presentation of the L-shaped cost curve see Kalecki (1939, p. 27, 1969a, p. 51).
9. In his earlier work, for example in Kalecki (1939, p. 19), Kalecki had assumed strictly profit maximizing behaviour of the firm and assumed that firms would equate marginal costs and marginal revenues, applying Lerner's (1934) notion of the degree of monopoly. However, in his later work, Kalecki (1954, 1971) abandoned this concept and made no more reference to the price elasticity of demand as a determinant of the degree of monopoly. See also Kriesler (1987, chaps 4–5) and Lee (1998, chaps 7–9).
10. According to Kriesler (1987, p. 42), 'Kalecki did not treat nor define the degree of monopoly in any formal or rigorous way. Rather he used it as a "nickname" for the "semi-monopolistic and monopolistic factors" which determine the mark-up.'
11. On the problems in Kalecki's microeconomic theory of exactly defining an industry, see in particular Kriesler (1987, chap. 6).
12. In Kalecki (1954, chap. 1, 1971, chap. 5), the pricing equation for the individual firm is $p = mu + n\bar{p}$, with p as the price set by the firm, u as constant unit prime (variable) costs, $\bar{p}$ as the average price in the industry, and m and n as positive coefficients, with $n < 1$, which characterize the price fixing policy of the firm. Taking the average values of p, u, m and n for the industry as a whole, the average mark-up for the industry or the sector of production (m in our notation below) in Kalecki's notation is $\bar{m}/(1 - \bar{n})$.
13. See also Kriesler (1987, p. 106), who argues that the starting point of the analysis should be the firm, which competes not only with other firms in its industry but also with other firms in the economy. For theoretical analysis, the economy should thus be divided into sectors (primary, secondary, tertiary sectors or sectors producing consumption goods and producing investment goods), as Kalecki did in his distribution and macro theories, and not into industries. Therefore, sectoral average mark-ups, unit variable costs and prices should be calculated and taken as starting points for distribution and macroeconomic theories. Our presentation of Kalecki's approach could be read in this way.
14. The concept of vertical integration is used by Kalecki (1954, 1971) in those chapters dealing with distribution and macroeconomic issues, but not in the chapters dealing with mark-up pricing. For a critique of using this concept in the context of price setting, see Steedman (1992). For a justification, see Sawyer (1992), who argues that this concept provides a bridge between microeconomic and macroeconomic analysis. And this is exactly what we attempt to do here, linking price setting to aggregate functional income distribution. See also our discussion in Section 5.4.

15. Kalecki holds that his theorem is broadly valid for functional income distribution in the private sector of the economy as a whole. Of course he acknowledges that '[i]n 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' (Kalecki 1954, p. 30, 1971, p. 64, emphasis in the original).
16. Steindl (1993) has pointed out that these determinants may, of course, interact. For example, a rise of the mark-up may also affect the ratio of raw material to wage costs if the increase of the mark-up is uniform across the economy and therefore rises at the same rate in the primary and the secondary and tertiary sectors. Therefore, the increase in the gross profit share due to the increase in the average mark-up would be amplified. If however the increase in the mark-up in industrial and service production were accompanied by a decline of the mark-up in raw material production, the rise in the aggregate gross profit share due to an increase in the average mark-up would be dampened or even reversed.
17. Asimakopulos (1988, p. 140) insists on the effects of demand and hence capitalist expenditures on functional income distribution in Kalecki's approach: 'Changes in this labor share can be affected by changes in average markups in industries whose prices are cost determined, and by changes in capitalists' expenditures through their effects on the demand for primary goods, and thus on the ratio of prices of raw materials to unit wage costs.'
18. 'Once the possible influence of overhead costs has been recognized, there is no divergence between mark-up pricing and full-cost pricing, when the latter is appropriately understood to be normal cost pricing' (Lavoie 1992, p. 135).
19. Starting with Rowthorn (1977), in the post-Keynesian literature the effect of trade union bargaining power has been integrated into conflicting claims inflation models, in which workers and their trade unions, on the one side, and firms, on the other side, have conflicting and potentially inconsistent income claims generating inflation, on the one hand, and affecting income distribution, on the other hand. See, for instance, Lavoie (1992, pp. 372–421) and Hein and Stockhammer (2010).
20. See also Sawyer (1985, p. 113): 'Kalecki considered the impact of trade unions through their effect on the degree of monopoly. Trade unions are seen as only able to raise real wages and wage shares in so far as they are able to modify the degree of monopoly. Thus power in the labour market is seen as of little use without some corresponding power in the product market or some constraint on firms in that market to offset power in the labour market.'
21. On 'Bowley's law', see Krämer (1996, 2011). He points out that Kalecki (1939, chap. 1) initially adhered to the law but finally abandoned it in Kalecki (1954, 1971) based on the arguments outlined in this chapter.
22. Marx's view on the long-run trend of functional income distribution has found different interpretations in the Marxian literature on distribution, capital accumulation and crisis. The proponents of the 'profit squeeze' approach to economic crisis, relying on Marx's (1867, chap. XXV) view in *Capital, Volume 1*, derive a cyclical and long-run tendency of the rate of surplus value to fall and hence the wage share to increase (Goodwin 1967; Glyn and Sutcliffe 1972; Gordon 1987; Gordon et al. 1987; Levine 1988). However, proponents of Marxian 'underconsumptionist' theories of crisis, relying on Marx's (1885, chaps 20–21) exposition of the schemes of reproduction in *Capital, Volume 2*, assume a tendency of the rate of surplus value to rise and hence the wage share to fall (Sweezy 1942; Baran and Sweezy 1966; Bleany 1976; Foster 1987). The same tendency of the rate of surplus value to rise and the wage share to fall is supposed by those Marxists adhering to the law of the general rate of profit to fall owing to technological change as an explanation of long-run crisis of over-accumulation of capital, following Marx's (1894, Part III) arguments in *Capital, Volume 3* (Shaikh 1978a, 1978b, 1987, 2011; Laibman 1987; Catephores 1989).
23. Similar considerations can already be found in Kalecki (1939, chaps 2–3, 1969a, chaps 1, 5). See also Feiwel (1975, chap. IV), Sawyer (1985, chap. 4), Kriesler (1987, chap. 7), Asimakopulos (1988) and Lopez G. and Assous (2010, chap. 2).

24. Kalecki (1954, p. 53, 1971, p. 86) assumes a delay in the capitalists' consumption expenditure decisions to the change in profits.
25. See, for example, Hein (2008, chaps 6, 10.2) for a more extensive discussion of the post-Keynesian monetary theory and the monetary circuit approach, as well as reference to further literature. On Kalecki's approach towards money and finance and its compatibility with post-Keynesian monetary theory, see in particular Sawyer (1985, chap. 5, 2001a, 2001b), Arestis (1996b), Dymski (1996) and Lopez G. (2002).
26. Kalecki's approach is inspired by his reading of Marx's (1885) schemes of reproduction in *Capital, Volume 2*. See also Kalecki (1968a) and Hein (2004b, 2006a) for further analysis.
27. According to Kalecki (1954, pp. 50–52, 1971, pp. 84–86), 'external profits', generated by net exports and governments' budget deficits, provide the link with imperialism. Conquering external markets provides the foundations for export surpluses, and armaments and wars are usually associated with government deficits.
28. See, in particular, Kriesler (1987, chap. 6) and Krämer (1996, pp. 227–236) for more extensive discussions.
29. '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' (Kalecki 1954, p. 11, 1971, p. 43, emphasis in the original).
30. See also Reynolds (1982/83) and Kriesler (1987, pp. 107–111) on a refutation of the 'tautology' accusation.
31. Weintraub's contribution seems to be more geared towards explaining inflation. With a constant wage-cost mark-up, the inflation rate is determined by the difference in the growth rates of money wages and labour productivity, as can be seen from equation (5.25). Therefore, in order to contain inflation, money wage growth has to be restricted. His co-authored proposal of a tax-based incomes policy (Wallich and Weintraub 1971), imposing taxes on excessive wage and hence price increases, is in this vein, as King (2002, pp. 105–110) explains.
32. For more general overviews of post-Keynesian cost-plus theories of pricing and prices, see for example Lavoie (1992, chap. 3, 2001, 2014, chap. 3), Lee (1998) and Gu and Lee (2012).
33. On the contributions by Wood, Eichner, and Harcourt and Kenyon to post-Keynesian theories of pricing and distribution, see, for example, Asimakopulos (1988) and Lavoie (1992, chap. 3, 2014, chap. 3). On Eichner's work more generally, see the chapters in the edited book by Lavoie et al. (2010).
34. See also Kalecki (1939, chap. 4). The modern mainstream version of Kalecki's approach, without mentioning Kalecki at all, is obviously the Stiglitz and Weiss (1981) approach towards credit rationing in imperfect credit markets characterized by asymmetric information and the related problems of adverse selection and moral hazard. With regard to equity markets and the preference of the management of corporations to finance investment out of the cash flow rather than by issuing shares, Myers and Majluf (1984) have put forward a similar argument based on asymmetric information between management and investors in equity markets.
35. For surveys on the empirical work confirming the effect of internal funds on firms' investment see Schiantarelli (1996) and Hubbard (1998).
36. Wood (1975, p. 4) and Harcourt and Kenyon (1976) also consider the growth of sales to be the main objective of the firm in the capitalist economy.
37. This approach was also supported by Shapiro (1981) and Kaldor (1985a, pp. 50–52), for example.
38. See Lavoie (1992, pp. 109–114) for a derivation in a simple model without depreciation and overhead costs and assuming the rate of interest on borrowed capital and the rate of return on shares to be equal. See also Wood (1975, chap. 3.3) and Eichner (1976, chap. 3).
39. On Steindl's pricing and distribution theory see, for example, Shapiro (1988), Lee (1998, chap. 10) and Bloch (2000, 2006).

40. '"Normal profit firms" are thus by definition a group which has on the average zero net profits, subject to the condition that it must be the smallest firms in the industry' (Steindl 1952, pp. 39–40).
41. Obviously, this notion is inspired by Marx's (1867, chap. 25) notion of the concentration of capital by means of differential rates of accumulation of individual capitals in *Capital, Volume 1*.
42. On Sylos-Labini's theory of pricing and distribution, see for example Krämer (1996, chap. VII.D), and, on Sylos-Labini's life and work, see Roncaglia (2006).
43. The price adjustment of the price leader will therefore be asymmetric.
44. Lima and Setterfield (2010) have also modelled several versions of the cost-push effect of higher interest rates, applying different versions of post-Keynesian and other heterodox theories of cost determined prices.
45. The lag between stages 2 and 3, which is important in Kalecki's (1969a) model but is dropped in the following models, will be ignored.
46. In the foreword to the English translation of his early works published in Poland in the 1930s, *Studies in the Theory of Business Cycles, 1933–1939*, there is a similar view: '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' (Kalecki 1969a, p. 1).
47. On the determinants of investment in Kalecki's approach in comparison to Keynes's theory of investment, see Lopez G. and Mott (1999) and Lopez G. (2002).
48. For a survey of Kalecki's models of the business cycle and the respective investment functions in these models, see in particular Steindl (1981b), Sawyer (1985, chap. 3) and Lopez G. and Assous (2010, chap. 5).
49. As Steindl (1981c, p. 132, emphasis in the original) points out, Kalecki's model 'can *alternatively* either produce a cycle or a trend'. Kalecki focused on the cycle and therefore had to rely on external stimulus in order to generate a positive trend.
50. For a more detailed analysis of Kalecki's trade cycle models see in particular Lopez G. and Assous (2010, chap. 5). They start with Kalecki's 1933 version of a business cycle model (Kalecki 1969a) referred to above, with the contradictory effects of investment on the constitutive elements of the profit rate, i.e. the amount of profits and the stock of capital, the development of which then feeds back to investment. Next, the Kalecki (1939, chap. 6) version is outlined, which includes a non-linear investment function and introduces Kalecki's 'principle of increasing risk' into a business cycle model. This is further developed in the also non-linear Kalecki (1943) model, which attempts to address jointly the problem of trend and cycle. The Kalecki (1954) model, to which we will refer below, returns to a linear system, in which cycles are generated and sustained by shocks. The trend in this model becomes semi-exogenous to the process generating the cycle and is mainly determined by innovations, which are exogenous but then affect investment, thus a 'semi-exogenous' trend. Finally, Kalecki's last (1968b, 1971, chap. 15) attempt at integrating trend and cycle in a theory of demand determined output with excess capacity as the normal state of the economy is outlined, in which however the notion of a semi-exogenous trend is maintained.
51. Steindl (1981c) adds that the mathematical treatment of innovations as a time trend does, of course, not represent what Kalecki had in mind. For this purpose innovations should have been modelled as a result of past experience and accumulation.
52. Steindl (1981b, p.148, emphasis in the original) concludes his review of Kalecki's trade cycle theories as follows: '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 recognised 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.'
53. In fact, the second edition of *Maturity and Stagnation in American Capitalism* was published in 1976 by Sweezy's Monthly Review Press.

54. It has to be noticed, as Dutt (2005b) has pointed out, that Steindl (1952) did not focus on the distinction between workers' household income (wages) and capitalists' or rentiers' household income (distributed profits). He rather made the distinction between firms' retained profits, which are saved by definition, and distributed income to households (wages and distributed profits), which are partly consumed and partly saved. In later publications, however, Steindl (1979, 1985, 1989) used Kalecki's distinction of workers and capitalists and their respective incomes, that is wages versus gross profits (including retained and distributed profits).
55. For more elaborated and complicated versions of Steindlian distribution and growth models, see for example Dutt (1995) and Flaschel and Skott (2006).
56. Guger et al. (2006) apply Steindl's (1979) concept of 'stagnation policy' to the economic policy stance in the European Union and outline policy alternatives in order to boost aggregate demand, employment and growth along Kaleckian–Steindlian lines.

6. The basic Kaleckian distribution and growth models

6.1 INTRODUCTION

In this chapter we will develop two versions of a basic Kaleckian distribution and growth model, which will only differ with respect to their investment functions. These models provide the foundations for further extensions in the following chapters of the book, providing models which have been applied in empirical research by several authors. As in the previous chapters, we will make use of equilibrium modelling methods and generate equilibrium growth paths or long-run steady states. This might be considered to contradict Kalecki's attempts at providing dynamic models of the trade cycle and of cyclical growth. However, as pointed out by Dutt (2011a), this method does not imply that the generated equilibria should be considered as actual states of rest or of tranquillity of the real economy. Steady state growth equilibria are rather theoretical tools of analysis, which are generated by the model holding several parameters and coefficients constant, which may and will change in the real world. Changes in these parameters and coefficients can then be integrated, and the model thus provides the tools to analyse these changes in a systematic way, either by means of treating these changes as exogenous shocks or by means of endogenizing them in a dynamic disequilibrium modelling approach.

Kaleckian distribution and growth models have been developed and initially presented by Rowthorn (1981) and Dutt (1984, 1987) in particular.[1] Early formulations and discussions of the model can also be found in Taylor (1985) and Amadeo (1986a, 1986b, 1987).[2] As we will see below, the most important results of these models are that lower mark-ups in firms' pricing and hence lower profit shares will increase the rates of capacity utilization, profit and capital accumulation. Aggregate demand, capital accumulation and growth are thus 'wage-led' in this type of model, which we will call the 'neo-Kaleckian' distribution and growth model; its results are well in line with Kalecki's thoughts outlined in Chapter 5. Bhaduri and Marglin (1990) as well as Kurz (1990) have presented a slight variation of the model, changing the investment function, and have derived different potential regimes, wage-led or profit-led, depending on the model parameters. We will term this variant the 'post-Kaleckian' distribution and growth model.

These different variants of the Kaleckian distribution and growth models contain the main features of Kalecki's (1954, 1971) and Steindl's (1952) approaches towards distribution, aggregate demand and economic dynamics outlined in Chapter 5 of this book. Labour supply is not a binding constraint for output and growth, and unemployment is a persistent feature of modern capitalist economies, both in the short and in the long run. Therefore, full employment is an exception and, even if it is achieved, effective labour supply is endogenous to aggregate demand, growth and hence labour demand through various channels: participation rates, minimum and maximum working ages, migration, and finally also labour productivity growth. Unlike the case in the post-Keynesian Kaldor–Robinson model outlined in Chapter 4, it is assumed that firms, in particular in the industrial sectors of the economy, operate in markets dominated by oligopolies or monopolistic competition, which gives them some price setting power. Mark-up pricing on unit variable costs is the main determinant of functional income distribution, as explained in Chapter 5, with the mark-up being determined by the degree of market concentration, the relevance of price competition, overhead costs, and the bargaining power of trade unions. Prices are thus cost determined and broadly rigid with respect to fluctuations in demand. Firms usually operate with excess capacity, both in the short and in the long run, and aggregate demand determines aggregate supply, with capacity utilization as the adjusting variable. For the economy as a whole, investment determines saving via income, capacity utilization and growth effects, but not (necessarily) via distribution effects as in the Kaldor–Robinson model. When it comes to the determination of investment decisions, we will see that in both the neo- and the post-Kaleckian versions aggregate demand and sales expectations matter, and hence capacity utilization, as do firms' internal means of finance, following Kalecki's (1937) 'principle of increasing risk'. The Bhaduri/Marglin–Kurz post-Kaleckian version, giving rise to different potential regimes of demand and accumulation or growth, differs from the Rowthorn–Dutt neo-Kaleckian version in that unit profits or the profit share is included as an additional determinant in the investment function.

Treating the rate of capacity utilization as an endogenous variable in Kaleckian models, as the main distinguishing feature when compared to the Kaldor–Robinson model, has been justified on different grounds. According to Kalecki (1971, p. 165), the long-run accumulation path is only an average of short-run cyclical fluctuations. And only in the boom phase of a cycle is full utilization of productive capacities reached. However, the average rate of capacity utilization over the entire cycle, which is of interest here, has to be below full utilization:

> Even on the 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. (Kalecki 1954, p. 131, 1971, p. 137)

Furthermore, as outlined in Chapter 5, Steindl (1952) and Sylos-Labini (1969) have emphasized that oligopolies hold desired capacity reserves in the long run in order to be able immediately to adjust to demand fluctuations and to deter potential competitors from entering the market. Indivisibilities of the capital stock especially, as well as the strategic market behaviour of oligopolies, thus prevent a continuous adaptation of productive capacities to varying demand. And Steindl (1952, p. 12) has made clear that, in the long run, oligopolies do not necessarily achieve their planned rate of capacity utilization. Finally, Lavoie (1992, pp. 327–328) has pointed out that the existence of planned capacity reserves does not mean that the entire capital stock of the corporation is used inefficiently, such that production is not undertaken with (close to) minimal unit costs. Rather, it can be assumed that in a multi-factory corporation some factories or segments of factories and thus parts of the capital stock are left unused, but can be activated at any time, and that the other factories or segments of factories are operated in an economically efficient way.

However, the treatment of the rate of capacity utilization as an adjusting variable, not only in the short run, but also in the medium to long run, and the concomitant divergence of the equilibrium rate of utilization from the 'normal' rate of utilization or from the target rate of the firms beyond the short run has not remained unchallenged. Classical and Marxian authors, like Committeri (1986), Auerbach and Skott (1988), Duménil and Lévy (1995, 1999), Shaikh (2009) and Skott (2010, 2012), have argued that such a deviation is not acceptable for a long-period equilibrium, that it will trigger responses by firms' investment, and that therefore the Kaleckian models are prone to 'Harrodian instability', which then requires other mechanisms to keep the long-run equilibrium stable. Kaleckians, however, have defended their notion of a long-run endogenous rate of utilization with the following lines of reasoning.

First, Chick and Caserta (1997), for example, have argued that expectations and behavioural parameters, as well as norms, are changing so frequently that a long-run equilibrium, defined as a fully adjusted position at normal or target rates of capacity utilization, is not very relevant. Instead, they argue that the focus should be on short-run analysis and on medium-run or provisional equilibria, in which the goods market equilibrium rate of capacity utilization may deviate from firms' target rate. The long run is thus nothing other than a succession of medium-run provisional equilibria, an interpretation which is faithful to Kalecki's view.

Second, Dutt (1990a, pp. 58–60, 2010a) and Lavoie (1992, pp. 327–332, 417–422) have suggested that the notion of a normal or target rate of utilization should be defined as a range and not as a single value. Under the conditions of fundamental uncertainty, firms may be quite content to run their production capacity at rates of utilization that are within that acceptable range for the normal or target rate without triggering adjusting reactions of investment. The normal rate of utilization thus becomes endogenous with respect to the actual rate within that range.

Third, Dallery and van Treeck (2011), building on Lavoie (2002), have argued that firms have multiple goals and targets, the achievement of which may be mutually inconsistent. Therefore, they may have to accept variations in capacity utilization and hence deviations from their target or normal rate in order to achieve or to come close to achieving other goals, for example a certain target rate of return imposed by shareholders.

Fourth, Lavoie (1995b, 1996b) and Cassetti (2006) have suggested that firms' assessment of the trend growth of demand and of the normal rate of capacity utilization becomes endogenous to their past experience and thus to actual growth and actual utilization. Therefore, in the long-period equilibrium we have an equality of actual and normal rates of utilization, because the latter adjusts towards the former. Schoder (2012) has recently presented empirical support for this view, and Nikiforos (2013) has provided a microeconomic rationale based on the choice of the cost minimizing number of shifts determining the normal rate of utilization.

Fifth and finally, if we consider the normal rate of utilization to be determined by a stable inflation rate of capacity utilization targeted by inflation averse central banks, Hein (2006c, 2008, chap. 17) has shown that this rate becomes endogenous to the central bank's interest rate policies reacting upon deviations of the actual rate of utilization from the stable inflation rate of utilization. The normal rate of utilization is thus affected by the actual rate of utilization, albeit in an indirect and complex way.

We will deal with the critique of the Kaleckian models and the Kaleckian responses and defences in more detail in Chapter 11 of this book.[3] For the time being and in what follows up to that chapter we consider the Kaleckian arguments to be convincing and we treat the rate of capacity utilization as accommodating variables in the distribution and growth models to be outlined in the following sections. We will start with an outline of the basics of the models which are shared by both variants in Section 6.2. Then we will discuss the neo-Kaleckian distribution and growth model in the tradition of Rowthorn (1981) and Dutt (1984, 1987) in Section 6.3, before we move to the post-Kaleckian model as suggested by Bhaduri and Marglin (1990) and Kurz (1990) in Section 6.4. Finally, in Section 6.5 we will assess these approaches.

6.2 BASICS OF THE MODELS

As in the textbook post-Keynesian Kaldor–Robinson model presented in Chapter 5, we assume a closed economy without a government sector. An open economy extension will be introduced in Chapter 7. The economy is composed of two classes, workers and capitalists. Workers offer labour power to capitalists and receive wages, which they use in order to purchase consumption goods. In this chapter, we assume a classical saving hypothesis, which means that workers do not save. We will relax this assumption in Chapter 7, too. As mentioned above, labour power is usually in excess supply, such that production is generally not constrained by the available labour force. Capitalists own the means of production and receive profits, which are partly consumed and partly saved – buying assets issued by the corporate sector and thus the capitalists themselves or depositing parts of the profits with the financial sector, which is also owned by the capitalists and not explicitly modelled here. Therefore, in this first, simple version of the model we do not distinguish between active industrial capitalists and rentiers living from the proceeds of financial wealth, nor between the rates of return on capital stock and on financial wealth, that is interest or dividend rates. Capitalists own the capital stock, hire labour, organize the production process, and decide about the investment in and thus the expansion of the capital stock. For the latter they draw on their own means of finance, issue corporate bonds or draw on credit granted by the financial sector, which is not explicitly modelled here. By assumption all these transactions take place within the capitalist class. They will be explored in more detail in Chapters 9 and 10, where we will explicitly integrate debt and equity and the respective rates of return, that is the rate of interest and the dividend rate, into the model.

We assume again that in our economy a homogeneous output (Y) is produced combining direct labour and a non-depreciating capital stock in the production process. The homogeneous output can be used for consumption and investment purposes. Here, we also abstract from overhead labour, depreciation of the capital stock, and raw materials and intermediate products. The technical conditions of production, that is the capital–potential output ratio ($v = K/Y^p$) and the labour–output ratio ($a = L/Y$), are each assumed to be constant, which means we also exclude technical progress from the model – it will be integrated in Chapter 8. Following Kalecki's and Steindl's approaches, we consider the rate of capacity utilization as the accommodating variable, which adjusts aggregate supply to aggregate demand and saving to investment, both in the short and in the medium to long run.

For such an economy, we can start again with the relation between the profit rate (r), the real wage rate (w^r), the profit share (h) and the rate of capacity utilization (u), with constant production coefficients (a, v):

$$r = \frac{\Pi}{pK} = \frac{\Pi}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = \frac{pY - wL}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = (1 - w^r a)\frac{u}{v} = h\frac{u}{v}. \quad (6.1)$$

The sum of profits is denoted again by Π, the real capital stock by K, output by Y and potential output given by the capital stock by Y^p. As usual, the general price level is represented by p and the nominal wage rate by w. As we now treat the rate of capacity utilization as a variable in short- and long-run perspectives, the Kaleckian approaches abandon the strictly inverse relationship between the rate of profit and the real wage rate known from the Kaldor-Robinsons model. An increase in the real wage rate need not mean a decline in the rate of profit, if it is associated with an increase in the rate of capacity utilization.

Functional income distribution, and hence the profit share, is determined by mark-up pricing of firms in incompletely competitive goods markets. As we have excluded material costs, firms only mark up unit labour costs (W/Y), which are assumed to be constant up to full capacity output. And, since we have no depreciation costs of fixed capital and other overhead costs, the mark-up only covers broad profits, that is retained earnings, interest and dividends. Denoting the mark-up again by m, we arrive at the following 'pricing equation' in our one-good economy:

$$p = (1 + m)\frac{W}{Y} = (1 + m)wa, \quad m > 0. \quad (6.2)$$

From this, holding the technical conditions of production constant, the real wage rate is inversely determined by the mark-up:

$$w^r = \frac{w}{p} = \frac{1}{(1 + m)a}. \quad (6.3)$$

A rise of the mark-up hence leads to a lower real wage rate. The mark-up can generally be understood as an indicator of the firms' ability to push through a certain profit claim against competitors and workers. Following Kalecki, in our simple model, the mark-up is determined by the intensity of price competition in the goods market and by the bargaining power of trade unions in the labour market. The mark-up uniquely determines the profit share as follows:

$$h = \frac{\Pi}{pY} = \frac{pY - W}{pY} = 1 - \frac{W}{(1+m)W} = 1 - \frac{1}{1+m} = \frac{m}{1+m}. \quad (6.4)$$

Since workers do not save, saving (S) only consists of saving out of profits, that is retained earnings, and saving out of distributed profits. Assuming a given and constant propensity to save out of total profits (s_Π), and including equation (6.1), we receive the following saving rate (σ), which relates total saving to the nominal capital stock:

$$\sigma = \frac{S}{pK} = \frac{s_\Pi \Pi}{pK} = s_\Pi r = s_\Pi h \frac{u}{v}, \quad 0 < s_\Pi \leq 1. \quad (6.5)$$

The macroeconomic saving rate thus depends positively on the saving ratio out of profits, on the profit share and on the degree of capacity utilization, and negatively on the capital–potential output ratio.

The foundations for the different variants of the Kaleckian models can thus be described by equation (6.1) for the profit rate, equation (6.4) for the profit share and equation (6.5) for the saving rate. In order to complete the model, we need an accumulation function (g) and the goods market equilibrium condition ($g = \sigma$), with the saving rate adjusting to the accumulation rate by means of variations in the rate of capacity utilization. We have outlined and discussed Kalecki's and Steindl's theories of investment decisions in Chapter 5. Broadly speaking, we have found that in their views investment decisions mainly depend on internal means of finance, because usually firms are external finance-constrained in incomplete financial markets (both credit and shares markets), on capacity utilization indicating the development of sales and sales expectations, and on semi-exogenous 'development factors', in particular technological progress and innovations. In the following sections we will see how these determinants are integrated into the investment functions of the neo-Kaleckian Rowthorn–Dutt model and into the post-Kaleckian Bhaduri/Marglin–Kurz model.

6.3 THE NEO-KALECKIAN OR ROWTHORN–DUTT MODEL – THE 'UNDERCONSUMPTIONIST' OR 'STAGNATIONIST' VERSION

Rowthorn (1981) and Dutt (1984, 1987) assume that firms' accumulation decisions are determined by the degree of utilization of productive capacities and by the realized profit rate. The realized profit rate is used as an argument for the accumulation function, because it can be seen as an indicator for expected future profitability. Furthermore, realized profits provide internal funds for accumulation, and internal profits enable easier access to external means of finance in incomplete markets of debt and equity, following Kalecki's (1937) 'principle of increasing risk', outlined in Chapter 5. The realized rate of utilization of productive capacities is included, because it has a positive impact on realized profits. Furthermore, the rate of capacity utilization is the important indicator for the development of demand in relation to the capital stock in existence and thus becomes one of the major factors influencing investment decisions. This consideration goes back to Steindl (1952, p. 214), in particular, as we have seen in Chapter 5.

If the decisions to invest are introduced as a function of the realized profit rate and the rate of capacity utilization, as in Rowthorn (1981) and Dutt (1984, 1987), it has to be assumed implicitly that an increase in the rate of utilization always leads to a rise in the realized profit rate. This is so because, if the rate of profit remained constant in the face of a rising rate of capacity utilization, the profit share would have to fall with constant technical conditions of production (equation (6.1)). And this should have an impact on investment decisions, too, which however is not included in the neo-Kaleckian model. Therefore, in the Rowthorn–Dutt formulations of the investment function the rate of capacity utilization appears twice – directly and indirectly. Following a suggestion by Amadeo (1986a, 1986b, 1987), the accumulation function can thus be simplified by means of dropping the rate of profit and only including a constant and the rate of capacity utilization. As we will show in the appendix to this chapter for an investment function with both the rate of capacity utilization and the rate of profit, the qualitative results of the model remain the same.

We can now complete the basic model in equations (6.1), (6.4) and (6.5) by the accumulation function in equation (6.6). In this function the positive parameter α can be interpreted along the lines of Keynes's (1936, p. 161) 'animal spirits', which have already been mentioned in Robinson's approach in Chapter 4. It represents the complex historical, political and psychological factors affecting investment, for example the general business climate, the pressure of competition, long-run expectations, and so on. The coefficient β measures the impact of the rate of capacity utilization on investment. Finally, we have the goods market equilibrium condition in equation (6.7), which says that the saving rate is equal to the rate of accumulation and that hence output of firms is equal to aggregate demand in the goods market. The adjustment takes place through a change in the rate of capacity utilization, which is the adjusting variable in the model. In order to obtain a stable equilibrium, the saving decisions have to react more strongly to a variation in the endogenous variable, the rate of capacity utilization, than the investment decisions, as shown in condition (6.8). For convenience we present the full model:

$$r = h\frac{u}{v}, \tag{6.1}$$

$$h = 1 - \frac{1}{1+m}, \tag{6.4}$$

$$\sigma = s_\Pi h\frac{u}{v}, \quad 0 < s_\Pi \leq 1, \tag{6.5}$$

$$g = \frac{I}{K} = \alpha + \beta u, \quad \alpha, \beta > 0, \tag{6.6}$$

$$g = \sigma. \tag{6.7}$$

$$\frac{\partial\sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \quad \Rightarrow \quad s_\Pi\frac{h}{v} - \beta > 0. \tag{6.8}$$

Inserting equations (6.5) and (6.6) into the equilibrium condition in equation (6.7), we receive the equilibrium rate of capacity utilization:

$$u^* = \frac{\alpha}{s_\Pi\frac{h}{v} - \beta}. \tag{6.9}$$

Plugging this equilibrium rate of capacity utilization into equation (6.5) or (6.6), we get the equilibrium accumulation and saving rates:

$$g^* = \sigma^* = \frac{\alpha s_\Pi\frac{h}{v}}{s_\Pi\frac{h}{v} - \beta}. \tag{6.10}$$

And, finally, inserting equation (6.9) into equation (6.1) yields the equilibrium profit rate:

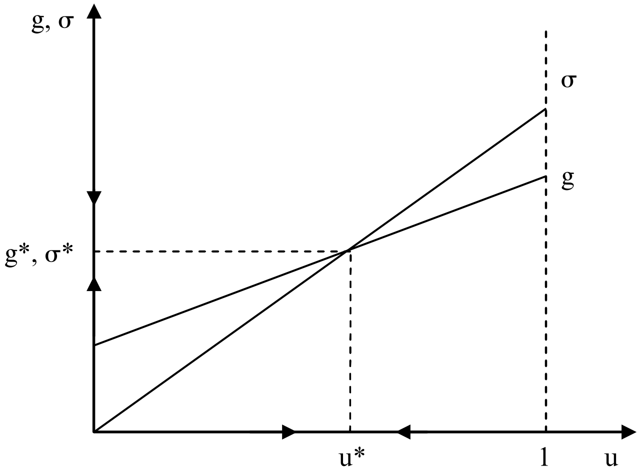
$$r^* = \frac{\alpha \frac{h}{v}}{s_\Pi \frac{h}{v} - \beta}. \tag{6.11}$$

Graphically, the equilibrium in the neo-Kaleckian distribution and growth model can be derived as in Figure 6.1. The equilibrium rates of capacity utilization and capital accumulation are obtained in the upper part in the point of intersection of the accumulation function from equation (6.6) and the saving function from equation (6.5). In the lower part the point of intersection of the function for the 'produced profit rate' from equation (6.1), which Rowthorn (1981, p. 8) called the 'profits function' and Lavoie (1992, p. 299) the 'profits costs curve', with the function for the 'equilibrium realized profit rate', which Rowthorn (1981, p. 11) termed the 'realization curve' and Lavoie (1992, p. 304) the 'effective demand curve', and which is derived by means of inserting equations (6.1) and (6.5) into the goods market equilibrium equation (6.7) and solving for $r = g/s_\Pi$, gives the equilibrium rates of capacity utilization and of profit.

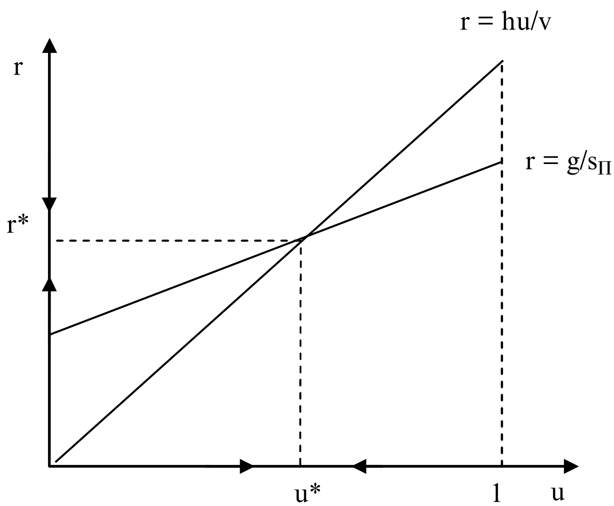
As Figure 6.1 shows, only by a fluke will the accumulation equilibrium (g^*, r^*, u^*) of the neo-Kaleckian model be at normal or full capacity utilization ($u_n = Y/Y^p = 1$). Usually in this model, an accumulation equilibrium with below full utilization can be expected, without any endogenous tendencies towards full utilization of productive capacities.

Let us take a more detailed look at the adjustment towards the equilibrium in our Kaleckian model without inventories and with prices fixed by mark-up pricing, in which firms therefore are assumed to adjust output and hence capacity utilization towards demand in each period. Since saving adjusts towards investment in each period by means of changes in output and hence capacity utilization, the goods market will be equilibrated within each period through this quantity adjustment, which is called a 'pure Keynesian adjustment process' (Lavoie 2010). In the models presented in this and the following chapters we assume this adjustment process to prevail.

Let us now assume that the stability condition (6.8) is met and, by accident, expected capacity utilization exceeds the equilibrium value ($u_1^e > u^*$) as in Figure 6.2. Capital accumulation (g_1) at this rate of utilization falls short of the respective desired saving rate ($g_1 < \sigma_1$); firms cannot sell what they expected because of a lack of aggregate demand. Production will hence be restrained, the saving rate adjusts to the accumulation rate through a reduction in capacity utilization, and the realized rate of capacity utilization (u_1) will therefore fall short of the expected rate ($u_1 < u_1^e$). This will induce firms to expect a lower rate of utilization ($u_2^e = u_1$) in



a) Accumulation rate and capacity utilization



b) Profit rate and capacity utilization

Figure 6.1 Equilibrium in the neo-Kaleckian distribution and growth model

the next period, and they will lower capital accumulation (g_2), which in Figure 6.2 is still below the desired saving rate at this rate of utilization. Aggregate demand will again fall short of aggregate supply, which will cause the rate of capacity utilization to fall further, triggering a lower

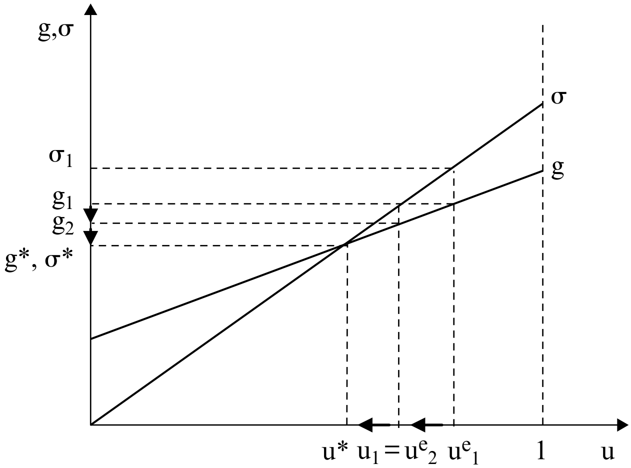


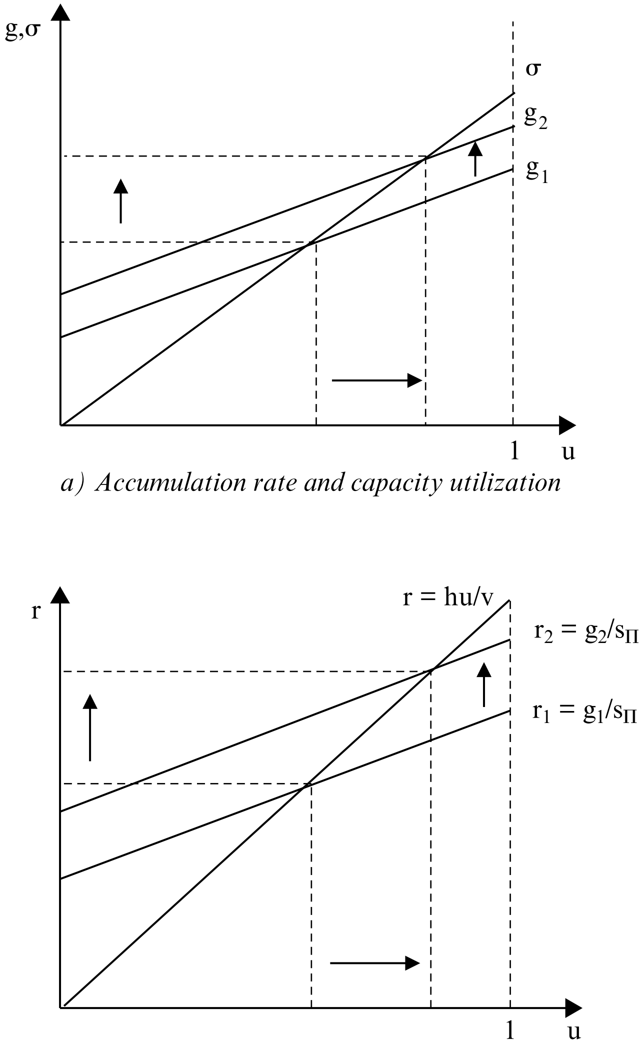
Figure 6.2 Adjustment towards the stable equilibrium in the neo-Kaleckian distribution and growth model

rate of capital accumulation, and so on. In this way, the rates of capacity utilization, capital accumulation and profit will converge towards their equilibrium values.

If actual capacity utilization falls short of its equilibrium value, the accumulation rate will exceed desired saving at this rate of utilization, and firms will observe that they can sell more than expected; they will expand output such that the realized rate of capacity utilization exceeds the expected rate of utilization. This will speed up capital accumulation and increase the rate of utilization even further, and so the rates of capacity utilization, capital accumulation and profit will converge towards their equilibrium values from below.

A rise in animal spirits (α) leads to a new equilibrium with higher rates of capacity utilization, capital accumulation and profit, as can easily be seen in equations (6.9) to (6.11). Graphically, an increase in animal spirits means an upwards shift in the accumulation function, from g_1 to g_2, and in the equilibrium realized profit rate function, from $r_1 = g_1/s_\Pi$ to $r_2 = g_2/s_\Pi$, as shown in Figure 6.3.[4] In the adjustment process towards the new equilibrium, firms observe that realized capacity utilization exceeds expected utilization, which induces them to increase capital accumulation until the rate of accumulation and the saving rate are again equal.

As in the post-Keynesian Kaldor–Robinson model of the previous



a) Accumulation rate and capacity utilization

b) Profit rate and capacity utilization

Figure 6.3 Increase in animal spirits in the neo-Kaleckian distribution and growth model

chapter, in the neo-Kaleckian distribution and growth model the paradox of saving is valid, too. A rise in the propensity to save from profits will cause lower rates of capacity utilization, capital accumulation and profit in the new equilibrium, as can be derived from equations (6.9) to (6.11):

$$\frac{\partial u^*}{\partial s_\Pi} = \frac{-\alpha\frac{h}{v}}{\left(s_\Pi\frac{h}{v} - \beta\right)^2} < 0, \tag{6.9a}$$

$$\frac{\partial g^*}{\partial s_\Pi} = \frac{-\alpha\beta\frac{h}{v}}{\left(s_\Pi\frac{h}{v} - \beta\right)^2} < 0, \tag{6.10a}$$

$$\frac{\partial r^*}{\partial s_\Pi} = \frac{-\alpha\left(\frac{h}{v}\right)^2}{\left(s_\Pi\frac{h}{v} - \beta\right)^2} < 0. \tag{6.11a}$$

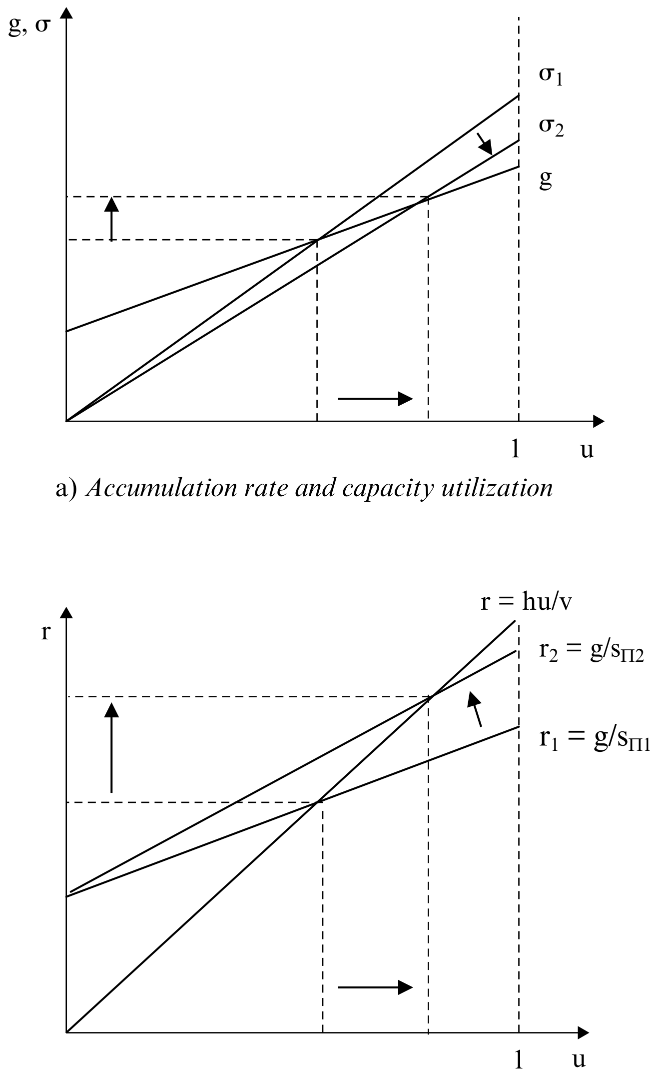
A lower propensity to save is thus expansionary, because consumption demand and capacity utilization increase, which will then also stimulate capital accumulation. The effect of a lower propensity to save from profits is shown in Figure 6.4. With a decrease in the propensity to save out of profits from $s_{\Pi 1}$ to $s_{\Pi 2}$, the saving function rotates clockwise from σ_1 to σ_2 and the equilibrium realized profit rate curve rotates counter-clockwise from $r_1 = g/s_{\Pi 1}$ to $r_2 = g/s_{\Pi 2}$. In the adjustment process towards the new equilibrium, firms will again observe realized capacity utilization exceeding expected utilization, which will induce them to increase capital accumulation until the rates of accumulation and saving are again equal.

Finally, we can examine the effect of a change in the mark-up and the profit share on the equilibrium rates of capacity utilization, capital accumulation and profit. From equations (6.9) to (6.11) we get:

$$\frac{\partial u^*}{\partial h} = \frac{-\alpha s_\Pi\frac{1}{v}}{\left(s_\Pi\frac{h}{v} - \beta\right)^2} < 0, \tag{6.9b}$$

$$\frac{\partial g^*}{\partial h} = \frac{-\alpha\beta s_\Pi\frac{1}{v}}{\left(s_\Pi\frac{h}{v} - \beta\right)^2} < 0, \tag{6.10b}$$

$$\frac{\partial r^*}{\partial h} = \frac{-\alpha\beta\frac{1}{v}}{\left(s_\Pi\frac{h}{v} - \beta\right)^2} < 0. \tag{6.11b}$$



a) *Accumulation rate and capacity utilization*

b) *Profit rate and capacity utilization*

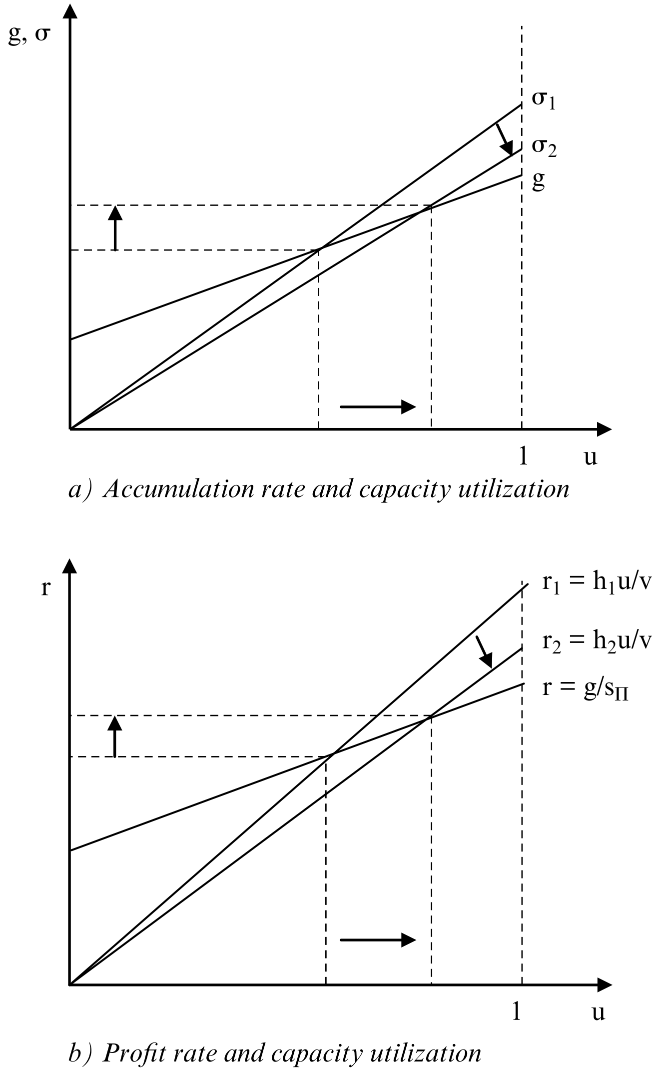
Figure 6.4 Reducing the propensity to save out of profits in the neo-Kaleckian distribution and growth model: the paradox of saving

An increase in the profit share, and hence a decrease in the wage share and with constant technical conditions of production in the real wage rate, has contractive effects on the equilibrium position of the system. Rowthorn (1981, p. 18) has termed this the 'paradox of costs': lower real wages and unit labour costs cause lower equilibrium rates of capacity utilization, capital accumulation and profit. An increase in the profit share thus lowers the profit rate! In reverse, the paradox of costs means that higher real wage rates and a higher wage share, or lower mark-ups and a lower profit share, lead to higher rates of capacity utilization, accumulation and profit in the new equilibrium. This is shown graphically in Figure 6.5, where a decline in the profit share from h_1 to h_2 means a clockwise rotation of the saving function from σ_1 to σ_2 and of the produced profit rate curve from $r_1 = h_1u/v$ to $r_2 = h_2u/v$.

The unambiguous effects of a change in the profit share on the equilibrium position are obtained, because in the model there are no direct effects of the profit share on capital accumulation. Redistribution in favour of the wage share only has a positive effect on consumption demand but no direct negative effect on investment and capital accumulation. The increase in capacity utilization then stimulates investment. Redistribution towards wages thus has a clear-cut expansive effect on each of the endogenous variables of the model: capacity utilization, capital accumulation and the rate of profit. Owing to the endogeneity of the rate of capacity utilization in the medium to long run, the strictly inverse relationship between the wage share (or the real wage rate) and the profit rate is invalidated – a higher wage share and a lower profit share do not mean a lower profit rate. And, owing to the expansionary effects of higher capacity utilization on investment and capital accumulation, profits and the profit rate even increase: workers and capitalists benefit from redistribution in favour of wages.

It goes without saying that the expansionary effects of an increase in animal spirits, a decrease in the propensity to save and redistribution towards the labour income share only occur while there is an underutilization of productive capacities. When full (or normal) capacity utilization is reached, these changes will have price and distribution effects, as was shown for the post-Keynesian Kaldor–Robinson model in Chapter 4.[5]

From the perspective of the neo-Kaleckian model, periods of stagnation with falling or low capacity utilization, declining or weak capital accumulation and falling or low profit rates can be attributed to falling or too low labour income shares. These cause problems with consumption demand, which then feed back negatively on investment demand, capital accumulation and growth. For this reason, the neo-Kaleckian



a) Accumulation rate and capacity utilization

b) Profit rate and capacity utilization

Figure 6.5 Reducing the profit share in the neo-Kaleckian distribution and growth model: the paradox of costs

Rowthorn–Dutt model can be termed an 'underconsumptionist' or 'stagnationist' version of the Kaleckian model. But as we will see in the next section this is not the only possible development of the approaches by Kalecki and Steindl.

6.4 THE POST-KALECKIAN OR BHADURI/MARGLIN–KURZ MODEL – DIFFERENT POTENTIAL REGIMES

The investment function in the neo-Kaleckian Rowthorn–Dutt model has not remained uncontested. Neo-Ricardian–Sraffian authors, like Ciccone (1986) or Vianello (1985, 1989), have argued that investment decisions of firms should depend on expected profitability at the normal or target rate of utilization of the expanded capital stock. This would mean applying an investment function with the normal rate of profit ($r_n = hu_n/v$) as the only determinant [$g = g(r_n)$] – without any role for the actual rate of capacity utilization. The paradox of costs would disappear completely, because a decrease in the profit share would depress investment without any compensating effect of the concomitant rise in capacity utilization.[6] However, the notion of an exogenously given normal rate of capacity utilization to which the system adjusts in the long run is alien to the Kaleckian approach, as we have outlined in Section 6.1 of this chapter. But this does not mean that profitability variables should disappear from the investment function altogether, as we have shown in our review of Kalecki's and Steindl's views on investment decisions in Chapter 5. However, introducing the actual rate of profit on top of the rate of capacity utilization into the investment function, strictly following Rowthorn's (1981) and Dutt's (1984, 1987) procedures, does not change the wage-led nature of the results, as can be seen in the appendix to this chapter.

Bhaduri and Marglin (1990), Kurz (1990, 1994) and Marglin and Bhaduri (1990, 1991) have therefore suggested an accumulation function in which the decision to invest is determined by the actual profit rate, similar to some of the arguments found in Kalecki's own works and the post-Keynesian models by Kaldor and Robinson, because profits in relation to the capital stock, that is the rate of profit, are important when it comes to financing investment. Profits provide internal means of finance and access to external means of finance in incomplete financial markets, as we have repeated several times. However, in contrast to the case of the post-Keynesian model, the rate of profit is now decomposed into the profit share, the rate of capacity utilization and the inverse of the capital–potential output ratio (equation 6.1), and, with the latter taken as constant, the former two are considered each to have a separate and positive impact on the decisions to invest through their independent effects on the profit rate and on profit expectations.[7] '[A] higher profit share and a higher rate of capacity utilization can each be argued to induce higher profit expectations, the first because the unit return goes up, the second because the likelihood of selling extra units of output increases', as Marglin and Bhaduri (1990, p. 163) claim.

With this slight change in the investment function, the unambiguously wage-led results of the Rowthorn–Dutt neo-Kaleckian model cannot generally be sustained any more in the post-Kaleckian model, as will be seen below.

The post-Kaleckian model can be described by the well-known equations (6.1), (6.4), (6.5), (6.7) and (6.8) from the neo-Kaleckian model. The accumulation function in equation (6.6) is now replaced by equation (6.12), which includes an independent positive effect of the profit share on investment decisions:

$$r = h\frac{u}{v}, \tag{6.1}$$

$$h = 1 - \frac{1}{1+m}, \tag{6.4}$$

$$\sigma = s_\Pi h\frac{u}{v}, \quad 0 < s_\Pi \leq 1, \tag{6.5}$$

$$g = \frac{I}{K} = \alpha + \beta u + \tau h, \quad \beta, \tau > 0, \tag{6.12}$$

$$g = \sigma. \tag{6.7}$$

$$\frac{\partial\sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \quad \Rightarrow \quad s_\Pi\frac{h}{v} - \beta > 0 \tag{6.8}$$

What equation (6.12) is telling us is that improved animal spirits (α), capacity utilization (u) and profit shares (h) each have partially positive effects on the firms' decisions to invest, holding the remaining determinants constant,[8] with β and τ representing the weights of demand and cost considerations in the decisions to invest. Furthermore, it should be noted that, unlike the case for the investment function in the neo-Kaleckian model, we do not have to assume any more that $\alpha > 0$ in this post-Kaleckian formulation. This becomes clear when we calculate the equilibrium values following the same procedure as in Section 6.3. Inserting equations (6.5) and (6.12) into the equilibrium condition in equation (6.7) yields the equilibrium rate of capacity utilization:

$$u^* = \frac{\alpha + \tau h}{s_\Pi\frac{h}{v} - \beta}. \tag{6.13}$$

Plugging this equilibrium into equation (6.5) or (6.12), we get the equilibrium accumulation and saving rates:

$$g^* = \sigma^* = \alpha + \beta\frac{\alpha + \tau h}{s_\Pi\frac{h}{v} - \beta} + \tau h = \frac{(\alpha + \tau h)s_\Pi\frac{h}{v}}{s_\Pi\frac{h}{v} - \beta}. \tag{6.14}$$

And inserting equation (6.13) into equation (6.1) gives the equilibrium profit rate:

$$r^* = \frac{(\alpha + \tau h)\frac{h}{v}}{s_\Pi\frac{h}{v} - \beta}. \tag{6.15}$$

Assuming the stability condition to hold, economically meaningful and hence positive equilibrium values only require that $\alpha + \tau h > 0$.

As can easily be seen from equations (6.13) to (6.15), improved animal spirits have uniquely positive effects on the stable equilibrium rates of capacity utilization, capital accumulation and profit. And the paradox of saving also remains valid in the post-Kaleckian model: an increasing propensity to save out of profits has negative effects on the stable equilibrium rates of capacity utilization, capital accumulation and profit:

$$\frac{\partial u^*}{\partial s_\Pi} = \frac{-(\alpha + \tau h)\frac{h}{v}}{\left(s_\Pi\frac{h}{v} - \beta\right)^2} < 0, \tag{6.13a}$$

$$\frac{\partial g^*}{\partial s_\Pi} = \frac{-\beta(\alpha + \tau h)\frac{h}{v}}{\left(s_\Pi\frac{h}{v} - \beta\right)^2} < 0, \tag{6.14a}$$

$$\frac{\partial r^*}{\partial s_\Pi} = \frac{-(\alpha + \tau h)\left(\frac{h}{v}\right)^2}{\left(s_\Pi\frac{h}{v} - \beta\right)^2} < 0. \tag{6.15a}$$

The paradox of costs, however, is no longer generally valid for the post-Kaleckian model, as can be seen below:

$$\frac{\partial u^*}{\partial h} = \frac{-\tau\beta - \alpha s_\Pi\frac{1}{v}}{\left(s_\Pi\frac{h}{v} - \beta\right)^2} = \frac{\tau - s_\Pi\frac{u}{v}}{s_\Pi\frac{h}{v} - \beta}, \tag{6.13b}$$

$$\frac{\partial g^*}{\partial h} = \frac{\beta\left(-\tau\beta - \alpha s_\Pi \frac{1}{v}\right)}{\left(s_\Pi \frac{h}{v} - \beta\right)^2} + \tau = \frac{s_\Pi \frac{1}{v}(\tau h - \beta u)}{s_\Pi \frac{h}{v} - \beta}, \tag{6.14b}$$

$$\frac{\partial r^*}{\partial h} = \frac{\frac{1}{v}(\alpha + \tau h)}{s_\Pi \frac{h}{v} - \beta} + \frac{\frac{h}{v}\left(-\tau\beta - \alpha s_\Pi \frac{1}{v}\right)}{\left(s_\Pi \frac{h}{v} - \beta\right)^2} = \frac{\frac{1}{v}\left(\alpha + 2\tau h - s_\Pi \frac{h}{v} u\right)}{s_\Pi \frac{h}{v} - \beta}. \tag{6.15b}$$

As equations (6.13b) to (6.15b) show, the effects of redistribution on the equilibrium rates of capacity utilization, capital accumulation and profit depend in the parameters in the behavioural equations of the model, that is on the saving and the investment functions, in particular. From equation (6.13b) it can be seen that an increase in the profit share will have a positive effect on equilibrium capacity utilization if the expansionary effect on investment overcompensates the contractionary effects of redistribution on consumption. A high elasticity of investment with respect to the profit share and a low propensity to save from profits favour a positive effect of the profit share on equilibrium capacity utilization, and thus a profit-led demand regime, which Bhaduri and Marglin (1990, p. 382) term an 'exhilarationist' regime. However, if changes in the profit share have only weak partially positive effects on investment and the propensity to save from profits assumes relatively high values, the effect of a higher profit share on equilibrium capacity utilization may become negative. In this case, the demand regime is wage-led, as in the neo-Kaleckian model. Bhaduri and Marglin (1990, p. 381) call this a 'stagnationist' regime.

Similar considerations apply when we look at the effects of a higher profit share on equilibrium capital accumulation and growth in equation (6.14b). A strong partial effect of the profit share and only weak partial effects of the rate of capacity utilization on investment favour a positive impact of redistribution in favour of the profit share, and accumulation and growth become profit-led. However, in the reverse constellation with weak effects of the profit share on investment and strong effects of capacity utilization, a higher profit share may have dampening effects on equilibrium capital accumulation, and growth becomes wage-led, as in the neo-Kaleckian model.

Finally, the effects of redistribution on the profit rate are ambiguous, too, as can be seen in equation (6.15b). Again, a strong partial effect of a rise in the profit share on investment and a low propensity to save from profits favour a positive effect of redistribution in favour of profits on the profit rate. Weak partial effects of profitability on capital accumulation and a high propensity to save from profits will tend to generate a negative effect of a higher profit share on the equilibrium profit rate, as in the neo-Kaleckian model.

Looking at the effects of redistribution on the rates of capacity utilization and profit, it becomes clear that the unique results of the neo-Kaleckian model become more complicated in the post-Kaleckian approach. Obviously, if an increase in the profit share raises equilibrium capacity utilization, as in a profit-led demand regime, this will also mean a higher equilibrium rate of profit, as is already clear from equation (6.1). However, comparing equations (6.13b) and (6.15b), it becomes clear that a negative effect of a rise in the profit share on capacity utilization, as in a wage-led demand regime, is not necessarily associated with a lower equilibrium rate of profit, because $\tau - s_{\Pi}u/v < 0$ in equation (6.13b) does not necessarily imply that $\alpha + 2\tau h - s_{\Pi}hu/v < 0$ in equation (6.15b). This can be easily evaluated by means of rearranging the latter condition to $\alpha/h + 2\tau - s_{\Pi}u/v < 0$ and comparing it to the former. Therefore, in a wage-led demand regime, a higher wage share will generate a rise in capacity utilization, which however may be too weak to compensate for the negative effect of a lower profit share on the rate of profit. Bhaduri and Marglin (1990, p. 383) call this a 'profit squeeze' constellation. In this case, although redistribution in favour of wages is expansionary with respect to aggregate demand and capacity utilization, it will not be supported by capitalists because it will mean a lower rate of profit to them.

Considering the effects of a change in distribution on capacity utilization and capital accumulation and thus growth, equations (6.13b) and (6.14b) reveal that a positive effect of a higher profit share on capacity utilization and hence profit-led demand always implies that the effect on capital accumulation and growth will be positive as well, and the economy will thus also be in a profit-led growth regime. A negative effect of a higher profit share on capacity utilization, as in the wage-led demand regime, may be accompanied by a negative effect on capital accumulation as well, and thus a wage-led growth regime, if investment decisions are dominated by capacity utilization rather than by unit profits or the profit share. In the opposite case, however, with a strong partial effect of the profit share and only weak effects of capacity utilization on capital accumulation, a higher profit share may cause a higher rate of accumulation and the economy will be in a profit-led growth regime. In the constellation of a wage-led demand plus a wage-led growth regime redistribution in favour of wages causes higher utilization and higher accumulation and growth rates. However, the constellation of a wage-led demand plus a profit-led growth regime will mean higher utilization in the short run but lower accumulation and growth in the long run.

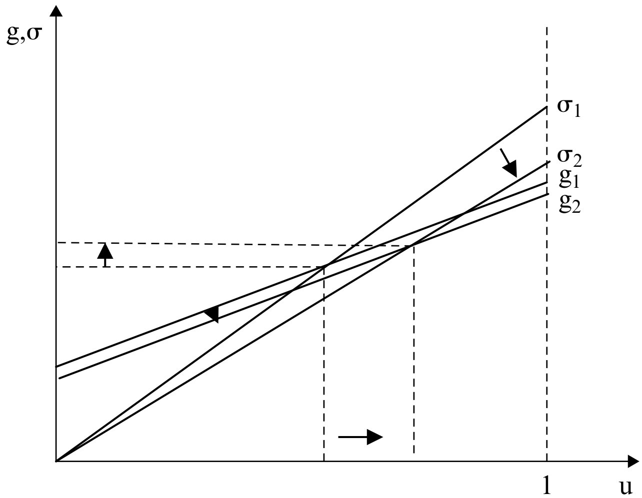


Figure 6.6 Increasing wage share/decreasing profit share in the post-Kaleckian model: the wage-led regime (wage-led demand and wage-led accumulation/growth)

Graphically, these constellations are shown in Figures 6.6 to 6.8, which display the effects of an increase in the wage share/decrease in the profit share. In each of the figures, an increase in the wage share means the same clockwise rotation of the saving rate function (equation (6.5)) from σ_1 to σ_2 and a shift of the accumulation function (equation (6.12)) from g_1 to g_2. The slope of the accumulation function, and thus the coefficient β, remains unchanged, and it is only the coefficient τ on the profit share in this function which makes a difference, because it determines the size of the downward shift of the accumulation function in the face of a decreasing profit share. In Figure 6.6 the partial effect of the profit share on capital accumulation is weak, and we only have a slight downward shift of the accumulation function, so that the expansionary effects on consumption, that is the clockwise rotation of the saving function, dominates the overall outcome. The result is thus a wage-led demand and a wage-led accumulation or growth regime. In Figure 6.7 the partial effect of the profit share on investment, and thus the downward shift of the accumulation function, is somewhat stronger. The overall effect on capacity utilization is still expansionary, and the economy is in a wage-led demand regime. However, it is no longer sufficient to overcompensate the depressing effect on capital accumulation, and the economy is thus in a profit-led growth regime. In Figure 6.8 the partial effect of the profit share on capital accumulation is even stronger than before, such that in the new equilibrium the rates of capacity utilization and capital

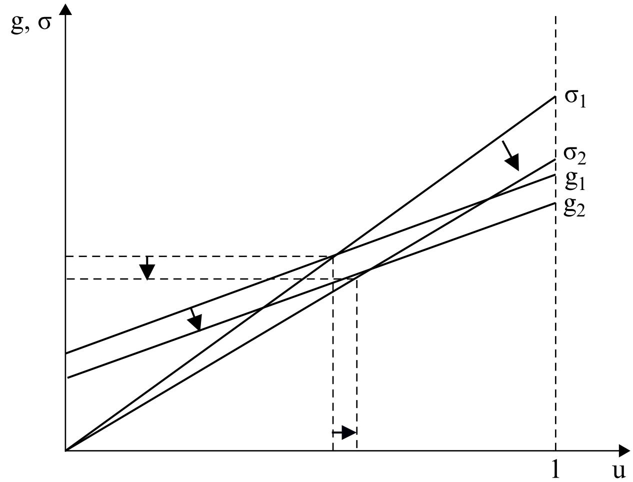


Figure 6.7 Increasing wage share/decreasing profit share in the post-Kaleckian model: the intermediate regime (wage-led demand and profit-led accumulation/growth)

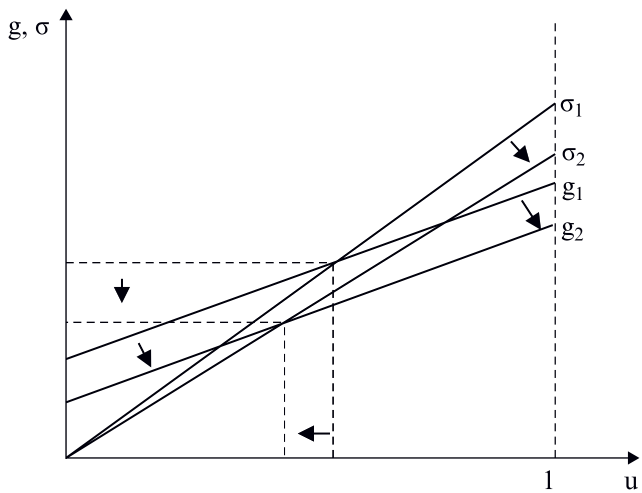


Figure 6.8 Increasing wage share/decreasing profit share in the post-Kaleckian model: the profit-led regime (profit-led demand and profit-led accumulation/growth)

accumulation are both lower. The economy is thus in a profit-led demand and in a profit-led accumulation or growth regime.

Analytically, we can derive the conditions for the three constellations from equations (6.13b) and (6.14b). From these equations we obtain the following conditions:

$$\frac{\partial u^*}{\partial h} > 0, \text{ if: } \tau - s_\Pi \frac{u}{v} > 0, \qquad (6.13b')$$

$$\frac{\partial g^*}{\partial h} > 0, \text{ if: } \tau\left(\frac{s_\Pi h}{v\beta}\right) - s_\Pi \frac{u}{v} > 0. \qquad (6.14b')$$

From the goods market stability condition (6.8) we have that $s_\Pi h/v > \beta$ and hence $s_\Pi h/v\beta > 1$. From this it follows that $\tau(s_\Pi h/v\beta) > \tau$. Therefore, we obtain the possible constellations as shown in Table 6.1.

As becomes clear again, a wage-led demand regime is obtained when the propensity to save out of profits (s_Π) assumes relatively high values as compared to the reaction of capital accumulation towards changes in the profit share (τ). In the opposite case, the demand regime will be profit-led. And a wage-led accumulation/growth regime will be obtained if capital accumulation responds vigorously towards changes in capacity utilization (β) and only weakly towards the profit share (τ). The opposite case is conducive to profit-led accumulation and growth. The overall regime may

Table 6.1 Demand and accumulation/growth regimes in the post-Kaleckian distribution and growth model

	$\frac{\partial u^*}{\partial h}$	$\frac{\partial g^*}{\partial h}$
Wage-led regime Wage-led (stagnationist) demand and profit-led accumulation/growth: $\tau - s_\Pi \frac{u}{v} < \tau(s_\Pi \frac{h}{v\beta}) - s_\Pi \frac{u}{v} < 0$	−	−
Intermediate regime Wage-led (stagnationist) demand and profit-led accumulation/growth: $\tau - s_\Pi \frac{u}{v} < 0 < \tau(s_\Pi \frac{h}{v\beta}) - s_\Pi \frac{u}{v}$	−	+
Profit-led regime Profit-led (exhilarationist) demand and profit-led accumulation/growth: $0 < \tau - s_\Pi \frac{u}{v} < \tau(s_\Pi \frac{h}{v\beta}) - s_\Pi \frac{u}{v}$	+	+

thus be overall wage-led, overall profit-led, or intermediate, which is the combination of wage-led demand and profit-led growth. Our considerations leading to the potential regimes in Table 6.1 also tell us that a combination of profit-led demand and wage-led growth is impossible.

Summing up, based on the distribution conflict between capital and labour, the long-run validity of the principle of effective demand, and hence the autonomy of firms' decisions to invest from households decisions to save, as well as the long-run underutilization of productive capacities as major features of modern capitalism, Bhaduri and Marglin (1990) and Kurz (1990) have presented a flexible distribution and growth model. This model is able to generate different regimes of demand and accumulation/growth, depending on the parameter values in the saving and investment functions of the model. Changes in the parameter values may generate different regimes of demand and growth across countries or over time for a specific country. Therefore, in order to explain differences of the regimes of demand and growth between countries or changes in these regimes over time, we do not have to switch the model framework. For example, we do not have to assume normal or full utilization of productive capacities in the long run, in order to obtain an inverse relationship between the rate of profit and the real wage rate or the wage share, or between the rate of capital accumulation and the real wage rate or the wage share, as in the post-Keynesian Kaldor–Robinson model. Nor do we have to abandon the principle of effective demand in the long run in order to obtain a positive effect of a higher profit share and hence a lower real wage rate or wage share on capital accumulation and growth, as in the classical and Marxian approaches to distribution and growth:

> Particular *models* such as that of 'cooperative capitalism' enunciated by the left Keynesian social democrats, the Marxian model of 'profit squeeze' or even the conservative model relying on 'supply-side' stimulus through high profitability and a low real wage, fit into the more general Keynesian theoretical scheme. They become particular *variants* of the theoretical framework presented here. (Bhaduri and Marglin 1990, p. 388, emphasis in the original)

The post-Kaleckian model thus provides a flexible tool of analysis which has to be embedded into a social and historical framework determining or affecting the values of the model parameters, and thus the model outcomes. It seems that was exactly the purpose of this approach when it was used by Marglin and Bhaduri (1990, 1991) in order to make sense of the shift from the golden age period of cooperative capitalism in the 1950s and 1960s towards the turbulent period of escalating distribution conflict and inflation in the 1970s, and finally to the dominance of supply-side policies in the 1980s. For this purpose it is important to analyse and determine empirically the prevailing regime of demand and accumulation in a certain country during a certain period of time. As we will see in Chapter 7, the post-Kaleckian model has inspired a flourishing literature of empirical and econometric research in this area. However, before dealing with this research, the simple model provided in this section will have to be made 'more realistic' in order to be applicable in empirical research. This will also be done in the following chapter. But before moving there let us briefly summarize and assess the main features of the basic Kaleckian distribution and growth models in the final section of this chapter.

6.5 CONCLUSIONS

The basic Kaleckian models presented in this chapter take into account some fundamental elements of modern capitalism: Goods and capital markets do not adhere to ideal perfect competition, but rather are characterized by oligopolistic and monopolistic elements. Prices are set via active cost-plus pricing, with the mark-up on unit variable costs affected by the degree and the relevance of price competition among firms in the goods market, by overhead costs and by the bargaining power of workers and trade unions in the labour market. Labour supply is not a constraint to production, output or growth, and the system is characterized by involuntary unemployment, also in the long run. Productive capacities given by the capital stock are not fully utilized on average over the trade cycle, and the rate of capacity utilization is treated as an adjusting variable in the long run, too. Functional income distribution depends on distribution conflict, which primarily affects the mark-up, via the intensity of competition of firms in the goods market and the bargaining power of capital and labour in the labour market. The principle of effective demand applies to the short, medium and long run. Saving is not a precondition for investment, but rather adjusts to investment through income and growth effects in the long run. The model also generates a paradox of saving in the long-run growth context. Depending on the theory of investment decisions and the investment function used in the model, either uniquely wage-led demand and growth results, and hence a general validity of the paradox of costs is obtained, as in the neo-Kaleckian model, or different potential regimes of demand and growth are derived, as in the post-Kaleckian model. The latter is open to explaining different regimes of aggregate demand and growth for different periods within a certain country as well as differences in the demand and growth regimes across countries. For this purpose the model will have to be extended by means of introducing saving out of wages, open economy issues, productivity growth, credit and interest as well as other financial issues. This will be done in the chapters to follow.

NOTES

1. For overviews see, in particular, Lavoie (1992, chaps 6.3–6.4, 2014, chaps 6.2–6.3) and Blecker (2002).
2. As pointed out by Lavoie (1992, p. 297), the main results of the Kaleckian model had already been derived in an Italian paper by Del Monte (1975).
3. See also Hein et al. (2011) and Hein, Lavoie et al. (2012) for critical reviews.
4. An improvement in animal spirits could also mean a more elastic response of capital accumulation with respect to capacity utilization, and thus in the coefficient β in the investment function (6.6). This would have meant an increase in the slope of the investment function and in the equilibrium realized profit rate function in Figure 6.3, too.
5. On this see also Rowthorn (1981), who provides a comparison of the post-Keynesian Kaldor–Robinson model and the neo-Kaleckian approach within a standard model framework.
6. See Lavoie (1992, pp. 332–334) for a discussion.
7. Equivalently, we could argue that the rate of capacity utilization and the normal rate of profit, that is the rate of profit calculated at some exogenously given normal rate of capacity utilization ($r_n = hu_n/v$), enter into the investment function, such that we obtain: $g = g(u, r_n)$. With a given capital–potential output ratio and an exogenous normal rate of capacity utilization, r_n is affected positively by variations in the profit share, so that we can also write $g = g(u, h)$ for the investment function, as in the post-Kaleckian model to be discussed in this section.
8. This '*ceteris paribus*' aspect is ignored in Mott and Slattery's (1994) critique of the Bhaduri and Marglin (1990) investment function, when they argue that a higher profit share will reduce consumption demand and capacity utilization and thus cannot have a positive effect on investment. Either they confuse partial and total effects of redistribution on capital accumulation or, alternatively, they have to assume that the capitalists in the post-Kaleckian model have perfectly 'rational' expectations and are able to anticipate the macroeconomic effects of redistribution as derived from the neo-Kaleckian model and to act accordingly. We do not want to make such strong assumptions, but rather hold that, at the firm level, a higher profit share at a given rate of capacity utilization and thus higher profits per unit of output improve the finance conditions of the firm and have hence a partially supportive effect on investment.

APPENDIX: THE NEO-KALECKIAN MODEL WITH THE CURRENT RATE OF PROFIT IN THE ACCUMULATION FUNCTION

In this appendix we show that the basic results of our neo-Kaleckian model, as presented in equations (6.1), (6.4), (6.5), (6.6) and (6.7) in Section 6.3, are maintained if we extend the investment function in equation (6.6) by the current rate of profit – not by the normal rate of profit, that is the rate of profit obtained at normal capacity utilization, or the profit share – and arrive at investment function (6A.4), as in Rowthorn (1981) and Dutt (1984, 1987). The model thus consists of the following equations:

$$r = h\frac{u}{v}, \tag{6A.1}$$

$$h = 1 - \frac{1}{1+m}, \tag{6A.2}$$

$$\sigma = s_\Pi h\frac{u}{v} \quad 0 < s_\Pi \leq 1, \tag{6A.3}$$

$$g=\frac{I}{K}=\alpha+\beta u+\chi r=\alpha+\beta u+\chi h\frac{u}{v}=\alpha+\left(\beta+\chi\frac{h}{v}\right)u, \quad \alpha,\beta,\chi>0, \tag{6A.4}$$

$$g = \sigma. \tag{6A.5}$$

In order to obtain a stable equilibrium, the saving decisions have to react more strongly to a variation in the endogenous variable, the rate of capacity utilization, than the investment decisions:

$$\frac{\partial\sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \quad \Rightarrow \quad \frac{h}{v}(s_\Pi - \chi) - \beta > 0 \tag{6A.6}$$

Following the same procedure as in Section 6.3 we can derive the equilibrium values:

$$u^* = \frac{\alpha}{\frac{h}{v}(s_\Pi - \chi) - \beta}. \tag{6A.7}$$

$$g^* = \sigma^* = \frac{\alpha s_\Pi \frac{h}{v}}{\frac{h}{v}(s_\Pi - \chi) - \beta} \tag{6A.8}$$

$$r^* = \frac{\alpha\frac{h}{v}}{\frac{h}{v}(s_\Pi - \chi) - \beta}. \tag{6A.9}$$

From the equilibrium values it can be immediately seen that improved animal spirits (α) have a positive effect on each of the endogenous variables of the model. As is demonstrated below, the paradox of saving is valid for this model version, too:

$$\frac{\partial u^*}{\partial s_\Pi} = \frac{-\alpha\frac{h}{v}}{\left[\frac{h}{v}(s_\Pi - \chi) - \beta\right]^2} < 0, \tag{6A.7a}$$

$$\frac{\partial g^*}{\partial s_\Pi} = \frac{-\alpha\frac{h}{v}\left(\frac{h}{v}\chi + \beta\right)}{\left[\frac{h}{v}(s_\Pi - \chi) - \beta\right]^2} < 0, \tag{6A.8a}$$

$$\frac{\partial r^*}{\partial s_\Pi} = \frac{-\alpha\left(\frac{h}{v}\right)^2}{\left[\frac{h}{v}(s_\Pi - \chi) - \beta\right]^2} < 0. \tag{6A.9a}$$

And finally we obtain again the paradox of costs, if only stable equilibria are considered:

$$\frac{\partial u^*}{\partial h} = \frac{-\alpha(s_\Pi - \chi)\frac{1}{v}}{\left[\frac{h}{v}(s_\Pi - \chi) - \beta\right]^2} < 0, \tag{6A.7b}$$

$$\frac{\partial g^*}{\partial h} = \frac{-\alpha\beta s_\Pi\frac{1}{v}}{\left[\frac{h}{v}(s_\Pi - \chi) - \beta\right]^2} < 0, \tag{6A.8b}$$

$$\frac{\partial r^*}{\partial h} = \frac{-\alpha\beta\frac{1}{v}}{\left[\frac{h}{v}(s_\Pi - \chi) - \beta\right]^2} < 0. \tag{6A.9b}$$

A stable equilibrium implies that: $s_{\Pi} - \chi > 0$. This also means that the direct partial effect of a change in the profit share on saving/consumption, $\partial\sigma/\partial h = s_{\Pi}u/v$, is stronger than the direct partial effect on investment, $\partial g/\partial h = \chi u/v$. Therefore, the wage-led results are maintained, although we now have a partially positive indirect effect of the profit share on capital accumulation, too (equation (6A.4)).

7. Extending Kaleckian models I: saving out of wages and open economy issues

7.1 INTRODUCTION

In this chapter we will extend the different versions of the basic Kaleckian models presented in Chapter 6. The final purpose is to assess the empirical work which has been done on the basis of the Bhaduri and Marglin (1990) or post-Kaleckian model – a model which already in its most simple version is able to generate different potential regimes of demand and accumulation. We will start in Section 7.2 by introducing saving out of wages into the closed economy versions of the Rowthorn (1981) and Dutt (1984, 1987) neo-Kaleckian and the Bhaduri and Marglin (1990) and Kurz (1990) post-Kaleckian models outlined in Chapter 6. Then we will further extend the post-Kaleckian model by means of introducing international trade in Section 7.3. This will provide us with the version of the theoretical model which has been used in empirical research on wage- and profit-led demand and growth regimes since the early or mid-1990s, starting with the works of Marglin and Bhaduri (1990, 1991) and Bowles and Boyer (1995). The main results of this research will be reviewed in Section 7.4, and Section 7.5 will summarize and conclude this chapter.

7.2 SAVING OUT OF WAGES IN THE KALECKIAN DISTRIBUTION AND GROWTH MODELS

Introducing saving out of wages into the two basic Kaleckian distribution and growth models, we do not change the assumptions regarding production, pricing and distribution which we have made in Chapter 6. We assume a closed economy without a government sector, which produces a homogeneous output (Y) combining direct labour and a non-depreciating capital stock in the production process. The technical conditions of production, that is the capital–potential output ratio ($v = K/Y^p$) and the labour–output ratio ($a = L/Y$), are each assumed to be constant. The rate of capacity utilization ($u = Y/Y^p$) is again the accommodating variable, which adjusts aggregate supply to aggregate demand and saving to investment, both in the short and in the medium to long run.

The economy is composed of two classes, workers and capitalists. Workers offer labour power, which usually is in excess supply, to capitalists and receive wages (W). Unlike the case in Chapter 6, we now assume that workers only use part of their labour income to purchase consumption goods – the rest is saved (S_W). Capitalists own the means of production and receive profits (Π), which are partly consumed and partly saved (S_Π) – buying assets issued by the corporate sector and thus the capitalists themselves or depositing parts of the profits with the financial sector, which is also owned by the capitalists and not explicitly modelled in this chapter.

Functional income distribution, and hence the profit share (h), is determined again by the mark-up pricing of firms in incompletely competitive goods markets. The mark-up (m) is mainly affected by the intensity of price competition in the goods market and by the bargaining power of trade unions in the labour market.

In the following models we have to distinguish a propensity to save from profits (s_Π) and a propensity to save from wages (s_W). These propensities are not identical with the propensity to save of the capitalists and of the workers, respectively, because, when workers save, they accumulate financial assets and earn part of the profits (interest or dividends), too. In order to avoid the related problems, we strictly hold that the propensities to save relate to types of income and not to different types or classes of households or persons. Furthermore, we assume that the propensity to save out of profits exceeds the propensity to save from wages. There are two major reasons for this. First, parts of the profits are retained by firms and not distributed to households at all, and are thus saved by definition. This increases the average propensity to save from profits relative to the average propensity to save from wages. Second, although workers save and accumulate financial assets, the major part of distributed profits goes to capitalists or rentiers. The latter earn higher incomes per head or per household than workers, who mainly have to draw on wages as a source of income. Following Keynes's (1936, Book III) absolute income hypothesis and the idea that the marginal propensity to save increases with the level of income, this should also imply that the propensity to save from profits exceeds the propensity to save from wages.

7.2.1 Saving out of Wages in the Rowthorn–Dutt or Neo-Kaleckian Model

Introducing saving out of wages into the neo-Kaleckian model of Chapter 6 yields the following equations:

$$r = h\frac{u}{v}, \tag{7.1}$$

$$h = 1 - \frac{1}{1 + m}, \tag{7.2}$$

$$\sigma = \frac{S_\Pi + S_W}{pK} = \frac{s_\Pi \Pi + s_W(Y - \Pi)}{pK} = [s_W(1 - h) + s_\Pi h]\frac{u}{v}$$

$$= [s_W + (s_\Pi - s_W)h]\frac{u}{v}, 0 \leq s_W < s_\Pi \leq 1, \tag{7.3}$$

$$g = \frac{I}{K} = \alpha + \beta u, \quad \alpha,\beta > 0, \tag{7.4}$$

$$g = \sigma, \tag{7.5}$$

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \Rightarrow [s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta > 0. \tag{7.6}$$

Equation (7.1) represents the relationship between the rate of profit (r), the profit share (h), the endogenous rate of capacity utilization (u) and the technologically fixed capital–potential output ratio (v). In equation (7.2) the profit share is determined by the mark-up (m) in firms' pricing in incompletely competitive goods markets. Equation (7.3) is the new equation for the saving rate (σ), including saving out of wages (S_W) and hence the propensity to save out of wages (s_W), along with saving out of profits ($S\Pi$) and the propensity to save out of profits ($s\Pi$). Equation (7.4) is the simple neo-Kaleckian investment function, making the decision to accumulate depend on animal spirits (α) and the rate of capacity utilization (βu). Finally, we have the goods market equilibrium in equation (7.5) and the stability condition in (7.6), which we again assume to hold for the following exercises.

The equilibrium rates of capacity utilization, capital accumulation and profit can be derived following the procedures already familiar from Chapter 6, that is substituting equations (7.3) and (7.4) into equation (7.5), solving for equilibrium capacity utilization, and plugging this equilibrium value into equation (7.3) or (7.4) and into equation (7.1):

$$u^* = \frac{\alpha}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta}, \tag{7.7}$$

$$g^* = \sigma^* = \frac{\alpha[s_W + (s_\Pi - s_W)h]\frac{1}{v}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta}, \tag{7.8}$$

$$r^* = \frac{\alpha\frac{h}{v}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta}. \tag{7.9}$$

From the equilibrium values it can be immediately seen that improved animal spirits (α) have a positive effect on each of the endogenous variables of the model. And, as demonstrated below, the paradox of saving is valid for all the endogenous variables of the system, for an increase in the propensity to save both from profits and from wages. An increase in either propensity to save will reduce consumption demand and the equilibrium rate of capacity utilization, which will feed back negatively on the equilibrium rates of capital accumulation and profit, too:

$$\frac{\partial u^*}{\partial s_\Pi} = \frac{-\alpha\frac{h}{v}}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.7a}$$

$$\frac{\partial g^*}{\partial s_\Pi} = \frac{-\alpha\beta\frac{h}{v}}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.8a}$$

$$\frac{\partial r^*}{\partial s_\Pi} = \frac{-\alpha\left(\frac{h}{v}\right)^2}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.9a}$$

$$\frac{\partial u^*}{\partial s_W} = \frac{-\alpha\frac{1}{v}(1 - h)}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.7b}$$

$$\frac{\partial g^*}{\partial s_W} = \frac{-\alpha\beta\frac{1}{v}(1-h)}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.8b}$$

$$\frac{\partial r^*}{\partial s_W} = \frac{-\alpha\frac{h}{v^2}(1-h)}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0. \tag{7.9b}$$

Examining the effects of a change in functional income distribution we obtain the following results:

$$\frac{\partial u^*}{\partial h} = \frac{-\alpha(s_\Pi - s_W)\frac{1}{v}}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.7c}$$

$$\frac{\partial g^*}{\partial h} = \frac{-\alpha\beta(s_\Pi - s_W)\frac{1}{v}}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.8c}$$

$$\frac{\partial r^*}{\partial h} = \frac{\alpha\left(s_W\frac{1}{v} - \beta\right)\frac{1}{v}}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2}. \tag{7.9c}$$

As can be seen from equations (7.7c) and (7.8c), with a positive propensity to save from wages, a higher profit share also causes lower equilibrium rates of capacity utilization and capital accumulation, because we have assumed $s_\Pi > s_W$. Therefore, demand and capital accumulation/growth remain wage-led. However, a positive propensity to save from wages dampens the compressing effect of a higher profit share or the expansionary effect of a higher wage share on these two variables, because the immediate effect of redistribution on consumption demand is lower than in the case of zero saving out of wages. And considering equation (7.9c) it becomes clear that with positive saving from wages an increase in the profit share, and thus a reduction in the wage share, does not necessarily mean a lower equilibrium profit rate. If the propensity to save from wages is sufficiently high, such that $s_W/v > \beta$, a higher profit share may also cause a higher equilibrium rate of profit, because the weakening effects on capacity utilization will be overcompensated by the direct positive effect of the profit share on the profit rate. The paradox of costs is therefore no longer generally valid when we introduce positive saving from wages into the model.

The effect of saving out of wages on the general validity of the wage-led nature of the neo-Kaleckian model becomes even more severe when we replace the simple investment function in equation (7.4) by the original investment function suggested by Rowthorn (1981) and Dutt (1984, 1987), as is pointed out by Mott and Slattery (1994). In equation (7.10) we add the current rate of profit as a further determinant of investment decisions to the accumulation equation:

$$g = \frac{I}{K} = \alpha + \beta u + \chi r = \alpha + \beta u + \chi h \frac{u}{v} = \alpha + \left(\beta + \chi \frac{h}{v}\right) u, \quad \alpha, \beta, \chi > 0. \quad (7.10)$$

Keeping the rest of the model as it was before, the stability condition, which we assume to hold, now turns to:

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \Rightarrow [s_W + (s_\Pi - s_W - \chi) h] \frac{1}{v} - \beta > 0. \quad (7.11)$$

The modified model yields the following equilibrium rates of capacity utilization, capital accumulation and profit:

$$u^* = \frac{\alpha}{[s_W + (s_\Pi - s_W - \chi) h] \frac{1}{v} - \beta}, \quad (7.12)$$

$$g^* = \sigma^* = \frac{\alpha [s_W + (s_\Pi - s_W) h] \frac{1}{v}}{[s_W + (s_\Pi - s_W - \chi) h] \frac{1}{v} - \beta}, \quad (7.13)$$

$$r^* = \frac{\alpha \frac{h}{v}}{[s_W + (s_\Pi - s_W - \chi) h] \frac{1}{v} - \beta}. \quad (7.14)$$

As we have shown in the appendix to Chapter 6, with zero saving out of wages the modified neo-Kaleckian model with the current rate of profit in the investment function has uniquely wage-led properties regarding demand and capital accumulation and also displays the paradox of costs regarding the profit rate, whenever income distribution is changed. The qualitative results were thus not different from those of the simplified model without the current rate of profit in the investment function. However, this is no longer generally true with positive saving out of wages, as can be seen below:[1]

$$\frac{\partial u^*}{\partial h} = \frac{-\alpha(s_\Pi - s_W - \chi)\frac{1}{v}}{\left\{[s_W + (s_\Pi - s_W - \chi)h]\frac{1}{v} - \beta\right\}^2}, \tag{7.12a}$$

$$\frac{\partial g^*}{\partial h} = \frac{\alpha\left[\chi s_W \frac{1}{v} - \beta(s_\Pi - s_W)\right]\frac{1}{v}}{\left\{[s_W + (s_\Pi - s_W - \chi)h]\frac{1}{v} - \beta\right\}^2}, \tag{7.13a}$$

$$\frac{\partial r^*}{\partial h} = \frac{\alpha\left(s_W \frac{1}{v} - \beta\right)\frac{1}{v}}{\left\{[s_W + (s_\Pi - s_W - \chi)h]\frac{1}{v} - \beta\right\}^2}. \tag{7.14a}$$

A higher profit share might now have negative or positive effects on the equilibrium rates of capacity utilization, capital accumulation and profits. Therefore, either wage-led or profit-led regimes regarding demand and capital accumulation/growth may be possible. And the paradox of costs may hold or may not. In particular, with a high propensity to save from wages, and thus a low differential in the saving propensities from profits and wages, and with a high elasticity of investment with respect to the profit rate (χ), profit-led demand as well as profit-led growth regimes and the invalidation of the paradox of costs become more likely.

Graphically, the effects of redistribution in the neo-Kaleckian distribution and growth model with the rate of profit in the accumulation function and with positive saving out of wages can be shown by making use of the graphs of equation (7.3) for the saving rate and equation (7.10) for the accumulation rate, as in Figures 7.1 to 7.3. A higher wage share, hence a lower profit share, means a clockwise rotation of each of these curves, from σ_1 to σ_2 and from g_1 to g_2. The higher the propensity to save from wages, and the lower the differential in the propensities to save from profits and from wages, the smaller will be the rotation of the saving function [$\partial\sigma/\partial h = (s_\Pi - s_W)u/v$], and the higher the elasticity of investment with respect to the profit rate, the more pronounced will be the rotation of the investment function ($\partial g/\partial h = \chi u/v$), when the profit share is changed. Note that the stability condition does not impose that $\partial\sigma/\partial h > \partial g/\partial h$ is required, and hence we do not have to assume that $s_\Pi - s_W > \chi$. Therefore, we may obtain different regimes depending on the degree of rotation of the investment function relative to the saving function. In Figures 7.1 to 7.3 we show the three different potential regimes for an increase in the wage share,

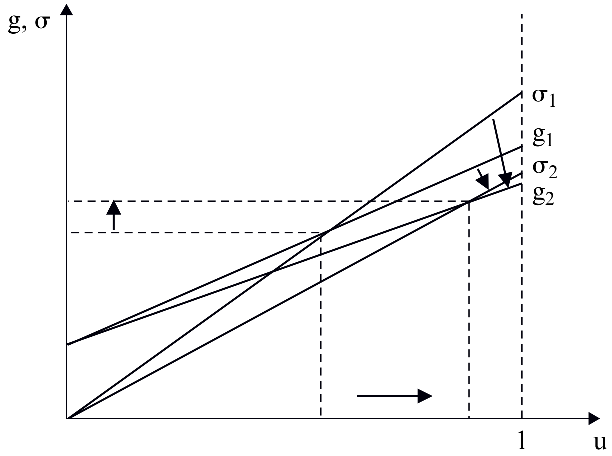


Figure 7.1 *Increasing the wage share/lowering the profit share in the neo-Kaleckian distribution and growth model with positive saving out of wages and the rate of profit in the accumulation function: the wage-led regime (wage-led demand and wage-led accumulation/growth)*

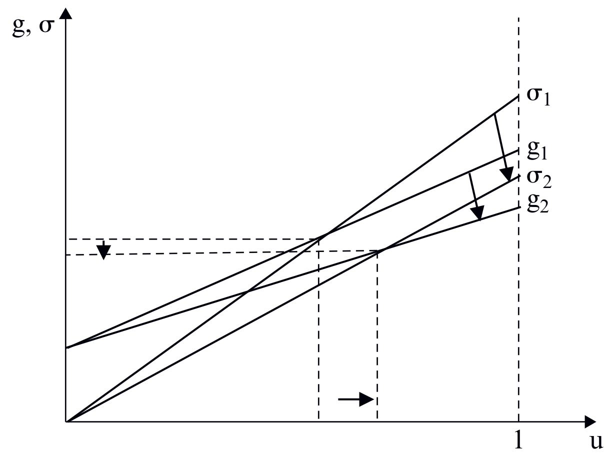


Figure 7.2 *Increasing the wage share/lowering the profit share in the neo-Kaleckian distribution and growth model with positive saving out of wages and the rate of profit in the accumulation function: the intermediate regime (wage-led demand and profit-led accumulation/growth)*

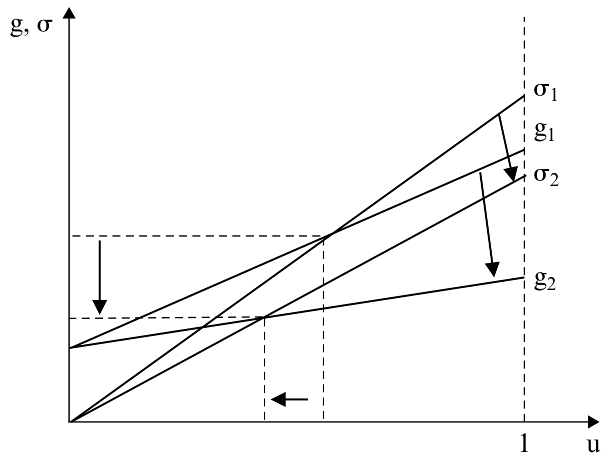


Figure 7.3 Increasing the wage share/lowering the profit share in the neo-Kaleckian distribution and growth model with positive saving out of wages and the rate of profit in the accumulation function: the profit-led regime (profit-led demand and profit-led accumulation/growth)

hence a decrease in the profit share, keeping the propensities to save from profits and wages constant and gradually increasing the responsiveness of investment with respect to the profit rate (χ), and thus the rotation of the investment function caused by a decrease in the profit share.

If the change in the slope of the investment function caused by redistribution is relatively small compared to the change in the slope of the saving function, the new equilibrium rates of capacity utilization and capital accumulation may exceed the initial ones, and the economy is in a wage-led demand and a wage-led accumulation/growth regime, or shortly in an overall wage-led regime, as shown in Figure 7.1. In this case, the dampening effect of a lower profit share on investment via its partial effect on the profit rate is overcompensated by the expansionary effects of redistribution on consumption and capacity utilization, which then has a direct partially positive effect on investment, and an indirect one via the profit rate. As equation (7.14a) tells us, with a strong partial effect of capacity utilization on investment (a high β), we will also have a high probability of the paradox of costs, that is a lower profit share but a higher profit rate in the new equilibrium.

With a somewhat stronger effect of the profit rate on investment and thus a slightly more pronounced rotation of the investment function caused by redistribution in favour of wages, we may have a higher rate of capacity utilization but a lower rate of capital accumulation in the new equilibrium, that is an overall intermediate regime. Aggregate demand is wage-led, but capital accumulation and growth are profit-led. In this intermediate regime, a higher wage share is able to stimulate consumption demand and to increase the rate of capacity utilization in the new equilibrium. However, the effect of higher capacity utilization on investment is too weak to compensate for the negative effect of a lower profit share on investment via the profit rate. Since β is low in this case, a lower profit share is likely to be accompanied by a lower profit rate, according to equation (7.14a), and the paradox of costs is thus more unlikely to hold.

Finally, with a strong effect of the profit rate on capital accumulation, and thus a strong rotation of the investment function, a higher wage share will cause a lower equilibrium rate of capital accumulation and also a lower equilibrium rate of capacity utilization, as shown in Figure 7.3. In this case, the demand and the accumulation/growth regimes will each be profit-led, and we have an overall profit-led regime. Although a higher wage share stimulates consumption demand, this will be overcompensated by the negative effects of a lower profit share via the profit rate on investment decisions. Since this regime also suffers from a low β in the accumulation function, the paradox of costs is invalidated, too, as can be seen in equation (7.14a).

Therefore, similar to the post-Kaleckian model without saving out of wages outlined in Chapter 6, the neo-Kaleckian model with the profit rate in the accumulation function and with positive saving out of wages gives rise to different regimes of demand and of accumulation/growth. Redistribution in favour of wages is no longer uniquely expansionary. Besides wage-led demand and growth regimes, we may have profit-led demand and growth regimes, or an intermediate case with wage-led demand and profit-led accumulation/growth. Generally, the introduction of positive saving out of wages into the model makes wage-led regimes less likely, but of course not impossible.

7.2.2 Saving out of Wages in the Bhaduri/Marglin or Post-Kaleckian Model

Next we include positive saving out of wages in the post-Kaleckian model put forward by Bhaduri and Marglin (1990) and Kurz (1990). The basics of the model are the same as in the other models discussed above in this chapter, and only the investment function (7.3) or (7.10) will now be replaced by the post-Kaleckian accumulation function (7.15), which includes separate partially positive impacts of the rate of capacity utilization (βu) and the share of profit (τh) on investment decisions, along with animal spirits (α).

$$r = h\frac{u}{v}, \tag{7.1}$$

$$h = 1 - \frac{1}{1 + m}, \tag{7.2}$$

$$\sigma = \frac{S_\Pi + S_W}{pK} = \frac{s_\Pi \Pi + s_W(Y - \Pi)}{pK} = [s_W + (s_\Pi - s_W)h]\frac{u}{v},$$
$$0 \le s_W < s_\Pi \le 1, \tag{7.3}$$

$$g = \frac{I}{K} = \alpha + \beta u + \tau h, \quad \beta, \tau > 0, \tag{7.15}$$

$$g = \sigma, \tag{7.5}$$

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \quad \Rightarrow \quad [s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta > 0. \tag{7.6}$$

The equilibrium values of capacity utilization, capital accumulation and the rate of profit are obtained in the usual way:

$$u^* = \frac{\alpha + \tau h}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta}, \tag{7.16}$$

$$g^* = \sigma^* = \frac{(\alpha + \tau h)[s_W + (s_\Pi - s_W)h]\frac{1}{v}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta}, \tag{7.17}$$

$$r^* = \frac{(\alpha + \tau h)\frac{h}{v}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta}. \tag{7.18}$$

As can be seen below, the paradox of saving remains valid throughout, for all the endogenous variables of the model:

$$\frac{\partial u^*}{\partial s_\Pi} = \frac{-(\alpha + \tau h)\frac{h}{v}}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.16a}$$

$$\frac{\partial g^*}{\partial s_\Pi} = \frac{-(\alpha + \tau h)\beta \frac{h}{v}}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.17a}$$

$$\frac{\partial r^*}{\partial s_\Pi} = \frac{-(\alpha + \tau h)\left(\frac{h}{v}\right)^2}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.18a}$$

$$\frac{\partial u^*}{\partial s_W} = \frac{-(\alpha + \tau h)\frac{1}{v}(1 - h)}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.16b}$$

$$\frac{\partial g^*}{\partial s_W} = \frac{-(\alpha + \tau h)\beta\frac{1}{v}(1 - h)}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0, \tag{7.17b}$$

$$\frac{\partial r^*}{\partial s_W} = \frac{-(\alpha + \tau h)\frac{h}{v^2}(1 - h)}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\}^2} < 0. \tag{7.18b}$$

A change in the profit share may have wage-led or profit-led effects on the endogenous variables of the model, depending on the parameters and coefficients in the saving and investment functions, as can be seen below:

$$\frac{\partial u^*}{\partial h} = \frac{\tau - (s_\Pi - s_W)\frac{u}{v}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta}, \tag{7.16c}$$

$$\frac{\partial g^*}{\partial h} = \frac{\frac{1}{v}[\tau s_W + (s_\Pi - s_W)(\tau h - \beta u)]}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta}, \tag{7.17c}$$

$$\frac{\partial r^*}{\partial h} = \frac{\frac{1}{v}\left[\alpha + 2\tau h - (s_\Pi - s_W)h\frac{u}{v}\right]}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta}. \tag{7.18c}$$

With the stability condition for the equilibrium assumed to hold, a profit-led demand regime is more likely, the stronger the direct effect of the profit share on investment decisions (τ), the lower the propensity to save from profits (s_Π), and the higher the propensity to save from wages (s_W) are, as can be seen in equation (7.16c). A wage-led demand regime requires a low direct effect of the profit share on investment and a high differential between the propensities to save from profits and from wages.

A profit-led demand regime implies that the effect of a higher profit share on the equilibrium rate of profit in equation (7.18c) is positive, too. However, in a wage-led demand regime a lower profit share may be associated with a higher or a lower profit rate. This is the same result as with the post-Kaleckian model with zero saving out of wages in Chapter 6. The argument here is basically the same: Comparing equations (7.16c) and (7.18c), it becomes clear that in a wage-led demand regime a negative effect of a rise in the profit share on equilibrium capacity utilization is not necessarily associated with a lower equilibrium rate of profit. Condition $\tau - (s_\Pi - s_W)u/v < 0$ in equation (7.16c) does not necessarily imply that $\alpha + 2\tau h - (s_\Pi - s_W)hu/v < 0$ in equation (7.18c), when the latter is rearranged to $\alpha/h + 2\tau - (s_\Pi - s_W)u/v < 0$ and compared to the former.

Finally, as equation (7.17c) reveals, a profit-led accumulation/growth regime also requires a strong direct effect of the profit share on investment, a low propensity to save from profits and a high saving propensity from wages, thus a low differential between these two saving propensities, and furthermore a weak direct effect of capacity utilization on investment decisions (β). In the opposite constellation the accumulation/growth regime will be wage-led.

As for the simple post-Kaleckian distribution and growth model without saving out of wages in Chapter 6, we obtain three potential combinations for the overall demand and accumulation/growth regimes. Graphically they can be derived as in Figures 6.6, 6.7 and 6.8 in Chapter 6, which we do not reproduce here. Analytically, we can derive the conditions for the three constellations from equations (7.16c) and (7.17c), which yield the following conditions:

$$\frac{\partial u^*}{\partial h} > 0, \quad \text{if:} \quad \tau - (s_\Pi - s_W)\frac{u}{v} > 0, \tag{7.16c'}$$

$$\frac{\partial g^*}{\partial h} > 0, \quad \text{if:} \quad \tau\left[\frac{s_W + (s_\Pi - s_W)h}{v\beta}\right] - (s_\Pi - s_W)\frac{u}{v} > 0. \tag{7.17c'}$$

From the goods market stability condition (7.6) we know that $[s_W + (s_\Pi - s_W)h]/v > \beta$ and hence $[s_W + (s_\Pi - s_W)h]/v\beta > 1$. From

Table 7.1 Demand and accumulation/growth regimes in the post-Kaleckian distribution and growth model with positive saving out of wages

	$\frac{\partial u^*}{\partial h}$	$\frac{\partial g^*}{\partial h}$
Wage-led regime Wage-led (stagnationist) demand and wage-led accumulation/growth: $\tau - (s_\Pi - s_W)\frac{u}{v} < \tau\left[\frac{s_W + (s_\Pi - s_W)h}{v\beta}\right] - (s_\Pi - s_W)\frac{u}{v} < 0$	−	−
Intermediate regime Wage-led (stagnationist) demand and profit-led accumulation/growth: $\tau - (s_\Pi - s_W)\frac{u}{v} < 0 < \tau\left[\frac{s_W + (s_\Pi - s_W)h}{v\beta}\right] - (s_\Pi - s_W)\frac{u}{v}$	−	+
Profit-led regime Profit-led (exhilarationist) demand and profit-led accumulation/growth: $0 < \tau - (s_\Pi - s_W)\frac{u}{v} < \tau\left[\frac{s_W + (s_\Pi - s_W)h}{v\beta}\right] - (s_\Pi - s_W)\frac{u}{v}$	+	+

this it follows that $\tau\{[s_W + (s_\Pi - s_W)h]/v\beta\} > \tau$. Therefore, we obtain the possible constellations shown in Table 7.1.

As becomes clear again, an overall wage-led regime requires a high differential between the propensities to save from profits and wages, a low effect of the profit share on investment and a strong effect of capacity utilization on capital accumulation. If the former conditions are met, but the effect of capacity utilization on capital accumulation is low, we will obtain an intermediate regime of wage-led demand but profit-led accumulation/growth. And, if we have a low differential between the propensities to save from profits and wages, a strong effect of the profit share and a weak impact of capacity utilization on investment, the overall regime will be profit-led.

The qualitative results regarding potential regimes in the post-Kaleckian model are therefore the same with or without saving out of wages. However, as already indicated by Blecker (2002), the scope for wage-led demand and wage-led capital accumulation/growth becomes much narrower when we introduce positive saving out of wages into the model. And the higher the propensity to save out of wages relative to the propensity to save out of profits, the less likely are wage-led demand and growth regimes.

We have seen so far that the results of the neo-Kaleckian and the post-Kaleckian models converge when we introduce saving out of wages into the model and allow for a positive effect of the actual rate of profit in the investment function of the neo-Kaleckian approach. As the post-Kaleckian model is a bit easier to tackle analytically, we will use this model for the integration of open economy issues in the following section.

7.3 OPEN ECONOMY ISSUES IN THE POST-KALECKIAN MODEL WITH SAVING OUT OF WAGES[2]

The model to be developed in this section is based on the open economy analysis in Bhaduri and Marglin (1990) concerning the relationship between distribution, the real exchange rate as an indicator of international competitiveness and demand and growth regimes, as well as on the analysis of the relationship between domestic redistribution and international competitiveness contained in Blecker (1989).[3] We assume an open economy without economic activity of the state, which depends on imported inputs for production purposes and the output of which competes in international markets. We take the prices of imported inputs and of the competing foreign final output to be exogenously given and to be moving in step. The nominal exchange rate, here the relationship between domestic currency and foreign currency or the price of a unit of foreign currency in domestic currency, is determined by monetary policies and international financial markets and is also considered to be exogenous for our purposes. Foreign economic activity is also taken to be exogenously given.

7.3.1 Prices, Distribution and International Competitiveness

We assume again the technical conditions of production and hence the labour–output ratio (a) and the capital–potential output ratio (v) to be constant. There is no overhead labour, and the capital stock (K) is assumed not to depreciate. Domestic prices (p) are set by firms marking up constant unit variable costs, which now consist of labour costs and imported raw material and semi-finished product costs. The mark-up (m) is mainly determined by the degree of price competition in the goods market and by relative powers of firms and workers in the labour market. Of course, in an open economy foreign competition limits the price setting power of domestic firms. But the wage setting power of workers and trade unions may also be constrained, because firms may use the threat of relocation of production sites.

Denoting the nominal wage rate with w, the labour–output ratio with a, unit raw material and semi-finished product inputs with μ, the nominal exchange rate with e and the prices of imported foreign goods in foreign currency with p_f, we get the following price equation for domestic goods:

$$p = (1 + m)(wa + p_f e\mu),\ m > 0. \tag{7.19}$$

The relationship between unit material costs and unit labour costs (z) becomes:

$$z = \frac{p_f e\mu}{wa}. \tag{7.20}$$

Therefore, the price equation can also be written as:

$$p = (1 + m)wa\left(1 + \frac{p_f e\mu}{wa}\right) = (1 + m)wa(1 + z). \tag{7.21}$$

The profit share (h) in domestic value added, consisting of domestic profits (Π) and wages (W), is given by:

$$h = \frac{\Pi}{\Pi + W} = \frac{(1 + z)m}{1 + (1 + z)m} = \frac{1}{\frac{1}{(1 + z)m} + 1}. \tag{7.22}$$

The profit share in the open economy is hence determined by the mark-up and by the relationship between unit costs for imported material and semi-finished products and unit labour costs.

Before we are able to analyse the effects of changes in domestic distribution on aggregate demand and growth, we have to clarify the relationship between distribution and international competitiveness, because the latter will affect net exports. Following Bhaduri and Marglin (1990), we choose the real exchange rate (e^r) as an indicator for international competitiveness:

$$e^r = \frac{ep_f}{p}. \tag{7.23}$$

An increase in the real exchange rate implies increasing international competitiveness of domestic producers. From equation (7.23), it follows for the respective growth rates:

$$\hat{e}^r = \hat{e} + \hat{p}_f - \hat{p}. \tag{7.24}$$

Therefore, increasing competitiveness can be caused by an increasing nominal exchange rate, hence a nominal depreciation of the domestic currency, increasing foreign prices or declining domestic prices. The effect of changes in distribution on international competitiveness will depend on the cause of distributional change. Applying equations (7.19) and (7.23) we can consider three main cases.

First, if the change in distribution is caused by a change in the mark-up, *ceteris paribus*, we get an inverse relationship between the profit share and international competitiveness. A higher (lower) mark-up causes a higher (lower) profit share and falling (rising) international competitiveness of domestic producers:

$$\frac{\partial e^r}{\partial m} = \frac{-ep_f(wa + p_f e\mu)}{p^2} < 0. \tag{7.23a}$$

Second, if a change in the nominal wage rate changes distribution via the effect on the relationship between unit material costs and unit labour costs, we obtain a positive relationship between the profit share and international competitiveness: falling (rising) nominal wages cause a rising (falling) profit share and increasing (decreasing) international competitiveness:

$$\frac{\partial e^r}{\partial w} = \frac{-ep_f(1 + m)a}{p^2} < 0. \tag{7.23b}$$

Third, if a change in the nominal exchange rate is the cause for redistribution, we also get a positive relationship between the profit share and international competitiveness: an increasing (decreasing) nominal exchange rate, that is nominal depreciation (appreciation), causes an increasing (decreasing) profit share and increasing (decreasing) international competitiveness:

$$\frac{\partial e^r}{\partial e} = \frac{p_f p - ep_f(1 + m)p_f\mu}{p^2} = \frac{p - (1 + m)\mu ep_f}{\frac{p^2}{p_f}} > 0. \tag{7.23c}$$

Summing up, changes in the domestic profit share may be associated with either declining or improving international competitiveness, depending on the source of the distributional change:

$$e^r = e^r(h), \ \frac{\partial e^r}{\partial h} > 0, \text{ if } dz > 0 \text{ and } dm = 0,$$
$$\frac{\partial e^r}{\partial h} < 0, \text{ if } dz = 0 \text{ and } dm > 0. \tag{7.25}$$

7.3.2 Distribution and Growth

In order to analyse the effects of changes in distribution on aggregate demand, economic activity and capital accumulation, we start with the goods market equilibrium condition for an open economy without economic activity of the state: planned saving (S) has to be equal to planned nominal investment (pI) plus nominal net exports (NX), the difference between nominal exports (pX) and nominal imports (ep_fM) of goods and services:

$$S = pI + pX - ep_fM = I + NX. \tag{7.26}$$

For convenience, equation (7.26) is normalized by the nominal capital stock (pK), and therefore we get the following goods market equilibrium relationship between the saving rate ($\sigma = S/pK$), the accumulation rate ($g = I/K$) and the net export rate ($b = NX/pK$):

$$\sigma = g + b. \tag{7.27}$$

Saving consists of saving out of profits (S_Π) and saving out of wages (S_W). The propensity to save out of wages (s_W) is assumed to fall short of the propensity to save out of profits (s_Π) for the reasons outlined in the previous sections. Since the rate of capacity utilization is the relation of output to potential output ($u = Y/Y^p$) and the capital–potential output ratio relates the capital stock to potential output ($v = k/Y^p$), we obtain for the saving rate the familiar equation:

$$\sigma = \frac{S_\Pi + S_W}{pK} = \frac{s_\Pi \Pi + s_W(Y - \Pi)}{pK} = [s_W + (s_\Pi - s_W)h]\frac{u}{v},\ 0 \le s_W < s_\Pi \le 1. \tag{7.28}$$

Investment is modelled according to the by now well-known post-Kaleckian approach following Bhaduri and Marglin (1990) and Kurz (1990):

$$g = \alpha + \beta u + \tau h, \quad \beta,\tau > 0. \tag{7.29}$$

Capital accumulation will only be positive if the expected rate of profit exceeds some minimum value, given either by financial markets or, in the case of capital mobility between countries, by the foreign rate of profit. Each of these rates is taken to be exogenously given and hence not explicitly considered in the investment function.

Finally, the net export rate is positively affected by international competitiveness, provided the Marshall–Lerner condition can be assumed to hold and the sum of the absolute values of the price elasticities of exports and imports exceeds unity. Under this condition, the real exchange rate will have a positive effect on net exports. But net exports also depend on the relative developments of foreign and domestic demand. If domestic demand increases (decreases), *ceteris paribus*, net exports will decline (increase). And, if foreign demand rises (falls), *ceteris paribus*, net exports will rise (fall). Net exports will thus depend on the real exchange rate, domestic capacity utilization indicating domestic demand, and foreign capacity utilization (u_f) representing foreign demand. The latter is considered to be exogenous for the purpose of our analysis. The coefficients on domestic and foreign utilization are affected by the income elasticities of the demand for imports and exports:

$$b = \psi e^r(h) - \phi u + \zeta u_f, \quad \psi,\phi,\zeta > 0. \tag{7.30}$$

Stability of the goods market equilibrium requires that saving responds more elastically towards a change in the endogenous variable, the rate of capacity utilization, than investment and net exports do together:

$$\frac{\partial\sigma}{\partial u} - \frac{\partial g}{\partial u} - \frac{\partial b}{\partial u} > 0 \quad \Rightarrow \quad [s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi > 0. \tag{7.31}$$

Applying the usual procedure, that is plugging equations (7.28), (7.29) and (7.30) into equation (7.27) and solving for capacity utilization and then using equilibrium capacity utilization to determine the equilibrium rates of capital accumulation, profit and net exports, yields the following results:

$$u^* = \frac{\alpha + \tau h + \psi e^r(h) + \zeta u_f}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}, \tag{7.32}$$

$$g^* = \frac{(\alpha + \tau h)\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi\right\} + \beta[\psi e^r(h) + \zeta u_f]}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}, \tag{7.33}$$

$$r^* = \frac{\frac{h}{v}[\alpha + \tau h + \psi e^r(h) + \zeta u_f]}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}, \tag{7.34}$$

$$b^* = \frac{[\psi e^r(h) + \zeta u_f]\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\} - \phi(\alpha + \tau h)}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}. \quad (7.35)$$

As can easily be seen from these equilibrium values, improved animal spirits, that is an increase in α, will increase the equilibrium rates of capacity utilization, capital accumulation and profit, but decrease the equilibrium net export rate. An increase in foreign demand will improve the equilibrium rates of domestic capacity utilization, capital accumulation and profit, and also the net export rate.

The paradox of saving regarding the equilibrium rates of capacity utilization, capital accumulation and profit remains valid for this variant of the post-Kaleckian model, too:

$$\frac{\partial u^*}{\partial s_\Pi} = \frac{-[\alpha + \tau h + \psi e^r(h) + \zeta u_f]\frac{h}{v}}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi\right\}^2} < 0, \quad (7.32a)$$

$$\frac{\partial g^*}{\partial s_\Pi} = \frac{-[\alpha + \tau h + \psi e^r(h) + \zeta u_f]\beta\frac{h}{v}}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi\right\}^2} < 0, \quad (7.33a)$$

$$\frac{\partial r^*}{\partial s_\Pi} = \frac{-[\alpha + \tau h + \psi e^r(h) + \zeta u_f]\left(\frac{h}{v}\right)^2}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi\right\}^2} < 0, \quad (7.34a)$$

$$\frac{\partial u^*}{\partial s_W} = \frac{-[\alpha + \tau h + \psi e^r(h) + \zeta u_f]\frac{1}{v}(1 - h)}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi\right\}^2} < 0, \quad (7.32b)$$

$$\frac{\partial g^*}{\partial s_W} = \frac{-[\alpha + \tau h + \psi e^r(h) + \zeta u_f]\beta\frac{1}{v}(1 - h)}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi\right\}^2} < 0, \quad (7.33b)$$

$$\frac{\partial r^*}{\partial s_W} = \frac{-[\alpha + \tau h + \psi e^r(h) + \zeta u_f]\frac{h}{v^2}(1 - h)}{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi\right\}^2} < 0. \tag{7.34b}$$

Since an increase in the propensity to save out of profits or out of wages is dampening domestic economic activity and thus imports, net exports will be positively affected by higher propensities to save:

$$\frac{\partial b^*}{\partial s_\Pi} = \frac{\phi\frac{h}{v}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi} > 0, \tag{7.35a}$$

$$\frac{\partial b^*}{\partial s_W} = \frac{\phi(1 - h)\frac{1}{v}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi} > 0. \tag{7.35b}$$

A change in functional income distribution again yields ambiguous results with respect to equilibrium capacity utilization and capital accumulation:

$$\frac{\partial u^*}{\partial h} = \frac{\tau - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}, \tag{7.32c}$$

$$\frac{\partial g^*}{\partial h} = \frac{\tau\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi\right\} - \beta(s_\Pi - s_W)\frac{u}{v} + \beta\psi\frac{\partial e^r}{\partial h}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}. \tag{7.33c}$$

Equation (7.32c) shows that an increasing profit share will have no unique effect on equilibrium capacity utilization. Assuming the stability condition (7.31) to hold, from the numerator in equation (7.32c) it can be seen that the total effect of redistribution in favour of profits on capacity utilization is composed of three effects: first, there is a positive effect via investment demand (τ), second, a negative effect via consumption demand $[-(s_\Pi - s_W)(u/v)]$, and, third, an undetermined effect via net exports $[\psi(\partial e^r/\partial h)]$. The direction of the latter depends on the source of redistribution and can be either negative or positive, as has been explained above. Therefore, the following condition for profit-led demand has to hold – otherwise demand will be wage-led:

$$\frac{\partial u^*}{\partial h} > 0, \quad \text{if:} \;\; \tau - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h} > 0. \tag{7.32c'}$$

For equilibrium capital accumulation a similar result is obtained, as can be seen in equation (7.33c). The first term in the numerator represents the direct effect of improved profitability on equilibrium capital accumulation. The second term captures the indirect effect of redistribution via consumption demand and capacity utilization, which is negative. And, finally, the third term includes the indirect effect of redistribution on capital accumulation via international price competitiveness, net exports and domestic capacity utilization. Again, this may be positive or negative. For profit-led accumulation and growth the following condition is required – otherwise accumulation and growth will be wage-led:

$$\frac{\partial g^*}{\partial h} > 0, \quad \text{if:} \;\; \tau\left\{\frac{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi}{\beta}\right\} - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h} > 0. \tag{7.33c'}$$

For the open economy with positive saving out of wages we can therefore again distinguish different overall constellations, as shown in Table 7.2. From the goods market stability condition (7.31) we know that $[s_W + (s_\Pi - s_W)h](1/v) + \phi > \beta$ and hence that $\{[s_W + (s_\Pi - s_W)h](1/v) + \phi\}/\beta > 1$. From this it follows that $\tau\langle\{[s_W + (s_\Pi - s_W)h](1/v) + \phi\}/\beta\rangle > \tau$.

We obtain again three potential overall regimes, as for the closed economy case shown in Table 7.1. As in the closed economy, an overall wage-led regime requires a high differential between the propensities to save from profits and wages, a low effect of the profit share and a strong effect of capacity utilization on investment. Furthermore, in an open economy, the effects of redistribution on international competitiveness and net exports have to be taken into account, provided that the Marshall–Lerner condition holds, which we have supposed here by means of assuming that $\psi > 0$. An overall wage-led regime becomes less likely if redistribution in favour of wages is associated with weakened international price competitiveness of domestic producers and a strong effect of the real exchange rate and hence price competitiveness on net exports. As we have shown above, this effect may become important if redistribution towards wages is associated with increasing nominal wages or nominal appreciation of the domestic currency. However, if redistribution in favour of wages is associated with a falling mark-up in firms' pricing, it will mean rising price

Table 7.2 Demand and accumulation/growth regimes in an open economy post-Kaleckian distribution and growth model with positive saving out of wages

	$\frac{\partial u^*}{\partial h}$	$\frac{\partial g^*}{\partial h}$
Wage-led regime Wage-led (stagnationist) demand and wage-led accumulation/growth: $\tau - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h} < \tau\left\{\frac{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi}{\beta}\right\} - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h} < 0$	–	–
Intermediate regime Wage-led (stagnationist) demand and profit-led accumulation/growth: $\tau - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h} < 0 < \tau\left\{\frac{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi}{\beta}\right\} - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h}$	–	+
Profit-led regime Profit-led (exhilarationist) demand and profit-led accumulation/growth: $0 < \tau - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h} < \tau\left\{\frac{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi}{\beta}\right\} - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h}$	+	+

competitiveness and hence higher net exports, which will then reinforce the wage-led nature of domestic demand.

If the demand regime is wage-led, but the effect of capacity utilization on capital accumulation is low, we will obtain an intermediate regime of wage-led demand but profit-led accumulation/growth.

The overall regime will be profit-led if the differential between the propensities to save from profits and wages is low, the effect of the profit share on capital accumulation is strong and the impact of capacity utilization on investment is weak and/or redistribution in favour of profits is associated with rising price competitiveness, that is associated with falling nominal wages and/or nominal depreciation of the domestic currency, which then needs to have a strong effect on net exports. Generally, if redistribution towards profits is associated with improved price competitiveness, and hence redistribution in favour of wages with weaker price competiveness, moving from the closed to the open economy makes wage-led demand and accumulation/growth regimes less likely, albeit not impossible, as the comparison of the conditions summarized in Tables 7.1 and 7.2 reveals.

A profit-led demand regime implies that the effect of a higher profit share on the equilibrium rate of profit in equation (7.34c) is positive, too:

$$\frac{\partial r^*}{\partial h} = \frac{\frac{1}{v}\left\{\alpha + 2\tau h - (s_\Pi - s_W)h\frac{u}{v} + \psi\left[e_r(h) + h\frac{\partial e^r}{\partial h}\right] + \zeta u_f\right\}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}. \tag{7.34c}$$

If the condition (7.32c’) holds, the numerator in equation (7.34c) will also be positive.

However, in a wage-led demand regime, a lower profit share may be associated with a higher or a lower profit rate, as can be easily checked by comparing equations (7.32c) and (7.34c): $\partial u^*/\partial h < 0$ does not necessarily imply that $\partial r^*/\partial h < 0$. This result is again similar to those we have obtained for the closed economy post-Kaleckian model, with and without saving out of wages.

The effect of a change in the profit share on the equilibrium net export–capital rate is ambiguous:

$$\frac{\partial b^*}{\partial h} = \frac{\psi\frac{\partial e^r}{\partial h}\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta\right\} + \phi\left[(s_\Pi - s_W)\frac{u}{v} - \tau\right]}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}. \tag{7.35c}$$

If domestic demand is wage-led, the second term in the numerator of equation (7.35c) will be positive. And if a higher profit share is based on nominal wage moderation or nominal depreciation and hence associated with improved price competitiveness, and the effect of capacity utilization on investment is only moderate, as in the intermediate regime, the first term in the numerator will be positive, too. In this constellation a higher profit share will cause a higher equilibrium net export–capital rate. However, if domestic demand is profit-led, the second term in the numerator will become negative. And if redistribution in favour of profits only means a modest improvement in price competitiveness, or is even accompanied by weakened price competitiveness, or is associated with a strong accelerator effect on capital accumulation, then the first term in the numerator may be positive, but too small, or even negative. In this constellation, the equilibrium net export–capital rate will decline in the face of a higher profit share.

The results of the post-Kaleckian open economy distribution and growth model with positive saving out of wages have some interesting and important implications for wage and exchange rate policies. In an open economy, aggressive wage policies aiming at redistribution in favour of labour will be successful in raising the wage share, even with a constant mark-up and thus rising output prices. In a domestically wage-led economy this will have expansionary effects on domestic demand. But net exports will be affected in the negative, so that the overall effects need not be expansionary and the economy may turn overall profit-led. However, with international competition domestic firms might not be able to keep mark-ups constant when domestic nominal wages and nominal unit labour costs are rising and foreign wages and nominal unit labour costs remain constant. If this is the case, improved workers' and trade unions' bargaining power and higher domestic nominal unit labour costs will squeeze the domestic mark-up, contractionary effects of redistribution via net exports will hence be avoided, and the overall regime is more likely to remain wage-led. In a profit-led domestic economy, improved workers' bargaining power and redistribution in favour of wages will be contractionary, and overall negative effects will certainly emerge, even if firms' mark-ups are squeezed and negative effects on price competitiveness are avoided.

Nominal depreciation of the currency, or nominal wage or unit labour cost cuts, and the associated redistribution in favour of profits will be expansionary in a domestically profit-led regime. The expansionary effects will be reinforced by the positive effects on net exports through increased price competitiveness, provided that the Marshall–Lerner condition holds. But, if the domestic regime is wage-led, the overall effects are uncertain: Wage moderation or nominal depreciation will stimulate net exports, but the associated redistribution in favour of profits will have depressing effects on domestic demand in a wage-led economy. The overall effects may hence also be negative.

As we have already argued above, provided that redistribution in favour of profits also means improved international price competitiveness of domestic firms and that this has positive effects on net exports, wage-led demand and accumulation/growth regimes are less likely in an open economy than in a closed economy, because potentially negative effects of redistribution in favour of wages on net exports have to be taken into account.

So far our theoretical analysis takes us. In Section 7.4 we will review the empirical literature on wage-led and profit-led demand regimes which has evolved since the publication of Bhaduri and Marglin (1990), in particular.

7.4 EMPIRICAL RESULTS FOR THE OPEN ECONOMY POST-KALECKIAN MODEL

Since the publication of the paper by Bhaduri and Marglin (1990), a number of empirical studies dealing with the relationship between distribution, aggregate demand and accumulation have been published. Regardless of the method applied or the main focus of the empirical analysis, these contributions have tackled the question of the type of the demand-led growth regime in the countries under investigation. Marglin and Bhaduri (1990, 1991) had already used descriptive data for a set of 16 advanced capitalist economies in the period from 1960 to 1985 in order to illustrate their approach.[4] They claim that there are indications of a regime shift in the course of the turbulent decade of the 1970s. Using our terminology introduced above, they argue that advanced capitalist economies have moved from a cooperative 'wage-led regime', with wage-led demand and wage-led growth, towards an antagonistic 'intermediate regime', with wage-led demand but profit-led growth. Hein and Krämer (1997) extended the analysis to the early 1990s for France, Germany, the UK and the US, using descriptive data and calculating cyclical average values for the important variables. They speculate that there may have been a re-shift towards a wage-led regime in these countries during the cycle from the early 1980s to the early 1990s. However, they do not apply any econometric tools either.

To our knowledge the econometric work on different regimes of demand and growth based on the post-Kaleckian model started with Bowles and Boyer (1995). They applied a single equations estimation approach, which has by now become quite popular in the empirical research based on the post-Kaleckian model.[5] Bowles and Boyer (1995) estimated separate equations for the three demand aggregates consumption (saving), investment and net exports, subject to changes in the profit share in the consumption function or in the profit rate and in the employment rate, as an indicator for economic activity, in the investment and the net exports functions. Summing up the effects of a change in distribution on consumption and investment, the effect on domestic demand is obtained, and adding the effect on net exports the effect on total demand is calculated. Therefore, what Bowles and Boyer (1995) and the numerous other studies applying similar estimation approaches have been doing is estimating the demand regime for the respective economies, but not yet the growth regimes.

A different methodological approach was presented by Stockhammer and Onaran (2004) and Onaran and Stockhammer (2005) (summarized in Onaran and Stockhammer 2006), who estimated two slightly different structural vector autoregression models (SVARs) for France, the United States and the United Kingdom, on the one hand, and for Turkey and South Korea, on the other hand. They find no significant effects of the profit share on capacity utilization and the accumulation rate in the advanced capitalist countries analysed. The results for the two developing countries, however, suggest a wage-led demand and growth regime for both countries. However, the demand channels through which distribution affects aggregate demand and capital accumulation are difficult to disentangle using this approach. Therefore, most of the recent studies have used the single equations estimations approach. The procedure of this approach can be described as follows.

From national accounting aggregate demand (Y) is the sum of consumption (C), investment (I), net exports (NX^r) and government expenditure (G^r). All variables are in real terms. In a general formulation, consumption, investment and net exports are written as functions of income (Y), the profit share (h), and some other control variables (Z_i) used in the estimations. The latter are assumed to be independent of output and distribution. Government expenditures are usually considered to be exogenous and thus independent of changes in functional income distribution. Equilibrium aggregate demand is then given as:

$$Y^* = C(Y,h) + I(Y,h,Z_I) + NX^r(Y,h,Z_{NX}) + G^r. \qquad (7.36)$$

The profit share is taken to be exogenous – feedbacks of changes in aggregate demand and in its components on functional income distribution are thus ignored. Total differentiation of equation (7.36) yields:

$$dY^* = \frac{\partial C}{\partial Y}dY + \frac{\partial C}{\partial h}dh + \frac{\partial I}{\partial Y}dY + \frac{\partial I}{\partial h}dh + \frac{\partial NX^r}{\partial Y}dY + \frac{\partial NX^r}{\partial h}dh. \qquad (7.37)$$

Rearranging and collecting terms gives:

$$\frac{dY^*}{dh} = \frac{\dfrac{\partial C}{\partial h} + \dfrac{\partial I}{\partial h} + \dfrac{\partial NX^r}{\partial h}}{1 - \dfrac{\partial C}{\partial Y} - \dfrac{\partial I}{\partial Y} - \dfrac{\partial NX^r}{\partial Y}} = \frac{1}{1-x}\left[\frac{\partial C}{\partial h} + \frac{\partial I}{\partial h} + \frac{\partial NX^r}{\partial h}\right], \quad (7.38)$$

with $x = \partial C/\partial Y + \partial I/\partial Y + \partial NX^r/\partial Y$. If the feedbacks of changes in the level of aggregate demand and income on consumption, investment and net exports, and hence the multiplier $[1/(1-x)]$, are ignored, equation (7.38) simplifies to:

$$\frac{dY}{dh} = \frac{\partial C}{\partial h} + \frac{\partial I}{\partial h} + \frac{\partial NX^r}{\partial h}. \quad (7.39)$$

Dividing by Y gives the percentage change of aggregate demand caused by a one percentage point change in the profit share:

$$\frac{\dfrac{dY}{Y}}{dh} = \frac{\dfrac{\partial C}{Y}}{\partial h} + \frac{\dfrac{\partial I}{Y}}{\partial h} + \frac{\dfrac{\partial NX^r}{Y}}{\partial h}. \quad (7.40)$$

Econometric studies using the single equations estimation approach based on macroeconomic data estimate the effects of changes in the profit share on each of the components of aggregate demand in separate equations and then sum up the results in order to obtain the total effect of a change in the profit share on aggregate demand. Therefore, these studies are estimating what Stockhammer and Ederer (2008), Stockhammer et al. (2009, 2011) and Stockhammer and Onaran (2013), among others, have called the effect of redistribution on 'private excess demand', because they are not considering the multiplying effects of changes in the levels of aggregate demand and income on consumption, investment and net exports. However, these can easily be included, as the recent study by Onaran and Galanis (2012) has shown – we will come to the results further below.

Whenever $[(\partial C/Y)/\partial h] + [(\partial I/Y)/\partial h] > 0$ in equation (7.40), domestic demand is called profit-led, and if $[(\partial C/Y)/\partial h] + [(\partial I/Y)/\partial h] < 0$ domestic demand is wage-led. Adding the effects of redistribution on net exports, if $[(dY/Y)/dh] > 0$ total demand is profit-led, and if $[(dY/Y)/dh] < 0$ total demand is wage-led.

The estimations of the effects of redistribution on consumption and investment basically follow the same procedure in each of the contributions. The consumption – or a saving function – is estimated including the profit share as a determinant together with a constant. Or alternatively the sum of profits and the sum of wages are included in the estimated function, and the obtained elasticities are then converted into marginal effects by means of applying sample average, start of sample and/or end of sample data from the statistics. For the estimation of the investment function, either the profit share or the sum of profits is included as a determinant, together with control variables for demand (GDP or capacity utilization) and for internal funds (interest rate or interest payments). If required, the estimated elasticities are then again converted into marginal effects by means of applying sample average, start of sample and/or end of sample data from the statistics.

Regarding the effect of redistribution on net exports, different estimation strategies have been applied. Some authors have directly estimated the effects of redistribution on net exports, or separately on exports and imports, controlling for other influences, in particular changes in domestic and foreign incomes (Naastepad 2006; Naastepad and Storm 2007; Hein and Vogel 2008, 2009; Hartwig 2013). However, other authors have chosen a stepwise estimation of the effects of redistribution on net exports, starting with the relationship between distribution and domestic prices relevant for international competitiveness, and then estimating the export (X^r) and import (M^r) functions, controlling for changes in domestic and foreign incomes (Ederer 2008; Stockhammer and Ederer 2008; Stockhammer et al. 2009; Onaran et al. 2011; Onaran and Galanis 2012):

$$\frac{dNX^r}{dh} = \frac{\partial X^r}{\partial p}\frac{\partial p}{\partial h} - \frac{\partial M^r}{\partial p}\frac{\partial p}{\partial h}. \tag{7.41}$$

In their study on Germany, Stockhammer et al. (2011) have also taken into account that higher exports may generate higher imports via the technologically determined import content of exports:

$$\frac{dNX^r}{dh} = \frac{\partial X^r}{\partial p}\frac{\partial p}{\partial h} - \frac{\partial M^r}{\partial p}\frac{\partial p}{\partial h} - \frac{\partial M^r}{\partial X^r}\frac{\partial X^r}{\partial p}\frac{\partial p}{\partial h} = \left(\frac{\partial X^r}{\partial p} - \frac{\partial M^r}{\partial p} - \frac{\partial M^r}{\partial X^r}\frac{\partial X^r}{\partial p}\right)\frac{\partial p}{\partial h}. \tag{7.42}$$

The studies applying the single equations estimation approach shown in Table 7.3, mostly on advanced capitalist economies and only recently including some emerging market economies, obtain statistically significant differentials in the propensities to save from profits and from wages, so that increases in the profit share have robust contractive effects on consumption demand. The effects on private investment are less clear cut. Several studies have difficulties in finding any statistically significant influence of the profit share or other indicators for profitability on investment in capital stock, besides the dominant and highly significant effects of a demand or sales variable. And, if statistically significant effects of profitability are found, the marginal effects are usually smaller than those on consumption, so that in most of the studies domestic demand for the countries under investigation is wage-led. The only exceptions are the Naastepad and Storm (2007) results for the US and Japan and the Hein and Vogel (2008) result for the Netherlands.[6] In these exceptional cases the positive effect of an increase in the profit share on investment dominates the negative effect on consumption, so that domestic demand is found to be profit-led.

Including the effects of redistribution on net exports renders some of the wage-led domestic demand countries overall profit-led in some studies. This is particularly true for the small open economies of Austria and Switzerland, as the studies by Hein and Vogel (2008), Stockhammer and Ederer (2008) and Hartwig (2013) have shown. The same holds true for the emerging market economies of Argentina, China, India, Mexico and South Africa, but also for Canada and Australia as more mature capitalist economies, as Onaran and Galanis (2012) have found.

The mature and less open economies of Italy, Spain, the UK, and the Euro area as a whole, but also the emerging market economies of South Korea and Turkey, remain wage-led in all the studies when the effect of redistribution on net exports is taken into account. And for Germany, France and the US most of the studies, and in particular the more recent ones applying more sophisticated estimation approaches, find that these economies are also overall wage-led. Only Bowles and Boyer (1995), for Germany and France, and Ederer and Stockhammer (2007), for France, argue that taking into account the effects on net exports renders aggregate demand in these economies profit-led.

A truly inconclusive case is the demand regime in Japan. In the view of Naastepad and Storm (2007) the regime is already profit-led for domestic demand. Bowles and Boyer (1995) hold that domestic demand is wage-led, but including distributional effects on net exports renders the overall regime profit-led. Onaran and Galanis (2012), however, argue that there is no such switch of regimes when net export effects of redistribution are included and that the overall regime remains wage-led.

Some further results and conclusions from the empirical studies included in Table 7.3 are remarkable. None of these studies have found indications for regime shifts in the course of time in the economies under investigation. This is remarkable, because these studies usually have examined more than four decades, from the early 1960s until the early 2000s, for which Marglin and Bhaduri (1990, 1991) supposed a shift from a wage-led regime, with wage-led demand and growth, towards an intermediate regime, with wage-led demand and profit-led growth, in the course of the 1970s. There may be

Table 7.3 *Demand regimes according to single equation estimation approaches of the Bhaduri and Marglin (1990) model*

	Period	Austria		Germany		Netherlands		France		Italy	
		DD	TD	DD	TD	DD	TD	DD	TD	DD	TD
Bowles and Boyer (1995)	1953/61–87			W	P			W	P		
Naastepad (2006)	1960–2000					W	W				
Naastepad and Storm (2007)	1960–2000			W	W	W	W	W	W	W	W
Ederer and Stockhammer (2007)	1960–2004							W	P		
Ederer (2008)	1960–2005					W	W				
Hein and Vogel (2008)	1960–2005	W	P	W	W	P	P	W	W		
Stockhammer and Ederer (2008)	1960–2005	W	P								
Hein and Vogel (2009)	1960–2005			W	W			W	W		
Stockhammer et al. (2009)	1960–2005										
Onaran et al. (2011)	1962–2007										
Stockhammer et al. (2011)	1970–2005			W	W						
Onaran and Galanis (2012)	1960s–2007			W	W			W	W	W	W
Hartwig (2013)	1950–2010										

		Argentina		Australia		Canada		China	
		DD	TD	DD	TD	DD	TD	DD	TD
Onaran and Galanis (2012)	Early 1970s/1980s–2007	W	P	W	P	W	P	W	P

Notes: DD: domestic demand; TD: total demand; W: wage-led; P: profit-led.

several reasons for not detecting such a shift in the estimated regimes. First, since most of the studies use annual data, estimations for sub-periods are constrained by data points, so that propensities to consume and the reaction coefficients in the investment and net export functions can only be estimated for the whole period.[7] However, the estimated coefficients for

Spain		Euro area		Switzerland		UK		US		Japan	
DD	TD	DD	TD	DD	TD	DD	TD	DD	TD	DD	TD
						W	W	W	W	W	P
W	W					W	W	P	P	P	P
						W	W	W	W		
		W	W								
								W	W		
		W	W			W	W	W	W	W	W
				W	P						

India		Mexico		South Africa		South Korea		Turkey	
DD	TD	DD	TD	DD	TD	DD	TD	DD	TD
W	P	W	P	W	P	W	W	W	W

the whole periods are usually reported to have passed the robustness tests so that there are no indications of structural breaks. Second, the studies are confined to estimating the demand regimes, and these are supposed to remain wage-led, according to Marglin and Bhaduri (1990, 1991), who assume that there was a shift in the accumulation/growth regime during the

1970s. However, since the difference between the overall wage-led regime and the intermediate regime is to be found in the reaction coefficient of investment towards capacity utilization, or to other demand variables included in the estimations of the investment function, this should have become visible in these estimations. But the reports on the estimated investment equations generally include strong and statistically significant effects of the demand variable – a well-known result in econometric studies on investment in capital stock based on different micro- and macroeconomic datasets.[8] Third, even if there were a shift in the accumulation/growth regime in the 1970s, it may have been very short-lived, as argued by Hein and Krämer (1997), so that it may not have severely affected the long-run estimation results for the investment functions in the studies included in Table 7.3. But these are preliminary thoughts on this problem, and the issue of shifts in the demand and accumulation/growth regimes merits further empirical and econometric research.

Although there is some controversy about the wage- or profit-led nature of the demand regime in some countries, there seems to be general agreement across the studies included in Table 7.3 that the quantitative effects of redistribution on aggregate demand are modest. This becomes clear when we look at the results of the recent comprehensive study by Onaran and Galanis (2012) of several G20 economies for the period from the early 1960s or the early 1970s/1980s, respectively, until 2007.[9] The authors also include multiplier effects and elaborate on the effects of redistribution when these policies are applied not only in a single country, as assumed in all the previous studies, but simultaneously in the major countries of the world economy.

Table 7.4 presents the Onaran and Galanis (2012) results for 'private excess demand' and its components in the case of redistribution in a single country, following equation (7.40). For example, a one percentage point increase in the profit share in the Euro area reduces consumption by 0.439 per cent of GDP, increases investment by 0.299 per cent of GDP, and raises net exports by 0.057 per cent of GDP. Therefore, a one percentage point increase in the profit share, or a one percentage point decrease in the wage share, reduces GDP (not GDP growth!) by 0.084 per cent in the Euro area. For Germany, France, the UK, Japan and South Korea the negative effects are even smaller, and for Italy they are only slightly larger. Only for the US and Turkey somewhat stronger effects have been found. Positive effects for Argentina and India are also negligible, and they are only slightly stronger in Australia, Canada and Mexico. Only in South Africa and in particular in China are more pronounced positive effects visible.

If multiplier effects are considered (equation (7.38)) and the effect of a one percentage point increase in the profit share on equilibrium aggregate

Table 7.4 Effect of a one percentage point increase in the profit share on private excess demand and its components

	$\frac{\partial C / Y}{\partial h}$	$\frac{\partial I / Y}{\partial h}$	$\frac{\partial NX^r / Y}{\partial h}$	$\frac{dY / Y}{dh}$
	A	B	C	A+B+C = D
Euro area-12	−0.439	0.299	0.057	−0.084
Germany	−0.501	0.376	0.096	−0.029
France	−0.305	0.088	0.198	−0.020
Italy	−0.356	0.130	0.126	−0.100
United Kingdom	−0.303	0.120	0.158	−0.025
United States	−0.426	0.000	0.037	−0.388
Japan	−0.353	0.284	0.055	−0.014
Canada	−0.326	0.182	0.266	0.122
Australia	−0.256	0.174	0.272	0.190
Turkey	−0.491	0.000	0.283	−0.208
Mexico	−0.438	0.153	0.381	0.096
Korea	−0.422	0.000	0.359	−0.063
Argentina	−0.153	0.015	0.192	0.054
China	−0.412	0.000	1.986	1.574
India	−0.291	0.000	0.310	0.018
South Africa	−0.145	0.129	0.506	0.490

Source: Onaran and Galanis (2012, Table 11).

demand or GDP is calculated, the effects become somewhat stronger, as can be seen in column E of Table 7.5. So far, only single country effects have been considered, which means it has been assumed that the change in income distribution takes place in a single country, holding distribution in the rest of the world constant. However, this is not what has happened since the early 1980s, when a general decline in wage shares in developed, but also in developing, countries has been observed.

Therefore, Onaran and Galanis (2012) have also calculated the effects of such a 'race to the bottom', and the final results are presented in column F of Table 7.5. These calculations take into account, first, that raising the profit share simultaneously in each of the countries severely weakens the gains in price competitiveness as compared to redistribution in a single country only. Competitive gains, however, do not disappear for all the countries, because the elasticities of relative prices and the real exchange rate with regard to the profit share may differ across countries. The same may be true for price elasticities of the demand for exports and imports.

Table 7.5 Summary of the multiplier effects at the national and global level

	The effect of a one percentage point increase in the profit share in only one country on private excess demand	The effect of a one percentage point increase in the profit share in only one country on percentage change in equilibrium aggregate demand	The effect of a simultaneous one percentage point increase in the profit share on percentage change in equilibrium aggregate demand
	D	E	F
Euro area-12	−0.084	−0.133	−0.245
United Kingdom	−0.025	−0.030	−0.214
United States	−0.388	−0.808	−0.921
Japan	−0.014	−0.034	−0.179
Canada	0.122	0.148	−0.269
Australia	0.190	0.268	0.172
Turkey	−0.208	−0.459	−0.717
Mexico	0.096	0.106	−0.111
Korea	−0.063	−0.115	−0.864
Argentina	0.054	0.075	−0.103
China	1.574	1.932	1.115
India	0.018	0.040	−0.027
South Africa	0.490	0.729	0.390

Source: Onaran and Galanis (2012, Table 13).

Second, it is taken into account that redistribution of income from wages to profits has dampening effects on domestic demand in each country, and thus on export markets for the other countries. Comparing column F to column E reveals that the simultaneous increase in the profit share increases the losses in equilibrium aggregate demand in the wage-led economies, and it decreases the gains in profit-led economies. In particular, some of those economies which were profit-led in isolation, such as Canada, Mexico, Argentina and India, turn wage-led when the profit share is increased simultaneously and the respective effects on external markets and on price competitiveness are taken into account. For these countries, a 'fallacy of composition' is thus obtained: If they decrease their respective wage share in isolation, aggregate demand will increase, because they benefit from the net export channel, which turns overall demand in these countries profit-led. However, if all the major countries in the world economy apply the same wage moderation and redistribution strategy, the net export channels will be severely harmed, and for these countries aggregate demand will turn wage-led.

7.5 CONCLUSIONS

In this chapter we have extended the basic variants of the Kaleckian distribution and growth models, the neo-Kaleckian and the post-Kaleckian, by means of introducing saving out of wages and international trade. The closed economy post-Kaleckian model with or without saving out of wages allows for different demand and accumulation/growth regimes, that is wage-led or profit-led regimes depending on the model parameters and coefficients. It has turned out in this chapter that the neo-Kaleckian model with saving from wages and the inclusion of the current rate of profit in the investment function also gives rise to wage- or profit-led demand and growth regimes. Since the analytical treatment of the post-Kaleckian model is more convenient, we have chosen this model for the integration and discussion of international trade. We have shown that generally three different types of regimes may emerge: a wage-led regime with wage-led demand and wage-led capital accumulation and growth, an intermediate regime with wage-led demand but profit-led accumulation and growth, and finally a profit-led regime with profit-led demand and profit-led accumulation and growth. Generally, wage-led demand and accumulation/growth regimes are less likely in an open economy than in a closed economy, because potentially negative effects of redistribution in favour of wages on net exports have to be taken into account, provided that this redistribution also means weakened international price competitiveness of domestic firms and that this will have negative effects on net exports.

The open economy post-Kaleckian model with positive saving out of wages has provided the theoretical foundation for empirical research on wage- or profit-led demand regimes. From the review of this research we have obtained that domestic demand has generally been found to be wage-led in the investigated countries – with only a very few studies finding profit-led domestic demand in exceptional cases. Including the effect of redistribution on net exports, the more mature less open economies remain wage-led, whereas some small open mature economies and some emerging market economies may turn profit-led. However, this is only strictly true when redistribution takes place in a single country in isolation. With simultaneous redistribution in major parts of the world economy, the relevance of the net export channel is scaled down and several economies turn wage-led again. Therefore, a general race to the bottom in terms of unit labour costs and labour income shares, as observed in the period from the early

1980s until the Great Recession 2008/09, only benefits a few economies which remain profit-led. But it harms most of the economies which are characterized by wage-led demand and most likely also by wage-led accumulation and growth regimes. These results also imply that internationally coordinated policies aiming at redistribution in favour of labour incomes will not harm aggregate demand, capital accumulation and growth in most of the countries. In particular, they will not harm global aggregate demand, because the world economy is a closed economy with wage-led demand and probably also wage-led growth. However, the expansionary effects of redistribution should not be overestimated. Stabilizing global demand and growth requires a more comprehensive and coordinated macroeconomic policy approach, including expansionary monetary and in particular fiscal policies along with redistribution policies in favour of labour, as for example outlined in the Hein and Truger (2012/13) suggestion of a Global Keynesian New Deal. However, this is not the place to elaborate further on such an approach.

NOTES

1. It goes without saying that improved animal spirits have positive effects on the equilibrium rates of capacity utilization, capital accumulation and profit in the modified neo-Kaleckian model, too, as can easily be seen in equations (7.12) to (7.14). And the model also contains the paradox of saving, as is demonstrated in the appendix to this chapter.
2. This section partly draws and builds on Hein and Vogel (2008, 2009).
3. For more comprehensive open economy models including conflicting claims inflation and feedbacks of growth on distribution see Blecker (2011) and Cassetti (2012). For a more general discussion of open economy issues within the Kaleckian framework see Blecker (1999, 2002). See also Blecker (1998) for the inclusion of distributional issues in the balance-of-payments-constrained growth rate approach discussed in Chapter 4.
4. In Marglin and Bhaduri (1991) we also find a set of regressions for 16 OECD countries for the period from 1960 to 1985, ranging from simple cross-country regression for average values to pooled regressions based on sub-period averages, confirming the positive effect of profits on saving and thus the assumption in the theoretical models that the propensity to save from profits exceeds the propensity to save from wages.
5. See Naastepad (2006), Ederer and Stockhammer (2007), Naastepad and Storm (2007), Ederer (2008), Hein and Vogel (2008, 2009), Stockhammer and Ederer (2008), Stockhammer et al. (2009, 2011), Onaran et al. (2011), Onaran and Galanis (2012) and Hartwig (2013).
6. Applying somewhat different approaches and focusing on domestic demand only, Gordon (1995) and Barbosa-Filho and Taylor (2006) have also found US domestic demand to be profit-led. However, Stockhammer and Stehrer (2011) have shown that these results are not robust. See also Nikiforos and Foley (2012), who focus rather on the cyclical relationship between distribution and capacity utilization in the US (1947–2010) and argue that this is non-linear, switching from wage-led to profit-led in the course of the trade cycle. However, this is a different focus compared to the medium- to long-run regimes assessed in the studies reviewed in this chapter.
7. The only way that potential changes over time are taken into account in several studies is the conversion of estimated elasticities for the whole period into marginal effects, when

sample average, start of sample and end of sample data from the statistics are applied. See, for example, Stockhammer and Ederer (2008) and Stockhammer et al. (2009, 2011). See also the study by Onaran et al. (2011) on the US, which is based on quarterly data.

8. See the surveys by Jorgensen (1971) and Chirinko (1993), and the empirical studies by Fazzari and Mott (1986/87), Fazzari et al. (1988), Ford and Poret (1991), Bhaskar and Glyn (1995) and Ndikumana (1999), for example.
9. See also Onaran and Galanis (2013) for a shorter version.

APPENDIX: THE PARADOX OF SAVING IN THE NEO-KALECKIAN DISTRIBUTION AND GROWTH MODEL WITH POSITIVE SAVING OUT OF WAGES AND THE CURRENT RATE OF PROFIT IN THE ACCUMULATION FUNCTION

For the neo-Kaleckian distribution and growth model with positive saving out of wages and the current rate of profit in the accumulation function, as described in equations (7.1), (7.2), (7.3), (7.5), (7.10) and (7.11) we get the following effects of changes in the propensity to save out of profits or out of wages on the equilibrium rates of capacity utilization, capital accumulation and profit in equations (7.12), (7.13) and (7.14), demonstrating the validity of the paradox of saving:

$$\frac{\partial u^*}{\partial s_\Pi} = \frac{-\alpha\frac{h}{v}}{\left\{[s_W + (s_\Pi - s_W - \chi)h]\frac{1}{v} - \beta\right\}^2} < 0, \qquad (7A.12b)$$

$$\frac{\partial g^*}{\partial s_\Pi} = \frac{-\alpha\left(\beta + \chi\frac{h}{v}\right)\frac{h}{v}}{\left\{[s_W + (s_\Pi - s_W - \chi)h]\frac{1}{v} - \beta\right\}^2} < 0, \qquad (7A.13b)$$

$$\frac{\partial r^*}{\partial s_\Pi} = \frac{-\alpha\left(\frac{h}{v}\right)^2}{\left\{[s_W + (s_\Pi - s_W - \chi)h]\frac{1}{v} - \beta\right\}^2} < 0, \qquad (7A.14b)$$

$$\frac{\partial u^*}{\partial s_W} = \frac{-\alpha(1 - h)\frac{1}{v}}{\left\{[s_W + (s_\Pi - s_W - \chi)h]\frac{1}{v} - \beta\right\}^2} < 0, \qquad (7A.12c)$$

$$\frac{\partial g^*}{\partial s_W} = \frac{-\alpha\left(\beta + \chi\frac{h}{v}\right)(1 - h)\frac{1}{v}}{\left\{[s_W + (s_\Pi - s_W - \chi)h]\frac{1}{v} - \beta\right\}^2} < 0, \qquad (7A.13c)$$

$$\frac{\partial r^*}{\partial s_W} = \frac{-\alpha\frac{h}{v}(1-h)\frac{1}{v}}{\left\{[s_W + (s_\Pi - s_W - \chi)h]\frac{1}{v} - \beta\right\}^2} < 0. \qquad (7A.14c)$$

8. Extending Kaleckian models II: technical progress

8.1 INTRODUCTION

In the discussion of the Kaleckian distribution and growth models so far we have assumed that the production technology does not change during the growth process. This assumption will be dropped in this chapter, and the effects of technological progress on the long-run equilibrium will be analysed. Modern Kaleckian distribution and growth models have increasingly taken productivity growth and other supply-side considerations into account. For example, Rowthorn (1981), Taylor (1991, pp. 225–228), Lavoie (1992, pp. 316–327, 2014, chap. 6.9), You (1994), Cassetti (2003), Dutt (2003, 2006a, 2010b, 2010c), Raghavendra (2006), Hein and Tarassow (2010), Naastepad and Storm (2010), Sasaki (2011), Schütz (2012) and Storm and Naastepad (2012, 2013) have introduced endogenous productivity growth into different variants of the Kaleckian model.[1] And the studies by Naastepad (2006) on the Netherlands and by Hartwig (2013) on Switzerland, already referred to in the review of demand regime estimations in Chapter 7 of this book, have included productivity growth issues in their empirical estimations for these countries as well.

The present chapter builds on this recent theoretical and empirical literature on productivity growth in Kaleckian models. We will integrate productivity growth into the post-Kaleckian Bhaduri/Marglin (1990) model. As in the previous chapters, the profit share will be considered to be the exogenous variable, and aggregate demand, capital accumulation and productivity growth will be determined endogenously. Following a procedure introduced by Setterfield and Cornwall (2002) and used by other authors as well, we will distinguish between the demand regime and the productivity regime in our model. We will discuss the separate effects of changes in the profit share on each of these regimes, and finally we will analyse the overall effects of changes in distribution on aggregate demand, capital accumulation and productivity growth. Feedback effects of accumulation and productivity growth on distribution will not be considered.[2] It should also be noted that we do not claim to deliver a full theory of technical progress but rather limit ourselves to the effects of distribution on aggregate demand

and productivity growth.[3] Extending the post-Kaleckian model in this way contributes to an understanding of the long-run effects of redistribution on capital accumulation, productivity growth and hence the potential or the 'natural' rate of growth. We show that, with the endogeneity of productivity growth, potential GDP growth becomes endogenous with respect to distributional changes and actual GDP growth – economic policies thus have long-lasting effects through these channels.

In Section 8.2 of this chapter we will present a post-Kaleckian model with endogenous productivity growth following the procedure outlined above. Section 8.3 will then deal with some empirical results on estimations of the productivity growth regime of the model, and Section 8.4, the final section, will draw some conclusions regarding the relationship between distribution and potential growth, taking into account the empirical results on demand regimes from Chapter 7.

8.2 THE THEORETICAL MODEL[4]

The theoretical model is based on the open economy post-Kaleckian distribution and growth model outlined in Chapter 7 of this book. Technological change is introduced in three steps, following the procedure suggested by Setterfield and Cornwall (2002), and also applied by Naastepad (2006) and Hartwig (2013) in their models.[5] In the first step, for the discussion of the demand and capital accumulation/growth regime, that is for the effects of changes in functional income distribution on the goods market equilibrium rates of capacity utilization and capital accumulation, we assume productivity growth to be exogenous. In the second step, we will then deal with the productivity regime, and technical progress will be endogenized, which means we will analyze the effects of changes in aggregate demand and/or capital accumulation as well as income distribution on productivity growth. In the third step, demand and productivity regimes will be integrated and we will discuss the effects of changes in income distribution on the overall accumulation and growth regime.

As will be seen below, we focus on the interrelationship between technological change and capital accumulation, in particular. Dutt (2003) has also discussed the potential effects of technical progress on consumption and saving. New products and hence consumption possibilities may cause a reduction in the propensities to save from profits and from wages. He has also elaborated on the effects of technical change on the mark-up and hence on income distribution. Technology leaders may increase their mark-ups and hence the profit share for the economy as a whole. We will not integrate these effects into the model presented in this chapter.

In the model, functional income distribution is considered to be the exogenous variable, determined by institutional factors and relative powers of capital and labour, that is by competition between firms in the goods market and between firms and workers in the labour market, as extensively discussed in the previous chapters of this book. The goods market equilibrium rates of capacity utilization, profit and capital accumulation together with the rate of productivity growth are endogenously determined. Potential feedbacks from goods market activity and productivity growth to income distribution are excluded from the analysis.

In order to simplify the following discussion we assume that technical progress is labour saving and capital embodied. Technical progress is hence associated with a falling labour–output ratio ($a = L/Y$) and rising labour productivity ($y = Y/L$). The capital–labour ratio ($k = K/L$) increases at the same rate as labour productivity does, and the capital–potential output ratio ($v = K/Y^p$) therefore remains constant. This means that we assume Harrod neutral technical progress, as for example in Rowthorn (1981), Cassetti (2003) and Dutt (2003).[6]

We deal with an open economy without economic activity of the state, which depends on imported inputs for production purposes and the output of which competes in international markets. Neither the movement of labour nor that of capital across borders is considered. We take the prices of imported inputs and of the competing foreign final output to be exogenously given and to be moving in step. The nominal exchange rate, here the relationship between domestic currency and foreign currency or the price of a unit of foreign currency in domestic currency, is determined by monetary policies and international financial markets, and is also considered to be exogenous for our purposes.

8.2.1 The Demand and Accumulation Regime

In order to analyse the effects of changes in distribution on economic activity and capital accumulation, we start with the goods market equilibrium condition for an open economy without economic activity of the state. Planned saving (S) has to be equal to net investment (pI) plus net exports (NX), the difference between exports (pX) and imports (ep_fM) of goods and services:

$$S = pI + pX - ep_fM = pI + NX. \tag{8.1}$$

For convenience, equation (8.1) is again normalized by the nominal capital stock (pK). Therefore, we get the following goods market equilibrium relationship between the saving rate ($\sigma = S/pK$), the accumulation rate ($g = pI/pK$) and the net export rate ($b = NX/pK$):

$$\sigma = g + b. \tag{8.2}$$

Saving consists of saving out of profits (S_Π) and saving out of wages (S_W). The propensity to save out of wages (s_W) is assumed to fall short of the propensity to save out of profits (s_Π), in particular because the latter includes retained earnings of firms. The profit share relates profits to domestic income consisting of wages and profits ($h = \Pi/(W + \Pi) = \Pi/PY$), the rate of capacity utilization is the relation of output to potential output ($u = Y/Y^p$), and the capital–potential output ratio relates the capital stock to potential output. Thus, we obtain the familiar saving rate:

$$\sigma = \frac{S_\Pi + S_W}{pK} = \frac{s_\Pi \Pi + s_W(Y - \Pi)}{pK} = [s_W + (s_\Pi - s_W)h]\frac{u}{v}, \quad 0 \leq s_W < s_\Pi \leq 1. \tag{8.3}$$

Investment is again modelled according to the post-Kaleckian approach following Bhaduri and Marglin (1990) and Kurz (1990): Capital accumulation is a positive function of animal spirits and the profit rate, which is decomposed into the profit share, the rate of capacity utilization and the capital–potential output ratio ($r = hu/v$). We also include technical progress, which for the time being is assumed to be exogenous, in the investment function. Since technical progress is embodied in capital stock, it will stimulate investment. Firms have to invest in new machines and equipment in order to gain from productivity growth which is made available by new technological knowledge. This effect on investment will be the more pronounced the more fundamental technical change is: the invention of new basic technologies will have a stronger effect on real investment than marginal changes in technologies already in existence.

Since the capital–potential output ratio is assumed to be constant with technological change, capital accumulation is positively affected by the profit share, indicating unit profits, by the rate of capacity utilization, indicating (expected) demand, and by productivity growth ($\hat{y}$). For domestic capital accumulation to be positive, the expected rate of profit has to exceed a minimum rate, given by the foreign rate of profit or by the rate of interest in financial markets. Both possible minimum rates are considered to be exogenous in the present model:

$$g = \alpha + \beta u + \tau h + \omega \hat{y}, \quad \beta,\tau,\omega > 0. \tag{8.4}$$

The net export rate is positively affected by international competitiveness, provided that the Marshall–Lerner condition can be assumed to hold and the sum of the absolute values of the price elasticities of exports and imports exceeds unity. Under this condition, the real exchange rate (e^r) will have a positive effect on net exports. But net exports also depend on the relative developments of foreign and domestic demand. If domestic demand grows at a faster rate than foreign demand, net exports will decline, *ceteris paribus*. Therefore, an increase in the domestic rate of capacity utilization will have a negative impact on net exports, *ceteris paribus*. Unlike the case in Chapter 7, exogenous foreign demand and capacity utilization are omitted from the net export–capital rate equation for the sake of simplicity:

$$b = \psi e^r(h) - \phi u, \quad \psi, \phi > 0. \tag{8.5}$$

The real exchange rate, which is determined by the nominal exchange rate (e) and by the relationship between foreign prices (p_f) and domestic prices (p), $e^r = ep_f/p$, is affected by changes in the profit share. In theory this effect is ambiguous, as has been shown in detail in Hein and Vogel (2008) and in Chapter 7 of this book. Empirically, however, if there is any relationship between the profit share and international competitiveness, this relationship seems to be positive, as we have also argued in Chapter 7. Therefore, we assume in what follows:

$$e^r = e^r(h), \frac{\partial e^r}{\partial h} \geq 0. \tag{8.6}$$

Stability of the goods market equilibrium requires that saving responds more elastically to a change in the endogenous variable, the rate of capacity utilization, than investment and net exports do together:

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} - \frac{\partial b}{\partial u} > 0 \quad \Rightarrow \quad [s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi > 0. \tag{8.7}$$

We shall only consider stable goods market equilibria and the effects of changes in distribution on these equilibria. The equilibrium rates of capacity utilization and capital accumulation are given by:[7]

$$u^* = \frac{\alpha + \tau h + \omega \hat{y} + \psi e^r(h)}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}, \tag{8.8}$$

(8.9)

The effects of a change in the profit share on the rates of capacity utilization and capital accumulation can be calculated from equations (8.8) and (8.9) and should be familiar from Chapter 7:

$$\frac{\partial u^*}{\partial h} = \frac{\tau - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}, \tag{8.8a}$$

$$\frac{\partial g^*}{\partial h} = \frac{\tau\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi\right\} - \beta(s_\Pi - s_W)\frac{u}{v} + \beta\psi\frac{\partial e^r}{\partial h}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi}. \tag{8.9a}$$

Assuming the goods market equilibrium to be stable, equation (8.8a) shows that an increasing profit share will have no unique effect on equilibrium capacity utilization. There are positive effects via investment (τ) and net exports [$\psi(\partial e^r/\partial h)$], but also a negative effect via consumption [$-(s_\Pi - s_W)(u/v)$]. For equilibrium capital accumulation a similar result is obtained, as can be seen in equation (8.9a). Again, we have positive effects via investment [$\tau\{[s_W + (s_\Pi - s_W)h](1/v) + \phi\}$] and net exports [$\beta\psi(\partial e^r/\partial h)$], but a negative effect via consumption [$-\beta(s_\Pi - s_W)(u/v)$]. Depending on the relative strengths of each of these effects, a rising profit share may cause rising rates of capacity utilization and capital accumulation or falling rates. In the first case, we would obtain a profit-led regime; in the second case, the regime would be wage-led. If a higher profit share triggers a lower rate of capacity utilization but a higher rate of capital accumulation, we have the intermediate regime. However, in what follows we will focus on wage- or profit-led demand/growth regimes and will disregard the intermediate regime. A wage-led regime becomes the more likely the lower the elasticity of investment with respect to the profit share, the lower the effect of redistribution on international competitiveness and net exports, and the higher the difference in saving propensities out of profits and out of wages. For further details regarding the demand and accumulation regime the reader should consult Chapter 7.

8.2.2 The Productivity Regime

As should be familiar from Chapter 4 of this book, Kaldor in particular has developed different ways to endogenize technological change into post-Keynesian demand-led growth models. In his technical progress function (Kaldor 1957, 1961), productivity growth is positively affected by the growth of capital intensity, because technical progress is capital embodied. Another possibility has been proposed by Kaldor (1966a) looking for an explanation of the (slow) growth in the United Kingdom. There he applies Verdoorn's law.[8] According to Verdoorn (1949), the growth rate of labour productivity in industrial production is positively associated with the growth rate of output. This can be explained by static and dynamic economies of scale: the expansion of aggregate demand, sales and hence the market allows for increasing rationalization and mechanization and favourably affects technical progress and productivity growth.

Following these approaches implies that the growth rate of labour productivity is positively affected by the dynamics of output and/or capital stock. Therefore, we can integrate either capacity utilization or capital accumulation into the equation determining productivity growth. Rowthorn (1981), Lavoie (1992, pp. 322–327, 2014, chap. 6.9) and Dutt (2003), for example, have chosen the latter way of integrating productivity growth into Kaleckian distribution and growth models.

Apart from aggregate demand and output dynamics, we will consider a second determinant of productivity growth which has been taken into account in recent theoretical and empirical work based on Kaleckian models. Taylor (1991, pp. 225–228), Cassetti (2003), Naastepad (2006) and Hein and Tarassow (2010), among others, have introduced a wage-push variable into the productivity equations of their models. They thus make use of an idea proposed by Marx (1867) and Hicks (1932).[9] The argument is as follows. Low unemployment and increasing bargaining power of employees and their labour unions will speed up the increase in nominal and real wages, which will finally generate some pressure towards a rising wage share and hence a falling profit share.[10] This will accelerate firms' efforts to improve productivity growth in order to prevent the profit share from falling. In a similar vein, Dutt (2006a) has recently argued that increasing pressure from lower unemployment and rising real wages will accelerate the diffusion of innovations and will thus increase productivity growth.

Taking into account both determinants yields the following alternative equations for labour productivity growth:

$$\hat{y} = \eta + \rho u - \theta h, \quad \eta,\rho,\theta > 0, \tag{8.10}$$

or:

$$\hat{y} = \eta + \varepsilon g - \theta h, \quad \eta,\varepsilon,\theta > 0. \tag{8.11}$$

Equation (8.10) contains a kind of Verdoorn relationship between output/capacity utilization and productivity growth, whereas equation (8.11) is reminiscent of Kaldor's technical progress function, because it includes a positive relationship between capital stock growth and productivity growth. Since for a given economy equations (8.10) and (8.11) have to hold simultaneously, this implies that $\rho u = \varepsilon g$, and hence $\rho/\varepsilon = g/u$.

Productivity growth in our model is hence positively affected by capacity utilization and/or capital stock growth, and negatively by the profit share. Equation (8.11) is also used by Cassetti (2003), whereas Naastepad (2006) and Storm and Naastepad (2007, 2008, 2012) have chosen real wage growth, and not the profit share or the wage share, as determinant of wage induced productivity growth. We follow Cassetti (2003), because we hold that real wage growth will only give an additional push to capitalists' efforts to implement technical progress if it exceeds productivity growth and downward pressure on the profit share or on unit profits is exerted.

Unlike the case for the demand regime, a change in the profit share has a uniquely inverse effect on the productivity regime:

$$\frac{\partial \hat{y}}{\partial h} = -\theta < 0. \tag{8.10a, 8.11a}$$

Independently of capacity utilization, capital stock growth or income distribution, productivity growth in equations (8.10) and (8.11) is also affected by a constant which can be seen as including learning by doing effects, which have been prominent in neoclassical models (Arrow 1962), too, as we have outlined in Chapter 3 of this book.

8.2.3 The Overall Long-Run Regime and the Effect of a Change in Distribution

In order to study the total effects of a change in the profit share on demand/accumulation and productivity regimes, we first have to determine the overall long-run equilibrium for a given profit share. From equations (8.8) and (8.10) the overall long-run equilibrium rates of capacity utilization and productivity growth can be determined as follows by substituting respectively:

$$u^{**} = \frac{\alpha + (\tau - \theta\omega)h + \psi e^r(h) + \omega\eta}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi - \omega\rho}, \tag{8.12}$$

$$\hat{y}^{**} = \frac{(\eta - \theta h)\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi\right\} + \rho[\alpha + \tau h + \psi e^r(h)]}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi - \omega\rho}. \tag{8.13}$$

Substituting the long-run equilibrium values for capacity utilization and productivity growth from equations (8.12) and (8.13) into the accumulation function in equation (8.4) yields the long-run overall equilibrium rate of capital accumulation:[11]

$$g^{**} = \alpha + \tau h + \beta\left\{\frac{\alpha + (\tau - \theta\omega)h + \psi e^r(h) + \omega\eta}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi - \omega\rho}\right\}$$
$$+\omega\left\langle\frac{(\eta - \theta h)\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi\right\} + \rho[\alpha + \tau h + \psi e^r(h)]}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi - \omega\rho}\right\rangle \tag{8.14}$$

Graphically, we obtain this long-run equilibrium in Figure 8.1. Figure 8.1a contains the goods market equilibrium rate of capacity utilization from equation (8.8) and the productivity growth equation (8.10), and Figure 8.1b shows the goods market equilibrium rate of capital accumulation from equation (8.9) and the productivity growth equation (8.11). With an exogenous profit share ($\bar{h}$), we obtain a dynamic long-run equilibrium in which the rate of capacity utilization (u^{**}), the rate of capital accumulation (g^{**}) and the growth rate of labour productivity ($\hat{y}^{**}$) are determined endogenously.[12] The 'natural' rate of growth, or potential growth, is hence endogenous in our post-Kaleckian model.

The existence and the stability of the overall equilibrium require that the slope of the graph for the capacity utilization equation (the capital accumulation equation) exceeds the slope of the graph representing the productivity growth equation in Figure 8.1a (in Figure 8.1b). Therefore, from equations (8.8) and (8.10) we obtain the following condition for the

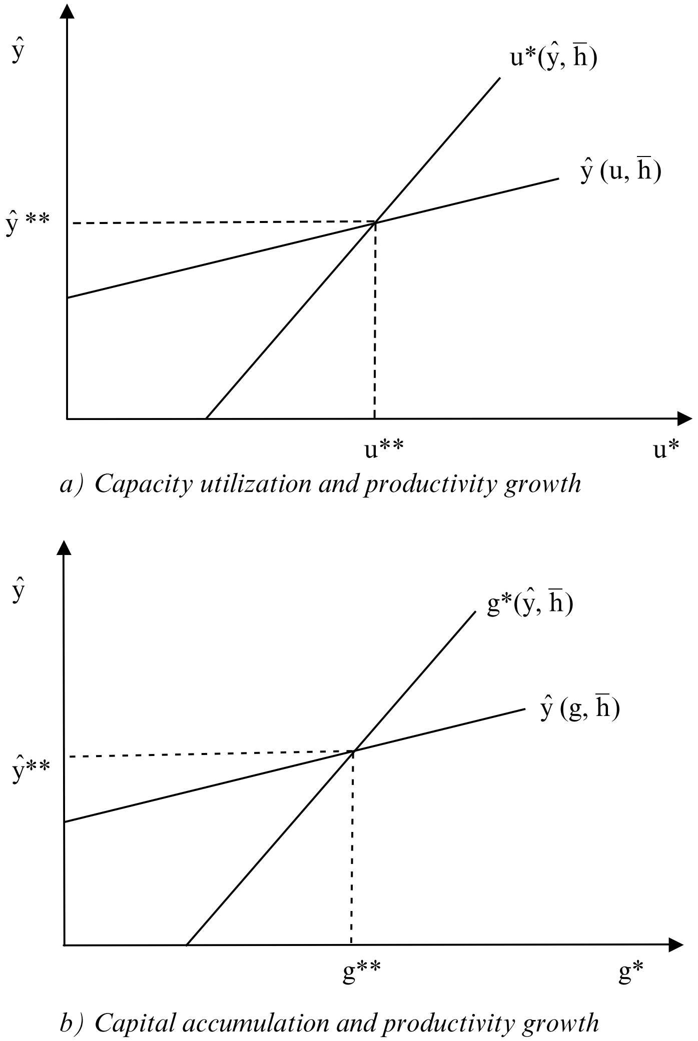


Figure 8.1 Long-run growth equilibrium with endogenous productivity growth

existence and stability of an overall long-run equilibrium of capacity utilization and productivity growth:

$$[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi - \omega\rho > 0. \tag{8.15}$$

From equations (8.9) and (8.11) the condition for existence and stability of an overall equilibrium of capital accumulation and productivity growth is:[13]

$$(1 - \omega\varepsilon)\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi\right\} - \beta > 0. \qquad (8.16)$$

Comparing the stability conditions for the post-Kaleckian open economy model with saving out of wages and endogenous productivity growth with the ones for the same model with exogenous productivity growth as in the demand regime shown above, we find that the requirements for stability are more difficult to meet when productivity growth becomes endogenous. If condition (8.15) or (8.16) is violated, we will see explosive capacity utilization, capital accumulation and productivity growth, as can easily be checked with the help of Figure 8.1.

The effect of a change in the profit share on the overall long-run equilibrium rate of capacity utilization is given by:

$$\frac{\partial u^{**}}{\partial h} = \frac{\tau - \theta\omega - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi - \rho\omega}. \qquad (8.12a)$$

The denominator has to be positive from the existence and stability condition (8.15) of the overall long-run equilibrium. There are positive effects of an increasing profit share via investment (τ) and net exports [$\psi(\partial e^r/\partial h)$], a negative effect via consumption [$-(s_\Pi - s_W)(u/v)$], and now also negative effects via productivity growth ($-\theta\omega$). The overall effect may hence be positive (profit-led) or negative (wage-led), depending on the strengths of the individual effects.

Regarding the effect on long-run overall equilibrium capital accumulation we obtain similar but not identical results:

$$\frac{\partial g^{**}}{\partial h} = \frac{(\tau - \theta\omega)\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi\right\} - (\beta + \omega\rho)(s_\Pi - s_W)\frac{u}{v} + (\beta + \omega)\psi\frac{\partial e^r}{\partial h}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi - \rho\omega}. \qquad (8.14a)$$

Redistribution has positive effects on long-run overall equilibrium capital accumulation through the partially and directly positive effect on investment decisions (τ) and through the effects on net exports [$\psi(\partial e^r/\partial h)$], which feed back positively on aggregate demand and productivity growth and thus on investment. Negative effects are exerted via consumption demand $[-(s_\Pi - s_W)(u/v)]$, which feed back negatively on investment and on productivity growth, and also through the negative effects of redistribution on productivity growth $(-\theta\omega)$, which then affect investment, too. As with long-run overall equilibrium capacity utilization, the overall effect of redistribution on long-run equilibrium capital accumulation may hence be positive (profit-led) or negative (wage-led), depending on the strength of the individual effects. Generally, long-run profit-led capacity utilization should be associated with long-run profit-led capital accumulation, and long-run wage-led capacity utilization with wage-led capital accumulation. However, comparing equations (8.12a) and (8.14a), it should be clear that there may emerge intermediate regimes. However, these will not be discussed here, and in what follows we assume that the effects of a change in the profit share on long-run overall equilibrium capacity utilization and capital accumulation have the same sign.

For the effect of a change in the profit share on the long-run equilibrium rate of productivity growth we obtain:

$$\frac{\partial \hat{y}^{**}}{\partial h} = \frac{\rho\left[\tau - (s_\Pi - s_W)\frac{u}{v} + \psi\frac{\partial e^r}{\partial h}\right] - \theta\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi\right\}}{[s_W + (s_\Pi - s_W)h]\frac{1}{v} - \beta + \phi - \rho\omega}. \tag{8.13a}$$

The total effect of a change in the profit share is composed of two sub-effects.[14] The effect via goods market activity $\{\rho[\tau - (s_\Pi - s_W)(u/v) + \psi(\partial e^r/\partial h)]\}$ may be positive or negative depending on the nature of the demand regime. If demand is profit-led, this effect will be positive; if it is wage-led, this effect will be negative. The second effect $(-\theta\{[s_W + (s_\Pi - s_W)h](1/v) - \beta + \phi\})$ is negative in any case, because the term in brackets has to be positive from the goods market stability condition. This term captures the directly negative effect of an increase in the profit share on productivity growth via the cost-push channel. Therefore, in a wage-led demand regime, the overall effect of an increasing profit share on productivity growth will be negative, whereas in a profit-led demand regime the overall effect of a rising profit share on productivity growth may be either positive or negative.

The overall results of an increase in the profit share on long-run equilibrium capacity utilization and capital accumulation, on the one hand, and long-run productivity growth, on the other hand, can also be demonstrated graphically. As mentioned above, for the sake of simplicity we assume that the effects on equilibrium capacity utilization and capital accumulation have the same sign. Therefore, we will focus on the interaction of capital accumulation as determined by the demand regime and productivity growth as determined by the productivity regime.

With a wage-led demand and accumulation regime the effects of a change in the profit share on aggregate demand and capital accumulation, on the one hand, and on productivity growth, on the other hand, are in same direction: An increasing profit share (from $\bar{h}_1$ to $\bar{h}_2$) has partially negative effects on the demand and on the productivity regime, and these partial effects then reinforce each other, as shown in Figure 8.2. The total effects with respect to equilibrium capital accumulation, which is reduced from g_1^{**} to g_2^{**}, and equilibrium productivity growth, which decreases from $\hat{y}_1^{**}$ to $\hat{y}_2^{**}$, will hence be negative.

Under the conditions of a profit-led demand and accumulation regime, a change in distribution has opposite effects on aggregate demand, respectively capital accumulation, and on productivity growth. The overall results of an increasing profit share will therefore depend on the relative strengths of each of these effects. If the expansive effect on the demand regime is rather weak and the contractive effect on the productivity regime is rather strong, we obtain an overall contractive effect, as shown in Figure 8.3a: long-run overall equilibrium capacity utilization, capital accumulation and productivity growth are reduced. However, if the positive effect on the demand regime is very pronounced and the negative effect on the productivity regime is rather weak, we obtain an expansive overall case, as can be seen in Figure 8.3c: the long-run equilibrium rates of capacity utilization, capital accumulation and productivity growth increase in the face of a

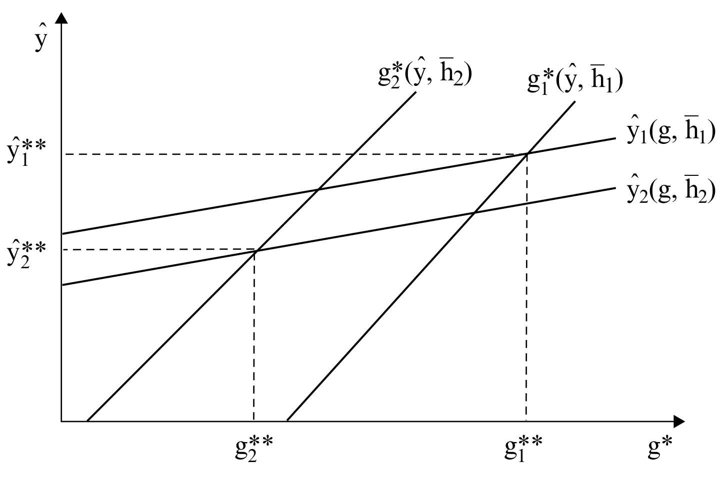
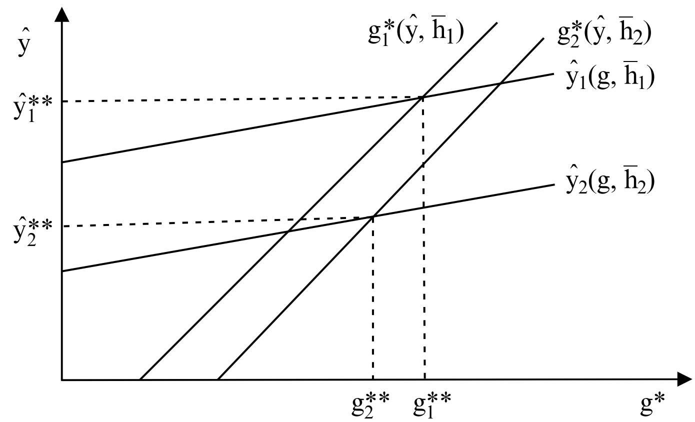


Figure 8.2 Increasing profit share and wage-led demand regime



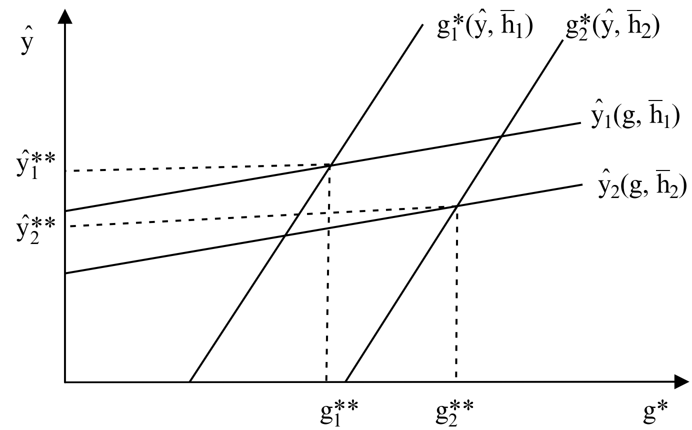
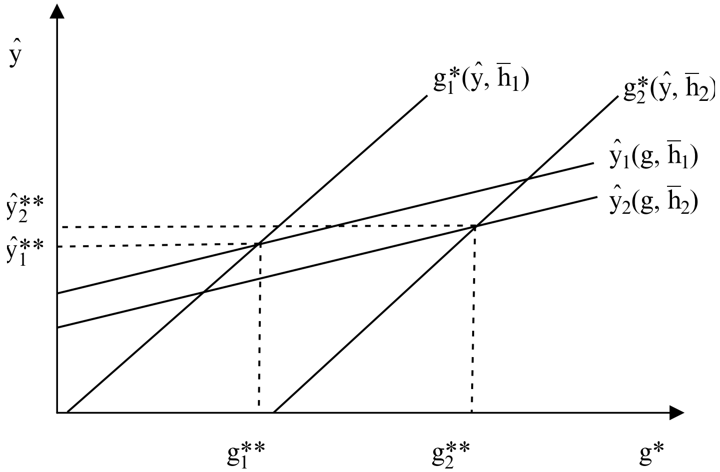


Figure 8.3 Increasing profit share and profit-led demand regime

rising profit share. With intermediate partial effects on the demand and productivity regime, an overall intermediate case is possible as well: An increasing profit share triggers higher equilibrium rates of capacity utilization and capital accumulation, but lower equilibrium productivity growth, as is displayed in Figure 8.3b. Table 8.1 summarizes the potential effects of a changing profit share on the demand, the productivity and the overall regime.



c) Expansive overall regime

Figure 8.3 (continued)

Table 8.1 Overall effects of a change in the profit share on the long-run equilibrium

	Wage-led demand regime: $(\partial u^*/\partial h) < 0, (\partial g^*/\partial h) < 0$	Profit-led demand regime: $(\partial u^*/\partial h) > 0, (\partial g^*/\partial h) > 0$		
$\partial u^{**}/\partial h$	−	−	+	+
$\partial g^{**}/\partial h$	−	−	+	+
$\partial \hat{y}^{**}/\partial h$	−	−	−	+
Overall regime with increasing profit share	contractive	contractive	intermediate	expansive

8.3 EMPIRICAL RESULTS

In Chapter 7 we reviewed the empirical and econometric studies on prevailing demand regimes in mature capitalist economies and in some emerging market economies. In these studies domestic demand has generally been found to be wage-led in the investigated countries – with only a very few studies finding profit-led domestic demand in exceptional cases. Including the effect of redistribution on net exports, the more mature less open economies remain wage-led, whereas some small open mature economies and some emerging market economies turn profit-led. But this is only strictly true when redistribution takes place in a single country in isolation. With simultaneous redistribution in major parts of the world economy, the relevance of the net export channel is scaled down and aggregate demand in several economies turns wage-led again. Let us now briefly review the empirical findings on the productivity regime.

Estimations on the productivity regime can be broadly distinguished into those studies estimating the effects of aggregate demand growth or capital accumulation on labour productivity growth and those which take into account the effects of wage-push factors on labour productivity growth as well.

McCombie et al. (2002b) have presented an instructive survey on more than 80 studies on the Verdoorn effect, from the original study by Verdoorn (1949) until 2001. They show that the Verdoorn effect has been confirmed in the overwhelming majority of these studies with different methods and data. This is true for cross-section estimations for countries or regions (US, UK, countries of the European Union, among others) or for industry branches (US, UK, France, Germany, among others), but also for time series econometrics for single countries or regions (US, UK, Germany, among others). Therefore, McCombie (2002, p. 106) summarizes the results as follows:

> In the three decades since the publication of the inaugural lecture there have been numerous studies estimating the Verdoorn Law using a variety of different data sets. The picture that emerges is, notwithstanding the instability of the law at the level of the advanced countries and with some time-series data sets, that the Verdoorn Law estimates are particularly robust with values of the Verdoorn coefficient in the range of 0.3 to 0.6 and statistically significant.

According to these results, an increase in output (or investment) growth by one percentage point raises productivity growth by 0.3 to 0.6 percentage points. More recent studies, or studies not included in the McCombie et al. (2002b) overview, broadly confirm these results regarding the effects of aggregate demand growth (or investment growth) on productivity growth, as is shown in Table 8.2.[15]

There are less numerous studies including the effect of real wage growth or of changes in the profit share on productivity growth. The causality of wage-push factors regarding productivity growth has been confirmed by Marquetti (2004). He finds co-integration between real wages and labour productivity in the US from 1869 to 1999. Real wages are Granger-causal for labour productivity, but labour productivity is not Granger-causal for real wages, according to his results. As can be seen in Table 8.3, the

Table 8.2 Estimates of the impact of (investment) demand growth on productivity growth

	Austria	France	Germany	Netherlands	Switzerland	Nordic countries	UK	US	Japan	OECD countries
McCombie et al. (2002b)										0.3–0.6
Schnur (1990)			0.54–0.6							
Jasperneite and Allinger (1998)			0.64–0.67							
Cornwall and Cornwall (2002b)										0.5
Leon-Ledesma (2002)										0.64–0.67
Knell (2004)		0.43				0.4–0.76	0.53	0.43		
Naastepad (2006)				0.63						
Uni (2007)								0.44–0.75	0.66–0.88	
Crespi and Pianta (2008)										0.27–0.38
Angeriz et al. (2009)										0.5–0.67
Alexiadis and Tsagdis (2010)										0.43–0.49

Hein and Tarassow (2010)	0.33	0.54	0.43	0.45			0.23	0.11	
Vergeer and Kleinknecht (2010/11)									0.24–0.37
Storm and Naastepad (2011)						0.31			0.39–0.46
Hartwig (2013)					0.67				

Notes: McCombie et al. (2002b): average of 80 empirical studies; Cornwall and Cornwall (2002b): based on data for 16 OECD countries (1960–89); Leon-Ledesma (2002): for 18 OECD countries (1965–94); Angeriz et al. (2008): for European regions (1986–2002); Crespi and Pianta (2008): data cover 22 manufacturing and 10 service industries in France, Germany, the Netherlands, Portugal and the UK (1994–2000); Alexiadis and Tsagdis (2010): based on data (1977–2005) for 109 EU-12 regions; Vergeer and Kleinknecht (2010/11): panel data results based on annual data for 19 OECD countries (1960–2004); and Storm and Naastepad (2011): OLS estimates using five-year average data for 20 OECD countries (1984–2004).

Source: Storm and Naastepad (2013, p. 106), own extensions.

quantitative effects of real wage growth on productivity growth found in econometric studies show some dispersion, but in the majority of studies the effect is around 0.3–0.4. This means that an increase in real wage growth by one percentage point raises productivity growth by around 0.3–0.4 percentage points.

Instead of using real wage growth indicating the wage-push factor, Hein and Tarassow (2010) have also estimated productivity growth equations with the profit share representing the wage-push factor. As we have argued above, one may conceive that real wage growth will only give an additional push to capitalists' efforts to implement technical progress if it exceeds productivity growth and downward pressure on the profit share or on unit profits is exerted. The results for six mature capitalist economies (1960–2007) are presented in Table 8.4. For the UK and the US robust results were found for the whole period under examination. However, the time series on the profit share for Austria, France, Germany and the Netherlands contained structural breaks in the early 1980s, that is falling trends of the profit share before the breakpoint and rising trends thereafter. Therefore, the productivity growth equations for these countries were estimated for sub-periods.

Column A in Table 8.4 presents the results for the Verdoorn effect, that is the effect of a one percentage point increase in aggregate demand growth or GDP growth on productivity growth. Most of the results are in the range of the other studies mentioned above. Interestingly, in those countries for which sub-periods had to be estimated, except Austria, the Verdoorn effect is stronger in the first period than in the second. Column B in Table 8.4 contains the effect of a change in the profit share on productivity growth. For the UK and the US the expected negative impact is found for the whole period: a one percentage point increase in the profit share decreases productivity growth by 0.46 percentage points in the UK and by 0.63 percentage points in the US. For the Continental European countries in the dataset, however, the estimations for the first sub-period yield a positive effect of a rise in the profit share on productivity growth, which is difficult to square with the theoretical model presented above. In the second sub-period, from the early or mid-1980s until 2007, however, the expected adverse relationship between the profit share and productivity growth is obtained, except for France, where the effect was not statistically significant. In Germany, an increase in the profit share by one percentage point decreases productivity growth by 0.87 percentage points. In Austria the effect is 0.68 percentage points, and in the Netherlands it is 0.33 percentage points.

The change in the relationship between functional income distribution and productivity growth in the Continental European countries is difficult to explain and remains to be assessed in further research. It can

Table 8.3 *Estimates of the impact of real wage growth on productivity growth*

	Austria	France	Germany	Netherlands	Switzerland	Nordic countries	UK	US	OECD countries
Rowthorn (1999)		0.11–0.24	0.33–0.87	0.24–0.44		0.1–0.54	0.25–0.6	0.13–0.28	0.24–0.3
Nymoen and Rødseth (2003)						0.5			
Naastepad (2006)				0.52					
Carter (2007)									0.6
Hein and Tarassow (2010)	0.67	0.31	0.32	0.33			0.25	0.36	
Vergeer and Kleinknecht (2010/11)									0.31–0.39
Storm and Naastepad (2011)									0.29
Hartwig (2013)					0.32				

Notes: Rowthorn (1999): data are from his table 2, panel (b); Nymoen and Rødseth (2003): for the four Nordic countries (1965–94); Carter (2007): based on data for 15 OECD countries (1980–96); Vergeer and Kleinknecht (2010/11): panel data results based on annual data for 19 OECD countries (1960–2004); and Storm and Naastepad (2011): OLS estimates using five-year average data for 20 OECD countries (1984–2004).

Source: Storm and Naastepad (2013, p. 107), own extensions.

Table 8.4 Determinants of productivity growth in Austria, France, Germany, the Netherlands, the UK and the US, 1960–2007

		A	B
		$\frac{\partial \hat{y}}{\partial \hat{Y}}$	$\frac{\partial \hat{y}}{\partial h}$
Austria	1960–83	0.32	0.67
	1984–2007	0.44	−0.68
France	1960–82	0.7	0.15
	1983–2007	0.36	–
Germany	1960–84	0.86	0.32
	1985–2007	0.27	−0.87
Netherlands	1960–83	0.66	0.29
	1984–2007	0.27	−0.33
UK	1960–2007	0.61	−0.46
US	1960–2007	0.39	−0.63

Source: Hein and Tarassow (2010, pp. 748–749).

be speculated that the relationship between the profit share and productivity growth may be non-linear, as for example Lima (2004) has suggested. In his model, the profit share has twofold effects on productivity growth: it affects the incentive to innovate, as in our model, but it also affects the funds to innovate. However, Lima (2004) has no effect of demand growth on productivity growth in his model. It misses therefore the inclusion of the Verdoorn effect, which seems to be quite stable and robust in empirical research.

8.4 CONCLUSIONS

Starting from the post-Kaleckian open economy model with saving out of wages, we have introduced technological progress and productivity growth, and we have examined the effects of a change in functional income distribution on the demand, the productivity and the long-run overall regime of the economy. Generally, we have obtained that, with endogenous productivity growth, potential GDP growth of the economy becomes path dependent with respect to actual GDP growth and to changes in distribution. With wage-led aggregate demand and capital accumulation, the negative effects of an increasing profit share on the demand and the productivity regime reinforce each other and an overall contractive regime emerges. If aggregate demand and capital accumulation are profit-led, however, different overall regimes may arise in the face of an increasing profit share, depending on the relative strengths of the effects of redistribution on the demand and on the productivity regime: contractive or expansive effects throughout on capacity utilization, capital accumulation and productivity growth, or an intermediate regime with positive effects on economic activity and capital accumulation, but negative effects on productivity growth.

Recent empirical studies reviewed in Chapter 7 of this book imply that the demand regime in large and medium-sized mature economies, as for example in Germany, France, the UK and the US, tends to be wage-led, whereas for small open economies, such as the Netherlands and Austria, and for emerging market economies, most notably China, some studies have obtained profit-led results. The reviewed estimations on the productivity regimes in this chapter confirm considerable, significant and robust Verdoorn effects, and hence positive impacts of GDP growth on productivity growth, for the countries investigated, mostly mature capitalist economies. In countries with wage-led demand regimes, therefore, not only does redistribution at the expense of labour weaken aggregate demand and GDP growth, but through the Verdoorn effect productivity growth, and thus long-run potential growth, is also affected in the negative. For countries with a profit-led demand regime, redistribution in favour of profits will have a positive effect on productivity growth and hence potential growth through the Verdoorn effect.

However, wage-push effects on productivity growth have to be taken into account, too. Positive effects of real wage growth on productivity growth have been confirmed by several studies. But these results do not necessarily imply that a higher wage share will boost and a higher profit share will dampen productivity growth. However, if real wage growth in the estimated productivity equation is replaced by the profit share, negative effects of the profit share on productivity growth can be confirmed for those mature capitalist economies under investigation. For the UK and the US these effects were found for the whole period from 1960 to 2007, and for Austria, Germany and the Netherlands for the period from the early or mid-1980s to 2007. Therefore, through the wage-push channel a falling wage share also has a directly negative impact on productivity growth in these countries.

Summing up, in those wage-led demand economies in which a statistically significant negative direct effect of the profit share on productivity growth is found, as for Germany, the UK and the US, the dampening effects of a rising profit share on the demand and the productivity regime reinforce each other and an overall contractive effect of a rising profit share emerges. In countries with a profit-led demand regime, however, as in

Austria for example, the expansive effects of an increasing profit share on aggregate demand go along with a partially depressing effect on productivity growth, which however may be compensated for by the expansive effect via GDP growth and the Verdoorn effect. Therefore, the character of the overall regime in these countries (contractive, intermediate or expansive) would have to be determined in more detailed empirical analysis focusing on the interaction of demand and productivity regime.

For those economies with a wage-led demand regime, however, a clear-cut result for economic policies is obtained from our analysis, at least for the period since the mid-1980s: Redistribution at the expense of labour is not only harmful for aggregate demand and economic activity in the short run, but also has depressing effects on capital accumulation and productivity growth, and hence on potential growth and the 'natural rate of growth', in these countries in the long run.

NOTES

1. Storm and Naastepad (2007, 2008, 2012, 2013), Naastepad and Storm (2010) and Sasaki (2011) have used this approach to address employment issues, in particular. We will not follow this road here.
2. See, for example, Cassetti (2003), Bhaduri (2006), Raghavendra (2006), Sasaki (2011) and Schütz (2012) on Kaleckian distribution and growth models with endogenous productivity growth and endogenously determined functional income distribution.
3. A comprehensive theory of technological progress and productivity growth would require a more detailed analysis of structural change within an economy, of productivity catching up-processes among economies, and of productivity growth conducive institutions. See for instance the studies by Cornwall and Cornwall (2002b) and Vergeer and Kleinknecht (2010/11).
4. This section draws and builds on Hein and Tarassow (2010).
5. However, there are several problems in the way Naastepad (2006) and, following her example, Hartwig (2013) integrate technological progress into the model. There is no effect of productivity growth on investment in the model, and real wage growth instead of distribution is taken to be the exogenous variable. This implies that, in this model with exogenous real wage rate growth, productivity growth only feeds back on output growth through its effects on the profit share, but has no direct effect on investment. Below we will integrate technological progress as a determinant into the investment function of the model, and we will also argue that introducing the wage share (or the profit share) as cost-push factor into the productivity function is more plausible than using real wage growth.
6. For more extensive treatment of technical progress in distribution and growth models see, for example, Kurz (1987) and Foley and Michl (1999).
7. The equilibrium rate of profit can easily be calculated inserting equation (8.8) into the definition of the profit rate: $r = hu/v$. The same is true for the equilibrium net export–capital rate, which can be computed by means of inserting equation (8.8) into equation (8.5). However, neither the profit rate nor the net export–capital rate will be considered explicitly in what follows. Therefore, the interested reader should consult Chapter 7 of this book, where the effects of changes in distribution on these rates are discussed.
8. On Verdoorn's law see the contributions in McCombie et al. (2002a).

9. See also Lima (2004), who makes use of a non-linear effect of the wage share on technological innovations in a somewhat more complex model than ours. However, in his model there is no Verdoorn effect or technical progress function. See also Lima (2000).
10. As we have shown in Chapter 7 for a post-Kaleckian model of an open economy, such as the one presented here, nominal wage growth exceeding productivity growth will cause a rise in the wage share and a drop in the profit share, even if the mark-up on unit labour costs in firms' pricing remains constant.
11. For an alternative calculation of the overall long-run equilibrium rate of capital accumulation see the appendix to this chapter.
12. The long-run profit rate and the long-run net export–capital rate, which are not considered explicitly in this chapter, are also determined endogenously, of course.
13. As can be seen in the appendix to this chapter, this condition appears in the numerator of the long-run overall equilibrium rate of capital accumulation, if we derive it by means of substituting equation (8.11) into equation (8.9).
14. Again, the denominator is positive from the existence and stability condition of the overall equilibrium.
15. See also Leon-Ledesma and Thirlwall (2002), who have shown for 15 OECD countries (including France, Germany, the UK, the US, the Netherlands and Austria) in the period 1960–95 that the natural rate of growth, that is the sum of labour force growth and productivity growth, is positively affected by actual GDP growth. The natural rate is thus endogenous with respect to the demand determined actual GDP growth rate, with both productivity growth and labour supply growth being the endogeneity channels.

APPENDIX: ALTERNATIVE CALCULATION OF THE LONG-RUN OVERALL EQUILIBRIUM RATE OF CAPITAL ACCUMULATION AND OF THE EFFECT OF A CHANGE IN THE PROFIT SHARE

Substituting equation (8.11) into equation (8.9) yields an alternative expression for the long-run overall equilibrium rate of capital accumulation.

$$g^{**} = \frac{\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi\right\}[\alpha + (\tau - \theta\omega)h + \omega\eta] + \beta\psi e^r(h)}{(1 - \omega\varepsilon)\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \sigma\right\} - \beta}. \tag{8A.1}$$

The effect of a change in the profit share on long-run equilibrium capital accumulation is then given by:

$$\frac{\partial g^{**}}{\partial h} = \frac{(\tau - \theta\omega)\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi\right\} + \beta\left[\psi e^r(h) - (s_\Pi - s_W)\frac{u}{v}\right]}{(1 - \omega\varepsilon)\left\{[s_W + (s_\Pi - s_W)h]\frac{1}{v} + \phi\right\} - \beta} \tag{8A.1a}$$

Redistribution has positive effects on long-run equilibrium capital accumulation through the partially and directly positive effect on investment decisions (τ) and through the effects on net exports [$\psi(\partial e^r/\partial h)$], which feed back positively on aggregate demand and thus on investment. Negative effects are exerted via consumption demand [$-(s_\Pi - s_W)(u/v)$], which feed back negatively on investment, and also through the negative effects of redistribution on productivity growth ($-\theta\omega$), which then affects investment, too. The overall effect of redistribution on long-run equilibrium capital accumulation may hence be positive (profit-led) or negative (wage-led), depending on the strengths of these single effects.

9. Extending Kaleckian models III: interest and credit

9.1 INTRODUCTION

In the previous chapters we have not explicitly considered issues of money, credit and interest. We just assumed that, in a monetary production economy, capitalists have access to credit in order to finance investment. Therefore, aggregate saving is not a financing constraint for aggregate investment, but adjusts to the latter through income growth and changes in functional income distribution in the Kaldor–Robinson model, and in capacity utilization in the Kaleckian models. In this chapter we will now explicitly integrate monetary issues into the post-Kaleckian model.

Introducing monetary variables into the model, we follow the post-Keynesian 'horizontalist' monetary view based on the works of Kaldor (1970a, 1982, 1985b), Lavoie (1984, 1992, chap. 4, 1996c, 2014, chap. 4) and Moore (1988, 1989a). We assume that the relevant monetary interest rate is an exogenous variable for the accumulation process, whereas the quantities of credit and money are determined endogenously by economic activity.[1]

Although the long-run independence of investment from saving immediately raises the problem of investment finance and financing costs, the introduction of monetary variables and an explicit analysis of the effects of a change in the monetary rate of interest on distribution, aggregate demand and capital accumulation or growth were missing in the older post-Keynesian growth and distribution models in the tradition of Kaldor and Robinson, and for a long period also in the models based on the work of Kalecki and Steindl. Money and a monetary rate of interest did not have a major role to play in the determination of the long-run accumulation equilibrium in both variants (Kregel 1985), in contrast to what Keynes (1933, pp. 408–409) had demanded for a 'monetary theory of production',

> in which money plays a part of its own and affects motives and decisions and is, in short, one of the operative factors in the situation, so that the course of events cannot be predicted, either in the long period or in the short, without a knowledge of the behaviour of money between the first state and the last.

The neglect of money, interest and credit in the early post-Keynesian distribution and growth models is even more surprising if we take into account that it is now well understood that Robinson, Kaldor and Kalecki contributed considerably to the development of the post-Keynesian monetary theory, or at least shared the main propositions of this monetary approach.[2]

It was not before the late 1980s or early 1990s that post-Keynesians started to take Keynes's (1933) research programme of a 'monetary theory of production' more and more seriously and introduced monetary variables into the Kaldor–Robinson and the Kalecki–Steindl variants of the distribution and growth models. Pasinetti's (1974, chap. 6) natural rate of growth model, which we have discussed in Chapter 4 of this book and in which the normal rate of profit is positively associated with the rate of interest as long as the latter is below the former, was an early exception from this general tendency of neglecting the relevance of monetary variables.[3] Since the mid/late 1980s, however, there have been presented several attempts at integrating monetary variables into different types of post-Keynesian distribution and growth models by Taylor (1985, 2008, chap. 8.5), Dutt (1989, 1990/91, 1992, 1995), Epstein (1992, 1994), Lavoie (1992, chap. 6.5, 1993, 1995a, 2014, chap. 6.10), Dutt and Amadeo (1993), Smithin (1997, 2003a, chap. 7, 2003b), Hein (1999, 2006b, 2006c, 2006d, 2007) and Lavoie et al. (2004), among others.

Based on this literature, Hein (2008) has systematically introduced a monetary interest rate, credit and debt finance step by step into the basic post-Keynesian distribution and growth models, with a focus on the Kaleckian approaches.[4] In the present chapter we can therefore restrict ourselves to discussing the role and effects of a monetary rate of interest, credit and debt in one variant of these models, the basic post-Kaleckian model, which we introduced in Chapter 6 of this book. Section 9.2 is devoted to this. In Section 9.3 we then review some empirical results regarding the effects of the monetary rate of interest on income distribution, aggregate demand and capital accumulation. Section 9.4, the final section, summarizes and concludes.

9.2 THE THEORETICAL MODEL[5]

9.2.1 The Basic Model

In the model we go back to a closed economy without economic activity of the state, in which just one type of commodity is produced that can be used for consumption and investment purposes. Technical conditions of production are taken as constant. It is assumed that there is a constant relation between the employed volume of labour and real output (Y), that is, there is no overhead labour. The productivity of labour is thus constant up to full capacity output and we get a constant labour–output ratio (a). The capital–potential output ratio (v) which relates the real capital stock (K) to potential real output (Y^p) is also supposed to be constant. The capital stock is assumed not to depreciate. The rate of capacity utilization (u) is given by the relation between actual real output and potential real output determined by the capital stock. Full utilization of the capital stock is not necessarily associated with full employment of labour. If output is limited by supply, it is the capital stock which is the limiting factor, not the labour force. In the long run, labour supply may be assumed to adjust passively to labour demand as soon as full employment is approached, through rising participation rates or immigration.

The profit rate (r) relates the annual flow of gross profits (Π), consisting of retained earnings and interest payments in this model, to the nominal capital stock (pK). Writing h again for the profit share and w^r for the real wage rate, the rate of profit can again be decomposed as follows:

$$r = \frac{\Pi}{pK} = \frac{\Pi}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = \frac{pY - wL}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = (1 - w^r a)\frac{u}{v} = h\frac{u}{v}. \quad (9.1)$$

Functional income distribution, and hence the profit share, is determined by firms' pricing (p) in incompletely competitive goods markets. Writing w for the nominal wage rate, we assume that firms set prices (p) according to a mark-up (m) on unit labour costs, which are constant up to full capacity output given by the capital stock. The mark-up is determined as in the previous chapters, that is by the degree of price competition in the goods market, by the bargaining power of workers and by overhead costs. Since the rate of interest on credit (i) now affects overhead costs, the mark-up and hence the profit share may become elastic with respect to changes in the rate of interest, as we will explain in more detail below:

$$p = [1 + m(i)]wa, \qquad m > 0, \frac{\partial m}{\partial i} \geq 0. \quad (9.2)$$

$$h = \frac{\Pi}{pY} = 1 - \frac{1}{1 + m(i)}, \ \frac{\partial h}{\partial i} \geq 0. \quad (9.3)$$

With regard to the inclusion of monetary variables in the model, we follow the post-Keynesian 'horizontalist' monetary view developed by Kaldor (1970a, 1982, 1985b), Lavoie (1984, 1992, chap. 4, 1996c, 1999, 2006b, 2014, chap. 4) and Moore (1988, 1989a), as already mentioned in the introduction.

We assume that the monetary interest rate is an exogenous variable for the accumulation process, while the quantities of credit and money are determined endogenously by economic activity. In this view, the central bank controls the base rate of interest in the money market. Commercial banks set the market rate of interest in the credit market by marking up the base rate, and then they supply the credit demand of consumers and investors they consider creditworthy at this interest rate. The central bank accommodates the necessary amount of central bank money, provided that commercial banks can supply securities of creditworthy borrowers in exchange or as collateral. The long-term rate of interest in the credit market relevant for the purposes of this chapter is determined by the interest rate policy of the central bank, which controls the base rate of interest, and by the liquidity and risk considerations of commercial banks supplying credit to the productive sectors of the economy. Furthermore, the long-term rate of interest is affected by the degree of competition in the banking sector and by the development of other costs of banking apart from refinancing costs with the central bank. All these factors determine the commercial banks' mark-up on the central bank's base rate and thus affect the loan rate of interest in the credit market.

For the sake of simplicity, in what follows we suppose that in the long run the central bank's interest rate policy controls the long-term 'real' interest rate, that is the nominal long-term interest rate corrected for inflation (expectations). The pace of capital accumulation has no direct and systematic feedback effects on this interest rate. In our demand-led growth model in this chapter we therefore follow Pasinetti's recommendation for the treatment of the rate of interest in the theory of effective demand:

> However important a role liquidity preference may play in Keynes' monetary theory, it is entirely immaterial to his theory of effective demand. What this theory requires, as far as the rate of interest is concerned, is not that the rate of interest is determined by liquidity preference, but that it is determined *exogenously* with respect to the income generation process. Whether, in particular, liquidity preference, or anything else determines it, is entirely immaterial. (Pasinetti 1974, p.47, emphasis in the original)

In what follows, therefore, the rate of interest is considered to be a purely monetary and conventional phenomenon mainly determined by the central bank. Changes in the interest rate are mainly due to changes in the central bank's monetary regime.

The position taken here differs from the post-Keynesian 'structuralist' view in monetary economics, which assumes that a decreasing liquidity position of commercial banks as well as rising lender's and borrower's risk associated with increasing indebtedness of the corporate sector in the course of economic expansion will finally lead to rising interest rates when the demand for credit is rising in the accumulation process. This position can be found in Wray (1990, 1992a, 1992b, 1995), Palley (1991, 1994a, 1996c, 2008a, 2013c), Howells (1995a, 1995b, 2006), Arestis and Howells (1996, 1999) and Dow (1996, 2006), among others.[6] From this view, it would follow that an endogenous rate of interest should be included in post-Keynesian distribution and growth models as well.

Of course, it has to be conceded that the commercial banks' loan rate may vary, even when the central bank maintains the base rate at a constant level. Changes in other costs of banking and in the degree of competition in the banking sector, and shifts in expectations and hence in liquidity preference or in risk assessments of commercial banks may be causes for this. What is questionable from a macroeconomic perspective, however, is the necessity for an increase in the loan rate in the face of rising demand for credit in an economic expansion, owing to a perceived decrease in liquidity of commercial banks and an increase in indebtedness of credit seeking firms (Lavoie 1996c, 2006b). Taking into account the macroeconomic feedbacks of higher credit financed investment on the liquidity position of commercial banks or on the indebtedness of the corporate sector of the economy, there is no reason to believe that the loan rates of interest will necessarily go up. We will come back to this further below in Subsection 9.2.5 where we will discuss this issue in the context of the model to be presented in this chapter.

The pace of accumulation in our model is determined by firms' decisions to invest, independently of saving, because firms have access to short-term (or initial) finance for production purposes supplied by a developed banking sector.[7] We assume then that long-term finance of the nominal capital stock consists of firms' accumulated retained earnings (E_F) and long-term credit granted by rentiers' households (B), either directly via holding bonds issued by the firm sector or indirectly via banks:

$$pK = B + E_F. \tag{9.4}$$

This provides us with the simple balance sheet matrix in Table 9.1, which presents the stocks of assets (+), liabilities (−) and net worth of each sector and the economy as a whole. To get the double-entry accounting right, the

Table 9.1 Balance sheet matrix

	Workers' households	Rentiers' households	Firms	Σ
Loans		+B	−B	0
Capital			pK	pK
Σ	0	+B	$+E_F$	$pK = B + E_F$

added sums of each of the columns ($B+E_F$) have to equal the added sums of each of the rows (pK).

The debt–capital ratio (λ) relates the stock of debt to the nominal capital stock and indicates the financial structure of the corporate sector:

$$\lambda = \frac{B}{pK}. \tag{9.5}$$

Only the stock of long-term credit gives rise to interest payments and hence distributed profits, because we have no equity held by rentiers and thus no dividend payments of firms to rentiers. By means of this simplification we do not have to distinguish between creditor households receiving interest income, on the one hand, and shareholder households receiving dividend income, on the other hand, and potentially different saving propensities, in contrast to what was done for example in Lavoie (1995a). Under these conditions, profits split into profits of enterprise (Π_F), which are retained and used for long-term investment finance, and rentiers' income (R), which is distributed to rentiers' households and either consumed or saved by them:

$$\Pi = \Pi_F + R. \tag{9.6}$$

Rentiers' income is determined by the stock of long-term credit (B) granted to firms and the exogenously given rate of interest (i):

$$R = iB. \tag{9.7}$$

In what follows in this chapter, we shall assume that the debt–capital ratio is a slowly changing variable which we consider to be given in the short run. In the long run, however, the debt–capital ratio will vary and it has to be determined endogenously within the model, and its stability will have to be studied.

Since firms now have to pay interest, the mark-up and the profit share in equations (9.2) and (9.3) can be decomposed into a part covering profits of enterprise and a part covering interest income of the rentiers. If the mark-up remains constant in the face of interest rate changes, the real wage rate and the labour income share will not be affected. A change in the interest rate will hence not affect distribution between wages and gross profit income, but will rather influence the distribution of gross profits between firms and rentiers. If changes in the rate of interest cause changes in the mark-up in the same direction, real wages and the labour income share will immediately be affected: rising (falling) interest rates and rising (falling) mark-ups mean rising (falling) prices and cause falling (rising) real wages, assuming nominal wages to be constant. A change in the rate of interest, therefore, causes changes in the gross profit share in the same direction. In what follows, the terms 'profit', 'profit share' and 'profit rate' will be related to gross profits as the sum of profits of enterprise and interest.

As we have discussed in Chapter 5 of this book, a change in overhead costs and thus in the interest rate and in interest costs, may but need not necessarily raise the mark-up, according to Kalecki (1954, p. 18, 1971, p. 51). Although in the longer run an interest-elastic mark-up is a highly likely outcome, because the mark-up has to cover overhead costs, such a change might depend on supportive shifts in the other determinants of the mark-up, which are the intensity of price competition in the goods market and the power of workers and labour unions in the labour market. We may expect that an increasing intensity of competition and rising power of labour unions will prevent rising interest rates from being shifted to higher mark-ups and prices, but enforce falling interest rates to cause falling mark-ups and prices. If the intensity of competition is decreasing and unions are weakened, rising interest rates will probably be accompanied by rising mark-ups, whereas falling interest rates will not lead to falling mark-ups. Changing interest rates may therefore affect the share of retained earnings as well as the share of wages in national income, depending on the circumstances in the goods and the labour market.[8] Of course, changes in the interest rate and in interest costs for firms may also fuel conflict inflation. However, here we will not deal with this issue but rather focus on the distributional effects only.[9]

Next, we have to introduce retained profits and interest payments to the rentiers' households into the saving function of the model. In order to keep the argument simple, we assume a classical saving hypothesis again and hold that workers do not save. The part of profits retained by firms is completely saved by definition. The part of profits distributed to rentiers' households, the interest payments, however, is used by those households according to their propensity to save (s_R). Therefore, total saving (S) comprises retained profits ($\Pi - R$) and saving out of interest income (S_R). Taking equations (9.1), (9.5) and (9.7) into account, we get for the saving rate (σ), which relates total saving to the nominal capital stock:

$$\sigma = \frac{S}{pK} = \frac{\Pi - R + S_R}{pK} = h\frac{u}{v} - i\lambda(1 - s_R), \quad 0 < s_R \leq 1. \quad (9.8)$$

The higher the interest rate at a given rate of profit, a given debt–capital ratio and a given propensity to save out of rentiers' income below unity, the lower will be the saving rate for the economy as a whole, because more income is transferred from firms which do not consume to rentiers who consume at least a part of their income. An increasing debt–capital ratio reduces the saving rate, *ceteris paribus*, for the same reason. However, if a higher interest rate is associated with an interest-elastic mark-up and hence a higher profit share, the redistribution at the expense of labour income may cause a rising saving rate for the economy as a whole, provided that the rate of capacity utilization does not fall to the same extent.

Explicitly introducing the interest rate and firms' indebtedness to rentiers' households into the investment function of the model, we can make use of Kalecki's (1937) 'principle of increasing risk', which we have outlined and discussed in Chapter 5 of this book. Firms have to finance their capital stock long-term. This can take place through accumulated retained earnings, but firms will also need external long-term finance, which in our model can be raised either by means of issuing bonds or by looking for long-term bank credit. Following Kalecki's 'principle of increasing risk', the firms' willingness to debt-finance investment and the access to external finance in imperfect financial and credit markets is positively affected by firms' own means of finance and thus by retained profits. Therefore, the higher the amount of retained profits, the more external finance firms are able and willing to raise, and the more investment in capital stock can be financed.

From these considerations it follows that the effect of the interest rate on investment depends less on direct financing costs or opportunity costs of real investment, as in Keynes (1936), but more on the effect of the interest rate on internal funds and the related access to external finance in imperfect financial markets. These basic insights going back to Kalecki (1937) have been rediscovered by new Keynesian economists focusing on asymmetric information, adverse selection and moral hazard in financial markets, without acknowledging Kalecki's work, however.[10] Extending the post-Kaleckian investment function from Chapter 6 by these considerations yields:

$$g = \frac{I}{K} = \alpha + \beta u + \tau h - \theta i\lambda, \quad \beta,\tau,\theta > 0. \tag{9.9}$$

Based on Kalecki's 'principle of increasing risk', the rate of interest and the debt–capital ratio have a negative impact on investment because of their adverse effects on internal means of finance. This negative effect is added to the positive effects of the profit share and the rate of capacity utilization in a linear way. The parameter α stands for the motivation to accumulate, which derives from the competition of firms independently of the development of distribution, effective demand, and monetary or financial variables, and is thus taken again to represent 'animal spirits'. The intensity of the influence of effective demand and capacity utilization is indicated by β, whereas τ shows the weight of the profit share or unit profits, and θ the impact of debt and the interest rate. To induce firms to demand real capital goods instead of financial assets issued by other firms, the expected rate of profit has to exceed the rate of interest in financial markets.

Finally, the goods market equilibrium condition is given by the equality of the decisions to save and to invest:

$$g = \sigma. \tag{9.10}$$

And the stability of the goods market equilibrium requires again that the saving rate responds more elastically to a change in capacity utilization than the accumulation rate:

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \quad \Rightarrow \quad \frac{h}{v} - \beta > 0. \tag{9.11}$$

In what follows we will only consider stable goods market equilibria.

The transactions in our simple model economy are summarized in the transaction flow matrix in Table 9.2. Workers' households receive wages (W), which are completely spent for buying consumption goods (pC_W), as can be seen in the column representing the workers' households account. The column representing the rentiers' households account shows that rentiers' households receive interest income (R), which is partly used for rentiers' consumption (pC_R) and partly saved. The only asset in which rentiers can hold their saving is credit to firms or bonds issued by the firm sector. Therefore, saving out of rentiers' income is equal to the change in credit to the firm sector (dB). The column representing the firms' current account shows that firms receive the proceeds from selling consumption goods to

Table 9.2 Transaction flow matrix

	Workers' households	Rentiers' households	Firms' current	Firms' capital	Σ
Consumption	$-pC_W$	$-pC_R$	$+pC_W+pC_R$		0
Investment			$+pI$	$-pI$	0
Wages	$+W$		$-W$		0
Retained profits			$-\Pi_F$	$+dE_F$	0
Distributed profits: interest		$+R$	$-R$		0
Change in loans		$-dB$		$+dB$	0
Σ	0	0	0	0	0

workers' and rentiers' households and from selling investment goods to other firms (pI). They pay wages to workers' households and interest on the existing stock of debt to rentiers' households, and they retain part of gross profits (Π_F), which adds to the equity held by the firm (dE_F) itself, shown in the column presenting firms' capital account. In this column it also becomes clear that long-term finance for investment, and hence for the change in the capital stock, consists of the change in equity held by the firm plus the change in debt issued by the firm and held by the rentiers' households. In the transaction matrix, inflows have a plus and outflows have a minus. In order to prevent black holes and to get the accounting right, the sum of each row as well as of each column has to be equal to zero.

9.2.2 Short-Run Equilibrium

Assuming the debt–capital ratio to be given and constant in the short run, the equilibrium values for capacity utilization, capital accumulation and the rate of profit in the short run can be calculated in the usual way. Using equations (9.8), (9.9) and (9.10) allows for the derivation of the equilibrium rate of capacity utilization, which can then be substituted into equation (9.8) or (9.9) to obtain the equilibrium rate of capital accumulation and into equation (9.1) to get the equilibrium rate of profit:

$$u^* = \frac{i\lambda(1 - s_R - \theta) + \alpha + \tau h}{\frac{h}{v} - \beta}, \tag{9.12}$$

$$g^* = \frac{i\lambda\left[\beta(1 - s_R) - \theta\frac{h}{v}\right] + \frac{h}{v}(\alpha + \tau h)}{\frac{h}{v} - \beta}, \tag{9.13}$$

$$r^* = \frac{\frac{h}{v}[i\lambda(1 - s_R - \theta) + \alpha + \tau h]}{\frac{h}{v} - \beta}. \tag{9.14}$$

As can easily be seen from these equations, higher animal spirits (α) in firms' investment function will raise the short-run equilibrium rates of capacity utilization, capital accumulation and profit. A higher propensity to save out of rentiers' income will lower the short-run equilibrium values, and the 'paradox of thrift' is valid here, too. The effects of a change in the profit share on the short-run equilibrium may be wage-led or profit-led, depending on the values of the coefficients on capacity utilization and the profit share in the accumulation function (9.9), in particular:

$$\frac{\partial u^*}{\partial h} = \frac{\tau - \frac{u}{v}}{\frac{h}{v} - \beta}, \tag{9.12a}$$

$$\frac{\partial g^*}{\partial h} = \frac{\frac{1}{v}(\tau h - \beta u)}{\frac{h}{v} - \beta}, \tag{9.13a}$$

$$\frac{\partial r^*}{\partial h} = \frac{\frac{1}{v}(\tau h - \beta u)}{\frac{h}{v} - \beta}. \tag{9.14a}$$

With a strong effect of the profit share on investment and weak effects of capacity utilization, equilibrium capacity utilization, capital accumulation and profit rate will be profit-led. In the opposite case, with weak effects of the profit share and strong effects of capacity utilization, the equilibrium will be wage-led. However, similar to the simple post-Kaleckian model discussed in Chapter 6, we may also obtain an intermediate regime with wage-led demand and thus capacity utilization and profit-led capital accumulation and thus growth. Unlike the case for the model in Chapter 6, in the model of the present chapter the effects of redistribution on the profit rate are the same as those on capital accumulation.

Analytically, we can derive the conditions for the three regimes from equations (9.12a), (9.13a) and (9.14a). From these equations we obtain the following conditions:

$$\frac{\partial u^*}{\partial h} > 0, \quad \text{if:} \quad \tau - \frac{u}{v} > 0, \tag{9.12a'}$$

$$\frac{\partial g^*}{\partial h} > 0, \quad \text{if:} \quad \tau\left(\frac{h}{v\beta}\right) - \frac{u}{v} > 0, \tag{9.13a'}$$

$$\frac{\partial r^*}{\partial h} > 0, \quad \text{if:} \quad \tau\left(\frac{h}{v\beta}\right) - \frac{u}{v} > 0, \tag{9.14a'}$$

From the goods market stability condition (9.11) we have that $h/v > \beta$ and hence $h/v\beta > 1$. From this it follows that $\tau(h/v\beta) > \tau$. Therefore, we obtain the possible regimes as shown in Table 9.3.

Table 9.3 Effects of changes in the profit share on the short-run equilibrium rates of capacity utilization, capital accumulation and profit

	$\frac{\partial u^*}{\partial h}$	$\frac{\partial g^*}{\partial h}$	$\frac{\partial r^*}{\partial h}$
Wage-led regime Wage-led demand and wage-led accumulation/growth: $\tau - \frac{u}{v} < \tau\left(\frac{h}{v\beta}\right) - \frac{u}{v} < 0$	−	−	−
Intermediate regime Wage-led demand and profit-led accumulation/growth: $\tau - \frac{u}{v} < 0 < \tau\left(\frac{h}{v\beta}\right) - \frac{u}{v}$	−	+	+
Profit-led regime Profit-led demand and profit-led accumulation/growth: $0 < \tau - \frac{u}{v} < \tau\left(\frac{h}{v\beta}\right) - \frac{u}{v}$	+	+	+

Next, we can analyse the short-run effects of a change in the interest rate, holding the debt–capital ratio constant. From equations (9.12) to (9.14), we get the following reactions of the short-run equilibrium rates of capacity utilization, capital accumulation and profit:

$$\frac{\partial u^*}{\partial i} = \frac{\lambda(1 - s_R - \theta) + \frac{\partial h}{\partial i}\left(\tau - \frac{u}{v}\right)}{\frac{h}{v} - \beta}, \tag{9.12b}$$

$$\frac{\partial g^*}{\partial i} = \frac{\lambda\left[\beta(1 - s_R) - \theta\frac{h}{v}\right] + \frac{\partial h}{\partial i}\frac{1}{v}(\tau h - \beta u)}{\frac{h}{v} - \beta}, \tag{9.13b}$$

$$\frac{\partial r^*}{\partial i} = \frac{\frac{h}{v}\lambda(1 - s_R - \theta) + \frac{\partial h}{\partial i}\frac{1}{v}(\tau h - \beta u)}{\frac{h}{v} - \beta}. \tag{9.14b}$$

The impact of changes in the rate of interest on the short-run goods market equilibrium values is exerted through two distributional channels. First, we have the effect of an interest rate variation on the distribution of income between firms and rentiers, which will affect households' consumption and firms' investment. This channel is captured in the first term in the numerators of equations (9.12b) to (9.14b). Second, we have the potential effect of changes in the interest rate on the mark-up in firms' pricing and hence on the profit share, which will then affect the goods market equilibrium rates of capacity utilization, capital accumulation and profit. These effects are captured by the second term in the numerators of equations (9.12b) to (9.14b), and from the discussion above we know that these effects may be wage- or profit-led. Let us now first discuss the effects of a change in the rate of interest via the redistribution of income between firms and rentiers, and assume for this purpose the mark-up and the profit share to be interest-inelastic, before we then add the effects of an interest-elastic mark-up.

In the case of a rigid mark-up, the reaction of the short-run goods market equilibrium values to changes in the interest rate is mainly determined by the rentiers' propensity to save and by the interest payments' elasticity of investment. With a high propensity to save, and thus a low propensity to consume, out of rentiers' income and a strong effect of a drain of internal means of finance on investment, redistribution associated with a higher interest rate is likely to impose a contractive effect on the goods market equilibrium rates of capacity utilization, capital accumulation and profit. This is the 'normal case', usually expected in post-Keynesian models.

With a low propensity to save out of rentiers' income, and thus a high propensity to consume out of this type of income, and weak effects of internal funds on investment decisions, we may obtain expansive effects of a higher interest rate on the equilibrium rates of capacity utilization and profit. For a positive effect on equilibrium capital accumulation a high elasticity of investment with respect to capacity utilization is required as well. Following Lavoie (1995a), this constellation is called the 'puzzling case'.

Finally, an 'intermediate case', may emerge, in which a rise in the interest rate causes the equilibrium rates of capacity utilization and profit to rise, but the equilibrium rate of capital accumulation to fall. The conditions for this case are a low propensity to save out of rentiers' income and weak effects of internal funds on investment decisions, but also a low elasticity of investment with respect to capacity utilization.

The conditions for these three cases, which may emerge with a rigid mark-up, and hence $\partial h/\partial i = 0$, are derived from equations (9.12b) to (9.14b):

Table 9.4 Effects of changes in the interest rate on the short-run equilibrium rates of capacity utilization, capital accumulation and profit with an interest-inelastic profit share

	$\frac{\partial u^*}{\partial i}$	$\frac{\partial g^*}{\partial i}$	$\frac{\partial r^*}{\partial i}$
Normal case	–	–	–
$\frac{\beta v}{h}(1 - s_R) - \theta < (1 - s_R) - \theta < 0$			
Intermediate case	+	–	+
$\frac{\beta v}{h}(1 - s_R) - \theta < 0 < (1 - s_R) - \theta$			
Puzzling case	+	+	+
$0 < \frac{\beta v}{h}(1 - s_R) - \theta < (1 - s_R) - \theta$			

$$\frac{\partial u^*}{\partial i} > 0, \quad \text{if:} \quad (1 - s_R) - \theta > 0, \tag{9.12b'}$$

$$\frac{\partial g^*}{\partial i} > 0, \quad \text{if:} \quad \frac{\beta v}{h}(1 - s_R) - \theta > 0, \tag{9.13b'}$$

$$\frac{\partial r^*}{\partial i} > 0, \quad \text{if:} \quad (1 - s_R) - \theta > 0. \tag{9.14b'}$$

From the goods market stability condition (9.11) we know that $h/v > \beta$ and hence $\beta v/h < 1$. From this it follows that $(\beta v/h)(1 - s_R) < (1 - s_R)$. Therefore, we obtain the three cases as shown in Table 9.4.

It should be noted that with an interest-inelastic mark-up and profit share the debt–capital ratio has no impact on the sign of the effects of a change in the interest rate on the goods market equilibrium rates of capacity utilization, capital accumulation and profit. However, it affects the size of the effect, as can be seen from equations (9.12b) to (9.14b): the lower the debt–capital ratio, the smaller will be the effects of interest rate variations. With a zero debt–capital ratio and a rigid mark-up, a change in the interest rate will not affect the short-run equilibrium position at all, as long as the interest rate remains below the profit rate and does not choke investment in capital stock.

When the mark-up and hence profit share are interest-elastic, the debt–capital ratio may affect the direction of change of the equilibrium posi-

Table 9.5 Responses of the profit share, the rate of capacity utilization, the rate of accumulation and the rate of profit to a variation in the interest rate: stable short-run equilibria

	$\frac{\partial u^*}{\partial i}$	$\frac{\partial g^*}{\partial i}$	$\frac{\partial r^*}{\partial i}$
$\frac{\partial h}{\partial i} = 0$	$\frac{\partial u^*}{\partial i} > 0$, if $1 - s_R - \theta > 0$	$\frac{\partial g^*}{\partial i} > 0$, if $\beta(1 - s_R) - \theta\frac{h}{v} > 0$	$\frac{\partial r^*}{\partial i} > 0$, if $1 - s_R - \theta > 0$
$\frac{\partial h}{\partial i} > 0$	$\frac{\partial u^*}{\partial i} > 0$, if $\lambda(1 - s_R - \theta) + \frac{\partial h}{\partial i}\left(\tau - \frac{u}{v}\right) > 0$	$\frac{\partial g^*}{\partial i} > 0$, if $\lambda\left[\beta(1 - s_R) - \theta\frac{h}{v}\right] + \frac{\partial h}{\partial i}\frac{1}{v}(\tau h - \beta u) > 0$	$\frac{\partial r^*}{\partial i} > 0$, if $\frac{h}{v}\lambda(1 - s_R - \theta) + \frac{\partial h}{\partial i}\frac{1}{v}(\tau h - \beta u) > 0$

tion caused by an interest rate variation, as can be seen in Table 9.5. In general, the lower the debt–capital ratio is, the lower are the direct effects interest rate variations have on investment and on rentiers' consumption and the more important are the effects exerted by the redistribution of income between profits and wages on consumption and investment. Without going too much into details, we can summarize the following effects.

If the normal case prevails for the direct effect of an increase in the interest rate via redistribution between firms and rentiers, an interest rate-elastic profit share will reinforce the contractive effects when demand and accumulation/growth are wage-led. And it will dampen or even reverse the contractive effect when demand and accumulation/growth are profit-led. If the puzzling case prevails for the direct effect of an increase in the interest rate via redistribution between firms and rentiers, an interest rate-elastic profit share will reinforce the expansive effects when demand and accumulation/growth are profit-led. And it will dampen or even reverse the expansive effect when demand and accumulation/growth are wage-led.

Let us finally take a look at the effect of a change in the exogenous debt–capital ratio on the short-run equilibrium rates of capacity utilization, capital accumulation and profit:

$$\frac{\partial u^*}{\partial \lambda} = \frac{i(1 - s_R - \theta)}{\frac{h}{v} - \beta}, \tag{9.12c}$$

$$\frac{\partial g^*}{\partial \lambda} = \frac{i\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]}{\frac{h}{v} - \beta}, \tag{9.13c}$$

$$\frac{\partial r^*}{\partial \lambda} = \frac{\frac{h}{v}i(1 - s_R - \theta)}{\frac{h}{v} - \beta}. \tag{9.14c}$$

An increase in the debt–capital ratio has expansive effects on the equilibrium rates of capacity utilization and profit if the propensity to save out of rentiers' income is low and the effects of internal funds on investment decisions are weak. For an expansive effect on equilibrium capital accumulation a high elasticity of investment with respect to capacity utilization is required as well:

$$\frac{\partial u^*}{\partial \lambda} > 0, \quad \text{if:} \quad (1 - s_R) - \theta > 0, \tag{9.12c'}$$

$$\frac{\partial g^*}{\partial \lambda} > 0, \quad \text{if:} \quad \frac{\beta v}{h}(1 - s_R) - \theta > 0, \tag{9.13c'}$$

$$\frac{\partial r^*}{\partial \lambda} > 0, \quad \text{if:} \quad (1 - s_R) - \theta > 0. \tag{9.14c'}$$

If these conditions are met, which are also the puzzling case conditions for the effects of a change in the interest rate with an interest-inelastic profit share, aggregate demand and capital accumulation/growth are 'debt-led'. If the opposite constellation prevails, and the propensity to save out of rentiers' income is high, the effects of internal funds on investment decisions are strong, and the elasticity of investment with respect to capacity utilization is weak, a higher debt–capital ratio will have contractive effects on the short-run equilibrium rates of capacity utilization, capital accumulation and profit. Under these conditions, which are also the normal case conditions for the effects of a change in the interest rate with an interest-inelastic profit share, aggregate demand and capital accumulation/growth are 'debt-burdened'. Again, we may also obtain an 'intermediate' constellation, in which the equilibrium rates of capacity utilization and profit are debt-led, whereas the equilibrium rate of capital accumulation is debt-burdened. This constellation will prevail if the propensity to save out of rentiers' income is low, the effects of internal

Table 9.6 Effects of changes in the exogenous debt–capital ratio on the short-run equilibrium rates of capacity utilization, capital accumulation and profit

	$\frac{\partial u^*}{\partial \lambda}$	$\frac{\partial g^*}{\partial \lambda}$	$\frac{\partial r^*}{\partial \lambda}$
Debt-burdened rates of capacity utilization, capital accumulation/growth and profit	−	−	−
$\frac{\beta v}{h}(1 - s_R) - \theta < (1 - s_R) - \theta < 0$			
Debt-led rates of capacity utilization and profit, and debt-burdened rate of capital accumulation/growth	+	−	+
$\frac{\beta v}{h}(1 - s_R) - \theta < 0 < (1 - s_R) - \theta$			
Debt-led rates of capacity utilization, capital accumulation/growth and profit	+	+	+
$0 < \frac{\beta v}{h}(1 - s_R) - \theta < (1 - s_R) - \theta$			

funds on investment decisions are weak, but the elasticity of investment with respect to capacity utilization is weak, too. Table 9.6 summarizes the potential constellations.

9.2.3 Long-Run Equilibrium

In the long run of our model, the debt–capital ratio has to be determined endogenously and its stability has to be examined. Furthermore, the long-run equilibrium rate of capital accumulation consistent with a constant debt–capital ratio has to be derived. Finally, the effects of changes in the interest rate and in animal spirits on the long-run equilibrium will be discussed.

We start with equation (9.5), and for simplicity we assume away inflation, which means that the mark-up may change but not the price level. This implies – somewhat unrealistically – that nominal wages fall when mark-ups rise. If prices were to rise in the face of rising mark-ups we might have an effect on the debt–capital ratio, depending on what is assumed with respect to the stock of debt and the valuation of the capital stock. Since we do not want to deal with these complications here, we assume constant prices.[11] For the growth rates of the variables it therefore follows from equation (9.5):

$$\hat{\lambda} = \hat{B} - \hat{K} = \hat{B} - g. \tag{9.15}$$

Given our model assumptions made above, the additional credit (dB) granted in each period is equal to rentiers' saving in this period:

$$dB = S_R = s_R iB. \tag{9.16}$$

For the growth rate of debt it follows:

$$\hat{B} = \frac{dB}{B} = s_R i. \tag{9.17}$$

In long-run equilibrium, the endogenously determined debt–capital ratio has to be constant, which means $\hat{\lambda} = 0$. Applying this condition to equation (9.15) and making use of equations (9.13) and (9.17), we get for the long-run equilibrium value of the debt–capital ratio:

$$\lambda^{**} = \frac{s_R i\left(\frac{h}{v} - \beta\right) - \frac{h}{v}(\alpha + \tau h)}{i\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]}. \tag{9.18}$$

This equilibrium will be stable if a deviation from the equilibrium value in λ^{**} will cause the debt–capital ratio to rise if it is below λ^{**}, and to fall if it is above λ^{**}, as is shown in Figure 9.1.

Analytically, the stability condition can be derived starting from equation (9.15) for the growth rate of the debt–capital ratio, plugging in equation (9.13) for the short-run equilibrium rate of capital accumulation and equation (9.17) for the growth rate of debt, and then calculating the partial derivative with respect to λ:

$$\frac{\partial\hat{\lambda}}{\partial\lambda} = \frac{-i\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]}{\frac{h}{v} - \beta}. \tag{9.15a}$$

From this it follows for the stability of the debt–capital ratio, taking into account that the stability of the short-run goods market equilibrium requires that $(h/v) - \beta > 0$:

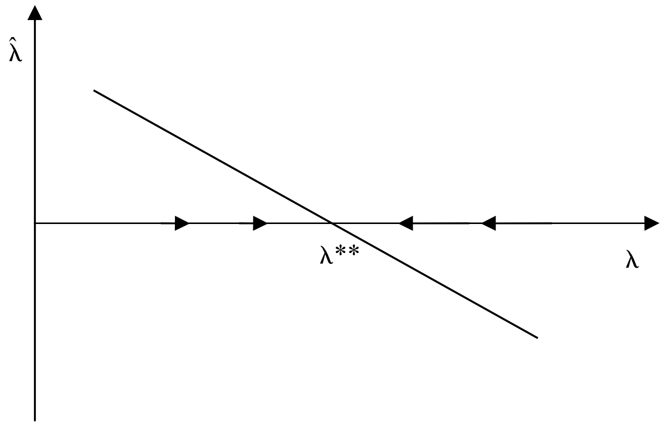


Figure 9.1 Stability of the long-run equilibrium debt–capital ratio

$$\frac{\partial \hat{\lambda}}{\partial \lambda} < 0, \quad \text{if:} \quad \beta(1 - s_R) - \theta\frac{h}{v} > 0. \tag{9.15a'}$$

Therefore, the long-run equilibrium tends to be stable if the propensity to save out of rentiers' income is low and investment decisions are very elastic with respect to changes in capacity utilization but very inelastic with respect to changes in internal means of finance. This is the parameter constellation which also favours the puzzling case positive effects of interest rate increases on capacity utilization, capital accumulation and the profit rate in the short-run equilibrium, as well as the debt-led effects of an increase in the debt–capital ratio on the short-run equilibrium rates of capacity utilization, capital accumulation/growth and profit.

If the rentiers' saving propensity is rather high and investment decisions are very inelastic with respect to demand and thus capacity utilization, but very elastic with respect to debt services and thus internal means of finance, the long-run equilibrium debt–capital ratio will become unstable:

$$\frac{\partial \hat{\lambda}}{\partial \lambda} > 0, \quad \text{if:} \quad \beta(1 - s_R) - \theta\frac{h}{v} < 0. \tag{9.15a''}$$

Deviations from the equilibrium will be cumulative and will make the debt–capital ratios converge to either zero or infinity in the long run. The conditions for long-run instability are the same as those for short-run normal case or intermediate case negative effects of interest rate hikes on equilibrium capital accumulation, as well as for debt-burdened effects of an increase in the debt–capital ratio on capital accumulation/growth.[12]

For the long-run equilibrium rate of capital accumulation which is associated with a constant debt–capital ratio ($\hat{\lambda} = 0$), we obtain from equations (9.15) and (9.17):

$$g^{**} = s_R i. \tag{9.19}$$

This long-run equilibrium rate of capital accumulation can be termed a 'warranted rate' (g^{**}), because it is the rate of accumulation which is required for the constancy of the debt–capital ratio. For this purpose, the capital stock has to grow at the same rate as the stock of debt. However, it is by no means guaranteed that the short-run goods market equilibrium rate of capital accumulation from equation (9.13) will adjust to the warranted rate in equation (9.19):

1. In the long-run stable case, in which $\beta(1 - s_R) - \theta h/v > 0$, a deviation of g^* in equation (9.13) from g^{**} in equation (9.19) will be self-correcting: If $g^* > g^{**}$, λ will fall according to equation (9.15) and this will feed back negatively on g^* in equation (9.13), adjusting g^* to g^{**}. If $g^* < g^{**}$, λ will rise according to equation (9.15) and this will feed back positively on g^* in equation (9.13), adjusting g^* to g^{**}.
2. In the long-run unstable case, in which $\beta(1 - s_R) - \theta h/v < 0$, a deviation of g^* in equation (9.13) from g^{**} in equation (9.19) will cumulatively accelerate: If $g^* > g^{**}$, λ will fall according to equation (9.15) and this will feed back positively on g^* in equation (9.13), making g^* deviate even further from g^{**}. If $g^* < g^{**}$, λ will rise according to equation (9.15) and this will feed back negatively on g^* in equation (9.13), making g^* deviate even further from g^{**}.

Our warranted rate of accumulation is thus reminiscent of Harrod's (1939) warranted rate of growth. However, in our case it is related neither to the goods market equilibrium nor to desired capacity utilization, but to a constant debt–capital ratio of the firm sector. Furthermore, in the unstable case of the model the economy will be characterized by a macroeconomic 'paradox of debt' (Steindl 1952, pp. 113–122): In the disequilibrium process it will be observed that falling (rising) rates of capital accumulation as a reaction to rising (falling) debt–capital ratios at the firm level will cause debt–capital ratios to rise (fall) even further at the macroeconomic level.[13]

9.2.4 The Effect of a Higher Rate of Interest on the Long-Run Equilibrium

Analysing the long-run effect of a higher interest rate, one should also take into account that the mark-up and hence the profit share may be interest-elastic and hence the gross profit share (including retained earnings and interest payments) may increase. Regarding the stability analysis from above, this means that, *ceteris paribus*, a long-run increase in the gross profit share may turn a stable financial structure unstable, as can be seen in conditions (9.15a') and (9.15a''). However, in what follows we will ignore the possibility of an interest-elastic mark-up and profit share in order to keep the analysis as simple as possible.[14]

From equation (9.18) we obtain the following effects of a change in the interest rate on the long-run equilibrium debt–capital ratio when the profit share is interest-inelastic:

$$\frac{\partial \lambda^{**}}{\partial i} = \frac{\frac{h}{v}(\alpha + \tau h)}{i^2\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]}. \tag{9.18a}$$

For the stable long-run equilibrium, in which $\beta(1 - s_R) - \theta h/v > 0$ has to hold, the equilibrium debt–capital ratio will therefore rise:

$$\frac{\partial \lambda^{**}}{\partial i} = \frac{\frac{h}{v}(\alpha + \tau h)}{i^2\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]} > 0. \tag{9.18a'}$$

In the long-run unstable case, we have $\beta(1 - s_R) - \theta h/v < 0$ and, therefore, a higher interest rate will cause a lower unstable equilibrium debt–capital ratio:

$$\frac{\partial \lambda^{**}}{\partial i} = \frac{\frac{h}{v}(\alpha + \tau h)}{i^2\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]} < 0. \tag{9.18a''}$$

From equation (9.19) the effect of a higher rate of interest on the long-run equilibrium rate of capital accumulation, given the propensity to save out of rentiers' income, is always positive, for both the stable and the unstable long-run equilibrium:

$$\frac{\partial g^{**}}{\partial i} = s_R > 0. \tag{9.19a}$$

A higher rate of interest means a higher rate of growth of the stock of debt issued by firms and held by rentiers. Therefore, the capital stock has to grow as well at a higher rate in order to keep the debt–capital ratio constant: the warranted rate of growth of the capital stock increases.

However, as we have shown above, it is in no way guaranteed that the short-run goods market equilibrium rate of capital accumulation will adjust to a change in the warranted rate. Only if short-run equilibrium capital accumulation is debt-led and the economy is in the short-run puzzling case will the warranted rate of accumulation/growth be stable. In this case, the short-run equilibrium rate of capital accumulation will rise towards the higher warranted rate of accumulation/growth – at a higher long-run stable equilibrium debt–capital ratio, as is summarized in Table 9.7.

If the short-run equilibrium capital accumulation is debt-burdened and the economy is in the short-run normal or intermediate case, the warranted rate of accumulation/growth will be unstable. If we assume that initially the short-run equilibrium rate of capital accumulation and the warranted rate are equal by a fluke, a rise in the warranted rate caused by an increase in the rate of interest will now make the short-run equilibrium rate of capital accumulation fall and cumulatively diverge from the higher warranted rate of accumulation/growth. In this case, we will observe the macroeconomic paradox of debt, that is falling rates of capital accumulation but rising debt–capital ratios. The latter will cumulatively diverge from a decreased unstable long-run equilibrium debt–capital ratio triggered by the increase in the interest rate. The results for the unstable long-run equilibrium are also summarized in Table 9.7.

9.2.5 Accumulation and the Debt–Capital Ratio: The Effects of an Increase in Animal Spirits[15]

Let us now come back to the question we have already touched on in the outline of the basic model structure above, when we assumed the rate of interest to be exogenous with respect to capital accumulation and growth. The focus will be on the structuralists' critique of this assumption and their claim that the rate of interest should be treated as an endogenous variable as well. Falling liquidity and rising debt ratios in the course of the expansion of the economy should make creditors demand higher mark-ups on the central banks' base rate because of higher liquidity and risk premiums, or even induce the central bank to raise the base rate, so the argument goes. In order to check the macroeconomic consistency of the argument in the context of our model, we will assume that animal spirits

Table 9.7 *Effects of interest rate variations with an interest-inelastic profit share on capital accumulation and the debt–capital ratio: stable and unstable long-run equilibria*

		$\beta(1 - s_R) - \theta\frac{h}{v}$	
		+	−
1. Interest rate and short-run equilibrium accumulation rate	$\frac{\partial g^*}{\partial i}$, equation (9.13b)	+ (puzzling case)	− (normal or intermediate case)
2. Debt-capital ratio and short-run equilibrium accumulation rate	$\frac{\partial g^*}{\partial \lambda}$, equation (9.13c)	+ (debt-led accumulation)	− (debt-burdened accumulation)
3. Interest rate and long-run equilibrium debt–capital ratio	$\frac{\partial \lambda^{**}}{\partial i}$, equation (9.18a)	+	−
4. Interest rate and long-run equilibrium accumulation rate (warranted rate)	$\frac{\partial g^{**}}{\partial i}$, equation (9.19a)	+	+
5. Stability of long-run equilibrium debt–capital ratio and of the warranted rate	$\frac{\partial \hat{\lambda}}{\partial \lambda}$, equation (9.15a)	− (stable)	+ (unstable)

(α) and thus the inducement to accumulate in equation (9.9) are shifted upwards. This rise will be accompanied by an increase in the demand for investment finance and hence for credit, and we are particularly interested in the effect on the long-run equilibrium debt–capital ratio. If the equilibrium value of this ratio were to rise, the structuralists would have a valid point to make.

In the short run, with a given debt–capital ratio and considering only stable goods market equilibria, the increase in animal spirits will positively affect the goods market equilibrium rate of capital accumulation in equation (9.13):[16]

$$\frac{\partial g^*}{\partial \alpha} = \frac{\frac{h}{v}}{\frac{h}{v} - \beta} > 0. \tag{9.13d}$$

Considering the effects on the long-run equilibrium debt–capital ratio we obtain from equation (9.18):

$$\frac{\partial \lambda^{**}}{\partial \alpha} = \frac{-\frac{h}{v}}{i\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]}. \tag{9.18b}$$

Therefore, for the discussion of the effects of higher animal spirits on the debt–capital ratio we have to distinguish between the long-run stable and the unstable case. For the long-run stable debt–capital ratio we have $\beta(1 - s_R) - \theta h/v > 0$ and hence:

$$\frac{\partial \lambda^{**}}{\partial \alpha} = \frac{-\frac{h}{v}}{i\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]} < 0. \tag{9.18b'}$$

For the long-run unstable case we have $\beta(1 - s_R) - \theta h/v < 0$ and hence:

$$\frac{\partial \lambda^{**}}{\partial \alpha} = \frac{-\frac{h}{v}}{i\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]} > 0. \tag{9.18b''}$$

Finally, we obtain for the overall effect of an increase in animal spirits on the long-run equilibrium capital accumulation, the warranted rate of accumulation, from equation (9.19):

$$\frac{\partial g^{**}}{\partial \alpha} = 0. \tag{9.19b}$$

The warranted rate of growth therefore remains unaffected by a change in animal spirits.

As condition (9.18b') shows, in the long-run stable regime an increase in animal spirits and in the short-run goods market equilibrium rate of capital accumulation will be associated with a decrease in the long-run equilibrium debt–capital ratio. Firms' indebtedness will not be increasing but decreasing in this case. We will see, at least temporarily in the process towards the new long-run equilibrium, a macroeconomic paradox of debt, which means rising rates of capital accumulation and falling debt–capital ratios.[17] Therefore, there is no reason to assume that the loan rate of interest will increase in this case. However, the fall in the debt–capital ratio will finally feed back negatively on the goods market equilibrium rate of accumulation/growth, which therefore will adjust to the unchanged warranted rate of accumulation/growth at the end.

For the long-run unstable case, condition (9.18b'') shows that an increase in animal spirits and in the short-run goods market equilibrium rate of capital accumulation will be associated with a rising long-run equilibrium debt–capital ratio. Therefore, this seems to be a case for a rising loan rate of interest owing to increased firms' indebtedness. However, the instability of the long-run debt–capital ratio in this case has to be taken into account. Let us assume that the economy is initially in a long-run equilibrium by a fluke. An increase in the equilibrium debt–capital ratio in the face of increasing animal spirits means that the actual debt–capital ratio will fall short of the new equilibrium. This will cause further deviations of the actual from the equilibrium debt–capital ratio and thus continuously falling debt–capital ratios. Simultaneously, the increase in animal spirits will make the goods market equilibrium rate of capital accumulation exceed the warranted rate of accumulation. The rate of accumulation will therefore cumulatively deviate from the warranted rate. The disequilibrium process will thus be characterized by the macroeconomic paradox of debt again: rising rates of capital accumulation will be accompanied by falling debt–capital ratios. And, again, rising capital accumulation will not be associated with rising firms' indebtedness and hence there is no reason to assume that loan rates of interest will necessarily have to rise if we take a macroeconomic perspective on the matter.

From the perspective of Kalecki's (1937) 'principle of increasing risk', which we discussed in Chapter 5 of this book, for the individual firm increasing demand for credit may be associated with increasing indebtedness and hence increasing lender's and borrower's risk, which may cause an increase in the loan rate of interest from a microeconomic perspective. However, from a macroeconomic perspective increasing investment expenditures of firms financed by way of credit also mean increasing realized profits for the firm sector as a whole. Therefore, an increasing debt–capital ratio for the firm sector as a whole is by no means necessary. On the contrary, if the paradox of debt prevails, Kalecki's 'principle of increasing risk' will become irrelevant at the macroeconomic level. The microeconomic context and limitations of the 'principle of increasing risk' were already acknowledged by Kalecki (1937, p. 445, emphasis in the original) himself, when he made the following clarification: 'We examined the planning of the entrepreneur in a given situation which in general is *not* the position of long run equilibrium.' And going beyond the planning horizon of the entrepreneur in the single period, and applying a period-by-period analysis, in which investment spending feeds back on profits and saving out of profits (retained earnings), he argues that '[t]his accumulation of savings causes a parallel shift of the curve of marginal risk to the right. For the entrepreneur can invest the new amount without reducing his safety or increasing illiquidity' (Kalecki 1937, p. 446). Therefore, in a macroeconomic context a rising credit supply curve, caused by rising debt–capital ratios of firms as debtors, is by no means warranted.

9.3 EMPIRICAL RESULTS ON INTEREST RATES, DISTRIBUTION, AGGREGATE DEMAND AND CAPITAL ACCUMULATION

An early attempt at estimating the behavioural equations of a model similar to the one presented in Section 9.2, in order to determine the effects of a change in the long-term 'real' interest rate, that is in the long-term monetary rate corrected for the rate of inflation, on distribution, aggregate demand and capital accumulation/growth, was presented by Hein and Ochsen (2003). They estimated the respective equations for four advanced OECD countries (France, Germany, UK, US) using annual data from 1960 to 1995. For the entire period, they find negative impacts of rising interest rates on the rates of GDP growth, indicating the development of aggregate demand,[18] capital accumulation and profits in France and in Germany, but not in the UK or in the US, where they observe no significant effects. Looking at sub-periods, that is the period from the early 1960s until the early 1980s and the period from the early 1980s until the mid-1990s, they obtain mixed results. In France, an increase in the interest rate is associated with a contraction of GDP growth, capital accumulation and the profit rate until the early 1980s, whereas no significant effects can be found afterwards. In Germany, in the first period, rising interest rates have contractive effects on the three endogenous variables, but in the second period they turn expansive. In the US, GDP growth and the profit rate increase as a response to increasing interest rates in the first sub-period, whereas the rate of accumulation does not, according to the estimations. In the second period, expansive effects on all three variables are observed. In the UK the effects in sub-periods remain insignificant. Hein and Ochsen (2003) conclude that their estimations do not offer a good explanation for long-run lower economic growth in the aftermath of the early 1980s recession. Several potential reasons for this can be identified. First, the failure to estimate robust effects of variations in the interest rate on distribution between capital and labour is a crucial shortcoming. Second, the degree of indebtedness of the firms which affects interest payments is not explicitly taken into account. Third, related to this, rentiers' income is only roughly calculated, by assuming rentiers' income to be equal to the rate of interest multiplied by the nominal capital stock. Fourth, some sub-period OLS regressions suffer from too few observations.

Hein and Schoder (2011) therefore applied a more refined approach, adjusting the theoretical model in several respects in order to make it 'more realistic' and thus applicable to the available data. For this purpose, not only debt finance but also external equity finance together with the respective rates of return, hence the monetary interest rate corrected for the rate of inflation and the dividend rate, are included in the investment and saving functions of the model. The rate of capacity utilization only enters as a deviation from its long-run average into the investment function, and the saving function allows for a positive propensity to save from wages, too. Finally, the distribution function contains not only the rate of interest as in our model above, but also the stock of debt. These modified equations were then estimated for Germany and the US for the period from 1960 to 2007, and the effects of a change in the real rate of interest on the equilibrium were calculated for the whole period and for sub-periods, in particular for the periods from 1960 to 1982 and from 1983 to 2007. For these estimations, Hein and Schoder (2011) considered the respective debt–capital ratios to be exogenous, so that in the terminology of our theoretical model in Section 9.2 they are concerned with short-run equilibria and with effects of changes in the real rate of interest on these equilibria.

In what follows, we will briefly present the Hein and Schoder (2011) results and compare and relate them to other empirical results presented in the literature. Before we do so, however, a note of caution is required. Since Hein and Schoder (2011) have significantly modified the post-Kaleckian model presented in Section 9.2 in order to run their estimations, it is potentially misleading and questionable from a methodological perspective to make use of their estimated coefficients in the accumulation, saving and distribution functions in order to check the empirical plausibility of the textbook post-Kaleckian model of Section 9.2, as for example Nishi (2012) and Sasaki and Fujita (2012) have done.

9.3.1 Interest Rate and Functional Income Distribution

Hein and Schoder (2011) included net interest payments of the non-financial business sector in relation to the nominal capital stock of this sector in their estimations of a profit share function for the total economy for Germany and the US (1960–2007).[19] The following control variables were applied: the unemployment rate indicating the relative powers of workers and firms in the distribution struggle, consumer price inflation indicating exogenous price shocks, and the growth rate of real net domestic income as an indicator for demand affecting the room for manoeuvre of firms for price setting. Hein and Schoder find a highly significant and strong effect of net interest costs on the profit share, thus confirming the notion of an interest payments-elastic mark-up affecting distribution between capital and labour. In the US, a one percentage point increase in the net interest payments–net nominal capital stock ratio raises the profit share by 2.44 percentage points. In Germany the corresponding effect is 2.16 percentage points. Unemployment has a positive effect on the profit share in the US, but no effect in Germany. Inflation shocks affect the profit share negatively in both countries. Hence, on average, trade unions were strong enough to compensate for inflation induced losses in the real wage position of workers. Aggregate demand had a short-run positive but long-run negative impact on the profit share in both countries.

There have been presented several econometric estimations supporting the existence of a cost-push channel of monetary policies and the interest rate ('Gibson's paradox' or the 'Wright Patman effect'), as recently reviewed by Lima and Setterfield (2010).[20] But the focus of this literature has been on the effects of changes in the interest rate on inflation and output without paying attention to the effects on functional income distribution. Hein and Schoder's (2011) paper is thus the first econometric study lending support to previous empirical observations regarding the inverse relationship between the interest rate or interest payments and the wage share or the labour income share. Other earlier econometric studies by Argitis and Pitelis (2001), Marterbauer and Walterskirchen (2002) and Hein and Ochsen (2003), for example, have not found clear-cut results on the effects of interest rates or interest payments on functional income distribution. However, they have only introduced real or nominal interest rates into their regressions and have not controlled for the indebtedness of the business or corporate sector.

Among those non-econometric empirical studies focusing on the distributional effects of changes in the interest rate, for example, Moore (1989b), looking at the US (1949–87), finds that from the late 1940s until the early 1970s a higher share of interest income in national income was associated with a rise in the wage share, whereas in the period of high interest rates from the early 1980s until 1987 the rise in the share of interest income was accompanied by a fall in the wage share. Therefore, higher interest rates in this period meant higher mark-ups and thus a lower wage share, according to Moore (1989b). Niggle's (1989) analysis for the US (early 1960s to mid-1980s) comes to similar conclusions. More recently, examining the experience of inflation targeting policies in several countries, Rochon and Rossi (2006a, 2006b) have argued that the wage share decreased more strongly in those countries which adopted inflation targeting regimes, supposing that these were associated with tighter monetary policies and higher interest rates. Studying the development of the profit rate of non-financial corporations in France and the US (1960–2001), Duménil and Lévy (2005) found that the rise in this profit rate since the early 1980s was mainly due to the rise in net real interest payments. Excluding these payments from profits, the so-corrected profit rate of the non-financial corporate sector remains constant in France and increases only slightly in the US. In a more general study of 29 OECD countries (1960–2000) focusing on the development of the share of rentiers' income in GDP, Epstein and Power (2003) confirm the results of Duménil and Lévy (2005). Epstein and Power show that the share of rentiers' income in GDP increased at the expense of the wage share in most countries during the 1980s until the early 1990s. In their study, rentiers' income is more broadly defined as the sum of profits of the financial sector plus interest income of the non-financial sector and households. Since nominal interest payments also compensate for capital losses due to inflation, a point already made by Pollin (1986/87), Epstein and Jayadev (2005) extended the analysis for 15 OECD countries (1960–2000), correcting the share of rentiers' income in GDP for inflation. Applying this method, they mainly confirm the earlier results of Epstein and Power (2003). Dünhaupt (2012) has presented a variation on these results redefining rentiers' income as the net property income of private households, including thus net interest and net dividends received, and she has examined the development of the rentiers' share in net national income and its components for Germany (1980–2008) and the US (1970–2008). For the US she finds an increase in the rentiers' share in the early 1980s, which then remained roughly constant over the next 2.5 decades, and a corresponding decline in the wage share, whereas the share of retained earnings shows no marked trend. The decomposition of the rentiers' share reveals that the spike in the early 1980s was mainly driven by net interest income. Since the late 1980s then, net dividend income has increased its share tremendously. In Germany, the rentiers' share has increased continuously since the early 1990s, with a corresponding fall in the wage share, whereas the share of retained earnings shows marked fluctuations but no trend. The increase in the rentiers' share, however, has almost exclusively been driven by an increase in the share of dividend income, but not by interest income.

9.3.2 Interest Rate, Investment and Saving

Estimating an extended post-Kaleckian investment function for Germany and the US (1960–2007), Hein and Schoder (2011) obtain the following results. A one percentage point change in the rate of capacity utilization leads to a 0.14 percentage points change in the rate of capital accumulation in the same direction for the US and to a 0.15 percentage points change for Germany. The profit share also has a positive impact on accumulation in both countries. In the US, a one percentage point increase in the profit share raises the rate of accumulation by 0.14 percentage points, whereas in Germany accumulation increases by 0.33 percentage points. Finally, net interest payments in relation to the capital stock have a considerable impact on the rate of accumulation: in the US a one percentage point increase in this ratio will lower capital accumulation by 0.72 percentage points, and in Germany capital accumulation will decline by 1.03 percentage points.

These results regarding the effects of the profit share and of capacity utilization on capital accumulation are basically in line with findings in the macroeconometric literature on the investment function in post-Kaleckian models, which we outlined and discussed in Chapter 7 of this book. However, Hein and Schoder (2011) add to these results the significant and robust negative effects of interest payments on investment. This has previously mostly been found in microeconometric investment function estimations, for example by Fazzari and Mott (1986/87), Fazzari et al. (1988), Ndikumana (1999), Gander (2008) and Orhangazi (2008a).[21] However, there are also other studies based on macroeconomic data which have found similar effects. Argitis and Pitelis (2006) find a negative effect of the interest payments–industrial profits ratio on the growth rate of the capital stock of the non-financial corporate sector in the UK and the US (1974–2002). Van Treeck's (2008) estimation for the US (1965–2004) reveals significantly negative effects of both interest and dividend payments, each normalized by the capital stock, a significantly positive effect of GDP growth, but no effects of the profit share on the rate of capital accumulation. Onaran et al. (2011), distinguishing between rentiers' profits (interest and dividend payments) and non-rentiers' profits (retained earnings), find a positive effect of the non-rentiers' profit share and a negative impact of the rentiers' profit share in GDP, besides a positive effect of GDP, on real private investment for the US (1962–2007).

Finally, estimating the saving function for Germany and the US (1960–2007) in order to obtain the propensities to save from rentiers' income, composed of interest and dividend incomes, and from wages, Hein and Schoder (2011) report the following results. As expected, the propensity to save out of rentiers' income is considerably higher than out of wage income: in the US the propensity to save out of wages is 0.09 and the propensity to save out of rentiers' income amounts to 0.76, whereas the respective values for Germany are 0.13 and 0.6. Onaran et al. (2011), including financial and housing wealth effects on consumption in their estimations of a saving function for the US (1962–2007), find a lower differential between the propensities to save out of rentiers' income and out of wages. These results are difficult to compare, but still broadly consistent with those results on saving/consumption functions in post-Kaleckian models, which we discussed in Chapter 7 of this book. Generally, since retained profits are saved by definition, we would expect the propensity to save from rentiers' income to be lower than the propensity to save from total profits, as estimated in the studies summarized in Chapter 7. For different reasons, however, this is not generally the case. For example, Naastepad and Storm (2007) estimated propensities to save out of wage income and out of profits for the US and Germany (1960–2000), explaining saving as a proportion of GDP at factor costs. Their estimates for the propensity to save out of wages are close to those of Hein and Schoder (2011), but their propensities to save out of total profits are well below those reported by Hein and Schoder (2011). This may be due to the fact that Naastepad and Storm (2007) relate saving to GDP and not to national income, as Hein and Schoder (2011) do.[22]

9.3.3 Effects of Changes in the Rate of Interest on the Short-Run Equilibrium Rates of Capacity Utilization, Capital Accumulation and Profit

Having estimated the relevant coefficients in the distribution, saving and investment functions of the model, Hein and Schoder (2011) then calculated the overall regime which the two economies are facing when the long-term real interest rates change. For this purpose, they used the estimated coefficients for the effects of capacity utilization (β), the profit share (τ) and the net interest payments–net capital ratio (θ) on capital accumulation, the estimated propensities to save out of wages (s_W) and out of rentiers' income (s_R), and the estimated effect of a change in the net interest payments–net capital stock ratio of the non-financial business sector on the profit share (ι). Furthermore, average data for the relevant time periods taken from the statistics were applied for the net debt–net capital ratio of the non-financial business sector (λ), the profit share in domestic income (h), adjusted for the labour income of the self-employed, and the net domestic income–net capital stock ratio (u), which is interpreted as the rate of capacity utilization. Table 9.8 reports the results for the effects of an

Table 9.8 Effects of interest rate variations on the rates of capacity utilization, accumulation and profit in the US and Germany, 1960–2007

	US	Germany
$\frac{\partial u^*}{\partial i}$	$-0.47 - 1.49 = -1.96$	$-1.27 - 0.55 = -1.82$
$\frac{\partial g^*}{\partial i}$	$-0.17 - 0.15 = -0.32$	$-0.53 + 0.16 = -0.37$
$\frac{\partial r^*}{\partial i}$	$-0.10 - 0.03 = -0.13$	$-0.26 + 0.26 = 0.00$
where		
$\lambda^{(a)}$	0.15	0.33
h	0.22	0.21
u	0.83	0.53
ι	2.44	2.16
β	0.14	0.15
τ	0.14	0.33
θ	−0.72	−1.03
s_W	0.09	0.13
s_R	0.76	0.60

Notes:
λ, h, and u denote the debt–capital ratio, the profit share and the rate of capacity utilization, respectively, and are average values over the entire time period taken from the statistics.
ι, β, τ, θ, s_W, and s_R are the relevant estimated coefficients from the investment, saving and profit share function, respectively. The first term in rows 1, 2 and 3 denotes the 'primary effect' of a change in the rate of interest via redistribution between firms and rentiers in each country, and the second term represents 'secondary effect' via redistribution between capital and labour, i.e. between total profits including interest payments and wages. The sum of these effects gives the total effect on the respective equilibrium.
[(a)] Time series from 1965 to 2005 for Germany and from 1960 to 2006 for the US.

Source: Based on Hein and Schoder (2011, p. 712).

increase in the long-term real rate of interest on the short-run equilibrium rates of capacity utilization, capital accumulation and profit for the entire period under investigation. Hein and Schoder (2011) distinguish between a 'primary effect' via redistribution between firms and rentiers on capital accumulation and the saving rate, holding distribution between capital and labour and hence the profit share constant and thus assuming an interest-inelastic mark-up, and a 'secondary effect' via the effect of a change in the rate of interest on the profit share, thus allowing for an interest-elastic mark-up. Before going into detailed results, it is worth noticing that, applying their estimated coefficients and average values from the statistics, Hein and Schoder (2011) report that the short-run goods market equilibria both in the US and in Germany meet the criteria for stability. However, the long-run stability of the debt–capital ratio was not examined, because this ratio was treated as an exogenous variable in their model and in their estimations.

Hein and Schoder (2011) find that for the whole period the primary effect of a change in the rate of interest on the equilibrium rates of capacity utilization, capital accumulation and profit, via redistribution between firms and rentiers, is negative in both countries. This means that for both countries the normal case for the effect of a change in the interest rate on the short-run equilibrium rates of capacity utilization, capital accumulation and profit applies. For the US also, the secondary effect via redistribution between capital and labour is negative throughout the rates of capacity utilization, capital accumulation and profit. Aggregate demand and capital accumulation, as well as the rate of profit, are thus found to be wage-led. For Germany, however, the secondary effect is negative for the rate of capacity utilization, but positive for the rates of capital accumulation and profit. Aggregate demand is hence found to be wage-led, whereas capital accumulation and the rate of profit seem to be profit-led. The finding of a wage-led nature of aggregate demand in both countries is in accordance with most of the recent studies based on the post-Kaleckian model, which we reviewed in Chapter 7 of this book. The finding of a profit-led accumulation regime in Germany – and thus of an intermediate overall regime – would merit further investigation.

Adding the primary and secondary effect of a change in the rate of interest, Hein and Schoder (2011) find the total effect to be negative for the short-run equilibrium rates of capacity utilization, capital accumulation and profit for both countries – apart from the effect on the profit rate in Germany, which is close to zero. Subject to this small exception, in both the US and Germany the normal case with respect to the effects of changes in the long-term real rate of interest on the goods market equilibrium seems to prevail, and also does so when we include the substantial redistribution effect of changes in the interest rate on the profit and wage share. In the US, a one percentage point increase in the long-term real rate of interest decreases capacity utilization by 1.96 percentage points, capital accumulation by 0.33 percentage points and the rate of profit by 0.13 percentage points. In Germany, capacity utilization decreases by 1.83 percentage points and capital accumulation by 0.37 percentage points, whereas the rate of profit does not change in the face of an increase in the long-term real rate of interest. Looking at sub-periods, Hein and Schoder (2011) do not find substantial changes for the US, whereas in Germany the negative effects of a rise in the interest rate are somewhat weaker in the second period, 1983–2007, as compared to the first period, 1960–82.

These results are confirmed by the study by Onaran et al. (2011), which also obtains a negative effect of redistribution in favour of rentiers on aggregate demand for the US (1962–2007). And they also seem to be broadly in line with results by Argitis (2009) and Argitis and Michopoulou (2010), who present panel estimations using annual data for different sets of OECD countries (1981–2003), which show that the share of interest income of banks in GDP has a negative effect on aggregate demand growth whereas the wage share has a positive impact.

9.4 CONCLUSIONS

In this chapter we have introduced a monetary rate of interest, corporate debt and a rentiers' class receiving interest income into the basic post-Kaleckian distribution and growth model. Following the horizontalist view in post-Keynesian monetary economics we have treated the relevant rate of interest as an exogenous variable mainly determined by interest rate policies of the central bank. And we have argued that the volume of credit and the stock of money adjust endogenously to the requirements of finance and circulation. The rate of interest has thus been considered as a monetary phenomenon which has short- and long-run effects on the real economy. Changes in the rate of interest affect the core functions of the post-Kaleckian model: the distribution function, the saving function and the investment function. We have argued that variations in the rate of interest affect the distribution of national income between retained profits, interest income and also wages, provided that the mark-up and the profit share are interest-elastic. And, since the propensities to save from these different types of incomes differ, changes in distribution have an impact on the aggregate saving rate and hence on consumption demand. Furthermore, applying Kalecki's (1937) 'principle of increasing risk', changes in the rate of interest have an impact on retained profits and thus on the willingness and the ability of firms to invest in capital stock.

Taking the debt–capital ratio as given in the short run, the equilibrium effects of interest rate variations on capacity utilization, capital accumulation and the rate of profit are not unique, but depend on parameter values of the model. Depending on the values of these parameters, the effects of interest rate variations on the short-run equilibrium may be negative throughout (normal case), mixed (intermediate case) or even positive throughout (puzzling case).

A low rentiers' saving propensity, a low elasticity of investment with respect to debt services or internal funds and a high elasticity with respect to capacity utilization are generally conducive to a positive effect of higher interest rates on capacity utilization, capital accumulation and the profit rate, and hence to the puzzling case. These are also the conditions under which aggregate demand and capital accumulation and growth are debt-led.

The normal case becomes more likely, the higher the rentiers' saving propensity, the higher the elasticity of investment with respect to debt services or internal funds and the lower the investment responsiveness to capacity utilization are. These are also the conditions for debt-burdened capital accumulation and growth.

When the mark-up and hence the profit share are interest-elastic, the debt–capital ratio may affect the direction of change of the equilibrium position caused by an interest rate variation. If the puzzling case conditions prevail, an interest rate-elastic profit share will reinforce the expansive effects when demand and accumulation/growth are profit-led. And it will dampen or even reverse the expansive effect when demand and accumulation/growth are wage-led. If the normal case conditions prevail, an interest rate-elastic profit share will reinforce the contractive effects when demand and accumulation/growth are wage-led. And it will dampen or even reverse the contractive effects when demand and accumulation/growth are profit-led.

Reviewing the available empirical literature we have shown that there is by now some evidence of interest rate-elastic mark-ups and profit shares, of significantly different propensities to save from wages and from rentiers' income, and of dampening effects of distributed profits on firms' investment in capital stock for some advanced capitalist economies. We have reviewed a more recent study in detail, which finds that in Germany and the US the increase in the long-term real rate of interest, that is the long-term monetary rate of interest corrected for the rate of inflation, considerably raises the profit share and dampens aggregate demand as well as capital stock and GDP growth. In other words, these economies are dominated by the normal case and by debt-burdened conditions.

Within our simple model we have then examined the long-run dynamics of the debt–capital ratio of the firm sector. We have obtained that long-run stability of the debt–capital ratio and capital accumulation/growth is associated with the short-run puzzling case and with debt-led accumulation/growth conditions. The short-run normal case and debt-burdened capital accumulation conditions are associated with long-run instability of the debt–capital ratio and of capital accumulation. Disequilibrium processes will display the macroeconomic paradox of debt, which means falling (rising) rates of capital accumulation and rising (falling) debt–capital ratios.

Summing up, in our model we could thus demonstrate that monetary variables have real effects, both in the short and in the long run of the model, which depend on historically, socially and institutionally conditioned parameters in the model, and that realistic parameter constellations entail a significant instability potential for the financial structure in the long run of the model. Of course, these are results for an overly simplistic model, which would require further elaboration and discussion. Here, we only refer to a few of them.

First, in the model discussed here, the inflationary impact of distribution conflict has been excluded from the analysis. Distribution conflict and monetary policies setting the interest rate have been assumed to affect the mark-up in firms' pricing, and hence distribution between firms, rentiers' households and workers' households, but not the inflation rate. However, this analysis can be extended in order to cover the inflationary consequences of distribution conflict, on the one hand, and the effects of monetary policy interventions reacting upon deviation of actual inflation from the inflation target, on the other hand, as has been shown in Hein (2006c, 2006d, 2008, chaps 16–17) and in Hein and Stockhammer (2010, 2011b), for example.

Second, as Sasaki and Fujita (2012) have argued, the assumption of zero dividend payments and thus a retention ratio of profits net of interest payments of 100 per cent is overly restrictive. Relaxing this assumption, Sasaki and Fujita (2012) obtain more modest or less restrictive results with respect to the instability potential, for example, in their alternative model. However, Hein (2013a) has argued that their model contains some problematic hidden assumptions and features, and that a model with equity issued by firms and held by rentiers, and hence with dividend payments to rentiers, may suffer from similar instability problems to those of the simple model in this chapter. We will show this in Chapter 10 of this book, where we accept that introducing equity held by rentiers and dividend payments makes the model more realistic. And we will show that it is indeed required when recent phenomena like the dominance of finance ('financialization') and the increasing shareholder value orientation of management are to be discussed.

Third, in the model we have presented, we have neither discussed different types of financing behaviour and risk assessments by creditors and debtors nor the change of these assessments in the course of accumulation. Our focus was on systemic instabilities arising from micro–macro fallacies of composition, in particular on the macroeconomic paradox of debt. However, Meirelles and Lima (2006), Lima and Meirelles (2007), Charles (2008a, 2008b, 2008c), Nishi (2012) and Ryoo (2013), for example, have recently introduced Minsky's (1986) distinction between hedge financing, speculative financing and Ponzi financing into different variants of Kaleckian distribution and growth models. They have provided richer models with several more regimes and sources of instability.

NOTES

1. For an introduction to the post-Keynesian monetary theory, see for example Lavoie (1992, chap. 4, 2011b, 2014, chap. 4), and for a more extensive discussion of money, credit and interest in post-Keynesian distribution and growth models see Hein (2008, 2012a).
2. On Robinson's monetary theory see Robinson (1956, chap. 23), Lavoie (1999), Rochon (2001) and Vernengo and Rochon (2001). On Kaldor's monetary theory see, of course, Kaldor (1958, 1970a, 1982, 1985b), as well as Rochon (1999, pp. 99–117, 2000), Bertocco (2001) and Vernengo and Rochon (2001). On Kalecki's monetary views, see Kalecki (1954, chaps 6–7), Sawyer (1985, chap. 5, 2001a, 2001b), Arestis (1996a), Dymski (1996) and Lopez G. (2002). For an overview see Hein (2008, chap. II.9).
3. See also Harrod (1973, p. 44) and Kaldor (1982, p. 63), who have discussed the effects of changes in the interest rate on the mark-up and hence on functional income distribution.
4. See also Lavoie (1995a).
5. This section partly draws and builds on Hein (2007, 2008, chap. 13). For a similar introduction of a monetary interest rate and credit into a neo-Kaleckian distribution and growth model see Hein (2006b, 2008, chap. 13).
6. Wray (2006), however, does not consider himself a 'structuralist' any more. On the discussion between 'horizontalists' and 'structuralists' see the surveys by Pollin (1991), Palley (1994a, 1996c, 2008a, 2013c), Fontana (2003, 2004, 2009), Hein (2008, chap. 6.5, 2012b) and Lavoie (2011b), for example.
7. The distinction between short-term (or initial) finance for production purposes and long-term (or final) finance for investment purposes, not dealt with in the present chapter, can be found in the monetary circuit approach. See Graziani (1989, 1994), Lavoie (1992, chap. 4.1), Seccareccia (1996, 2003) and Hein (2008, chap. 10.2). In this chapter we are only dealing with long-term or final finance of investment and the capital stock.
8. See Hein (2008) for an overview of the development and implementation of this idea in neo-Ricardian, Marxian and post-Keynesian economics.
9. See, for example, Dutt (1990/91), Hein (2006c, 2006d, 2008, chaps 16–17) and Hein and Stockhammer (2010, 2011b) for post-Keynesian distribution and growth models with conflict inflation, including the cost-push effects of monetary policies and higher interest rates.
10. In these new Keynesian models credit rationing, external finance premiums and financial accelerators in economic downturns are derived. See Greenwald and Stiglitz (2003) for an overview and Stiglitz and Weiss (1981) on credit rationing, Bernanke and Blinder (1992) on external finance premiums, Bernanke and Gertler (1995) on the bank-lending and the credit channel of monetary transmission, and Gertler and Gilchrist (1993) and Bernanke et al. (1996) on the financial accelerator.
11. See Hein (2006c, 2006d, 2008, chaps 16–17) and Hein and Stockhammer (2010, 2011b) for similar models including conflicting claims inflation in which real debt effects of changes in the price level, respectively in the rate of inflation, are included.
12. Note that the conditions for long-run instability may be associated with short-run positive effects of an increase in the interest rate and/or the debt–capital ratio on the equilibrium rates of capacity utilization and profit and short-run 'debt-led' rates of capacity utilization and profit.
13. On the paradox of debt see also Dutt (1995), Lavoie (1995a) and Hein (2006b, 2007, 2008, chap. 13).
14. See Hein (2007, 2008, chap. 13) for model results when interest-elastic mark-ups and profit shares are included.
15. This section draws and builds on Hein (2012b), where the discussion is based on a monetary extension of the neo-Kaleckian model instead of the post-Kaleckian model, as in this chapter.
16. Of course, the effects of an increase in animal spirits on the short-run goods market

equilibrium rates of capacity utilization and profit in equations (9.12) and (9.14) are positive, too.

17. Similar results have been found by means of simulations in more complex stock–flow consistent models (see Lavoie and Godley 2001/02; Lavoie 2006b; Godley and Lavoie 2007, chap. 11).
18. Instead of capacity utilization used in the theoretical model, in the empirical research GDP growth was used to represent the development of demand, because no reliable and internationally comparable data for capacity utilization were available.
19. The profit share is the net operating surplus of the total economy adjusted for the labour income of the self-employed related to the net value added.
20. On 'Gibson's paradox' and related empirical evidence see also Hannsgen (2004, 2006a, 2006b).
21. For overviews see Schiantarelli (1996) and Hubbard (1998).
22. See Hein and Schoder (2011) for comparisons with other studies and potential explanations for deviations of results.

10. Extending Kaleckian models IV: finance-dominated capitalism[1]

10.1 INTRODUCTION

In this chapter we provide a macroeconomic perspective on 'finance-dominated capitalism' or 'financialization' – the terms are used interchangeably – based on extended versions of the Kaleckian distribution and growth models. Financialization is considered as a long-run trend which has dominated modern capitalism, to different degrees in different countries, starting roughly in the late 1970s or early 1980s in the US and the UK and later in other developed capitalist economies and also in emerging market economies. Epstein (2005a, p. 3) has presented a vague but widely accepted definition, arguing that 'financialization means the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies'. Detailed empirical case studies of the development of financialization have been presented by, for example, the contributions in Epstein (2005b), and by Krippner (2005), Orhangazi (2008a, 2008b) and Palley (2008b, 2013a, chap. 2) for the US, by van Treeck et al. (2007) and van Treeck (2009b) for Germany as compared to the US, and by Stockhammer (2008) for Europe.[2] Based on these case studies and on further empirical work related to the specific channels of transmission of the dominance of finance to the macroeconomy, Hein (2012a) has discussed the *Macroeconomics of Finance-dominated Capitalism* and has argued that, from a macroeconomic perspective, financialization has affected long-run economic developments through the following channels:

1. With regard to distribution, financialization has been conducive to a rising gross profit share, including retained profits, dividends and interest payments, and thus a falling labour income share, on the one hand, and to increasing inequality of wages and top management salaries, on the other hand. The major reasons for this have been falling bargaining power of trade unions, rising profit claims imposed in particular by increasingly powerful rentiers, and a change in the sectoral composition of the economy in favour of the financial corporate sector.

2. Regarding investment in capital stock, financialization has been characterized by increasing shareholder power vis-à-vis management and workers, an increasing rate of return on equity and bonds held by rentiers, and an alignment of management with shareholder interests through short-run performance-related pay schemes, such as bonuses, stock option programmes and so on. On the one hand, this has imposed short-termism on management and has caused decreasing managements' 'animal spirits' with respect to real investment in capital stock and long-run growth of the firm and increasing preference for financial investment generating high profits in the short run. On the other hand, it has drained internal means of finance for real investment purposes from the corporations, through increasing dividend payments and share buybacks in order to boost stock prices and thus shareholder value. These 'preference' and 'internal means of finance' channels have each had partially negative effects on firms' real investment in capital stock, and hence also on the long-run growth potential of the economy to the extent that productivity growth is capital embodied.
3. Regarding consumption, financialization has generated increasing potential for wealth-based and debt-financed consumption, thus creating the potential to compensate for the demand-depressing effects of financialization, which were imposed on the economy via redistribution and the impact on real investment. Stock market and housing price booms have each increased notional wealth against which households were willing to borrow. Changing financial norms (conspicuous consumption, 'keeping up with the Joneses'), new financial instruments (credit card debt, home equity lending), and deterioration of creditworthiness standards, triggered by securitization of debt and 'originate and distribute' strategies of banks, made increasing credit available to low income, low wealth households, in particular. This allowed for consumption to rise faster than the median income in several countries and thus to stabilize aggregate demand. But it also generated increasing debt–income ratios of private households and thus increasing financial fragility.
4. The deregulation and liberalization of international capital markets and capital accounts have created the potential to run and finance persistent current account deficits. Simultaneously it has created the problems of foreign indebtedness, speculative capital flows, exchange rate volatilities and related currency crises.

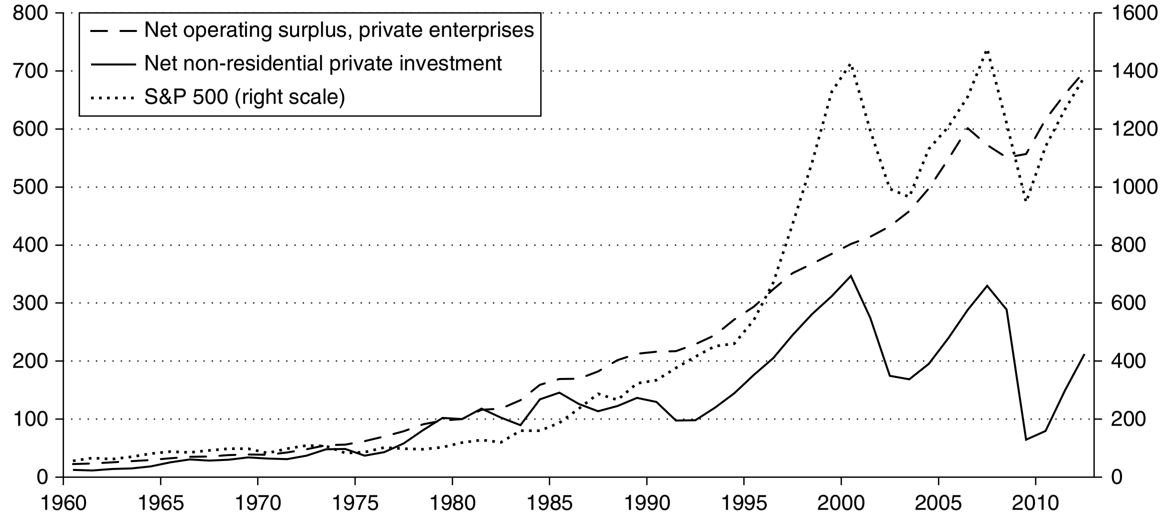
These characteristics of financialization led to the dominance of 'profits without investment' regimes in several countries during the pre-2007 crisis financialization period, that is a long-run tendency of rising levels of profits (not only profit shares) but relatively weak investment in capital stock (van Treeck et al. 2007; van Treeck 2009b; Hein 2012a, chap. 6; Hein and Mundt 2012, 2013; van Treeck and Sturn 2012, 2013). This is shown in Figure 10.1 for the US and in Figure 10.2 for Germany, as outstanding examples. In the US the divergence of profits from investment started in the early 1980s and was only interrupted during the new economy boom of the late 1990s. In Germany this divergence becomes apparent in particular after the unification recession in the early 1990s and has dominated since then.

Profits without investment regimes can be driven by flourishing consumption demand, by rising export surpluses or also by increasing government deficits, each compensating for low or falling investment in capital stock. This is so because from a macroeconomic perspective the following equation, derived from national income accounting, has to hold, as pointed out by Kalecki (1954, chap. 3, 1971, chap. 7), and already discussed in Chapter 5 of this book:

Gross profits net of taxes = Gross investment + Capitalists' consumption + Government budget deficit + Export surplus − Workers' saving

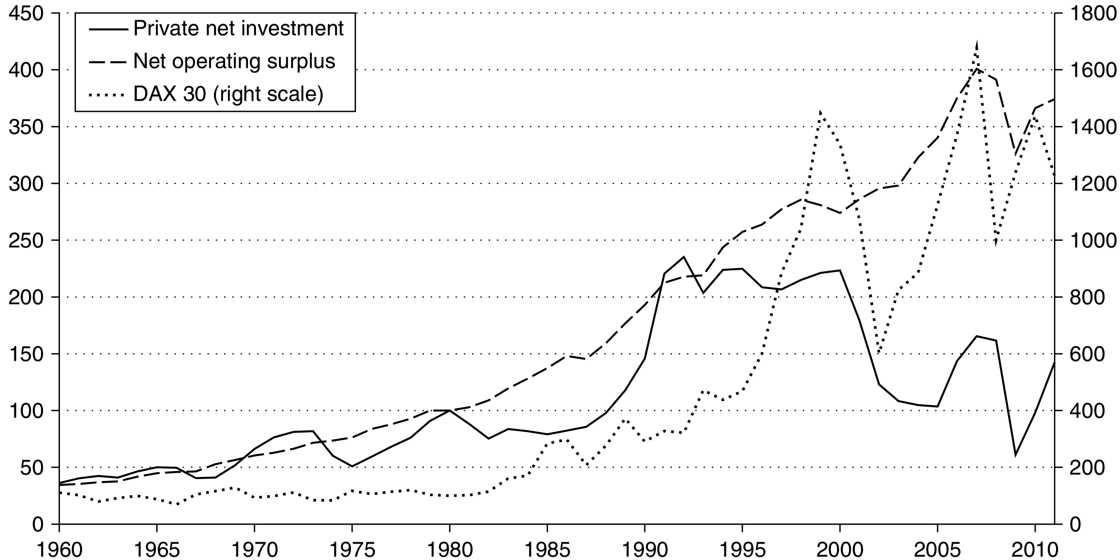
Empirically, several countries, like the US, the UK, Spain, Ireland and Greece, have relied on a 'debt-led consumption boom' type of development in the face of low investment in capital stock and redistribution at the expense of labour incomes, making use of the increasing potential for wealth-based and debt-financed consumption generated by financialization. Turning to the international dimension of financialization, profits without investment regimes can also be driven by net exports and current account surpluses. In the face of redistribution at the expense of (low) labour incomes, stagnating consumption demand and weak real investment, 'mercantilist export-led' strategies, relying on nominal wage moderation and suppressed domestic demand, are thus an alternative to generating aggregate demand. This type of development was found in countries like Austria, Belgium, Germany, the Netherlands, Sweden, Japan and China during the pre-2007 crisis financialization period.[3]

Against the background of these basic macroeconomic tendencies of finance-dominated capitalism, rising current account imbalances at the global, but also at the European, level developed, which then contributed to the worldwide Great Recession 2008/09 and the euro crisis thereafter. The countries which have relied on debt-led soaring private consumption demand as the main driver of aggregate demand and GDP growth generated and accepted concomitant rising deficits in their trade and current



Source: Hein and Dodig (2014, p. 3). Data sources: Bureau of Economic Analysis (2013); Federal Reserve Bank of St. Louis (2013); authors' calculations.

Figure 10.1 Investment, profits (index 1980 = 100) and share prices (index), US, 1960–2012



Source: Hein and Dodig (2014, p. 3). Data sources: European Commission (2012); Börse.de (2012); authors' calculations.

Figure 10.2 Investment, profits and share prices (index 1980 = 100), Germany, 1960–2012 account balances. The countries focusing on export-led mercantilist strategies as an alternative to generating demand have accumulated increasing surpluses in their trade and current account balances.

The financial crisis, which was triggered by over-indebtedness problems of private households in the leading debt-led consumption boom economy, the US, could thus quickly spread to the export-led mercantilist economies through the foreign trade channel (collapse of exports) and the financial contagion channel (devaluation of financial assets) and thus cause the worldwide Great Recession.

In this chapter we will deal with the four features of finance-dominated capitalism outlined above in more detail. We will present some stylized facts and econometric results regarding the channels of transmission, briefly review some theoretical contributions and then present Kaleckian models of distribution and growth incorporating these issues, based on either the post-Kaleckian or the neo-Kaleckian model variant introduced in Chapter 6 of this book. In Section 10.2 we review and interpret the effects of financialization on income distribution against the background of Kalecki's theory of distribution. In Section 10.3 we integrate the distribution effects of financialization with the effects on investment in capital stock and derive implications for capital accumulation and growth, as well as for the stability of the financial structure of the firm sector. In Section 10.4 we turn to the effects on consumption and household debt, and we again discuss the implications for accumulation and growth as well as for the sustainability of household debt. In Section 10.5 we then introduce the open economy dimension and present a Kaleckian model of growth driven by net exports and current account surpluses, and we discuss the sustainability of such a regime. Section 10.6 summarizes and concludes. In this chapter we will not deal with the effects of financialization on long-run productivity growth and thus potential growth of the economy. For this, see Hein (2010a, 2012a, chap. 4, 2012c).

10.2 FINANCIALIZATION AND REDISTRIBUTION OF INCOME SINCE THE EARLY 1980S[4]

10.2.1 Empirical Evidence

The period of finance-dominated capitalism has been associated with a massive redistribution of income. First, functional income distribution has changed at the expense of labour and in favour of broad capital income. The labour income share, as a measure taken from the national accounts and corrected for changes in the composition of employment regarding employees and the self-employed, shows a falling trend in the developed

Table 10.1 Labour income share as a percentage of GDP at current factor costs, average values over the trade cycle, early 1980s to 2008

	1 Early 1980s to early 1990s	2 Early 1990s to early 2000s	3 Early 2000s to 2008	Change (col. 3 minus col. 1), percentage points
Austria	75.66	70.74	65.20	−10.46
Belgium	70.63	70.74	69.16	−1.47
France	71.44	66.88	65.91	−5.53
Germany	67.11	66.04	63.34	−3.77
Greece[(a)]	67.26	62.00	60.60	−6.66
Ireland	70.34	60.90	55.72	−14.61
Italy	68.31	63.25	62.37	−5.95
Netherlands	68.74	67.21	65.57	−3.17
Portugal	65.73	70.60	71.10	5.37
Spain	68.32	66.13	62.41	−5.91
Sweden	71.65	67.04	69.16	−2.48
UK	72.79	71.99	70.67	−2.12
US	68.20	67.12	65.79	−2.41
Japan[(a)]	72.38	70.47	65.75	−6.64

Notes:
The labour income share is given by the compensation per employee divided by GDP at factor costs per person employed. The beginning of a trade cycle is given by a local minimum of annual real GDP growth in the respective country.
[(a)] Adjusted to fit in the three-cycle pattern.

Source: Hein (2012a, p. 13). Data source: European Commission (2010); author's calculations.

capitalist economies considered here from the early 1980s until the Great Recession 2008/09. This is shown in Table 10.1, which presents cyclical averages in order to eliminate cyclical fluctuations due to the familiar counter-cyclical properties of the labour income share.

Second, personal income distribution became more unequal in most countries from the mid-1980s until the late 2000s. Taking the Gini coefficient as an indicator, this is true for the distribution of market income, with the Netherlands being the only exception in the dataset (Table 10.2). If redistribution via taxes and transfer payments by the state is included and the distribution of disposable income is considered, Belgium, France, Greece, Ireland and Spain have not seen an increase in their Gini coefficients. The other countries, however, have also experienced increasing inequality in distribution of disposable income during the period of finance-dominated capitalism.

Table 10.2 Gini coefficient

Country	Mid-1980s	Around 1990	Mid-1990s	Around 2000	Mid-2000s	Late 2000s	Change from mid-1980s, around 1990 or mid-1990s to late 2000s
Gini coefficient for households' market income:							
Austria					0.433	0.472	
Belgium	0.449		0.472	0.464	0.494	0.469	0.020
Finland	0.387		0.479	0.478	0.483	0.465	0.078
France			0.473	0.490	0.485	0.483	0.010
Germany	0.439	0.429	0.459	0.471	0.499	0.504	0.065
Greece	0.426		0.446	0.466	0.454	0.436	0.010
Ireland							
Italy	0.420	0.437	0.508	0.516	0.557	0.534	0.114
Netherlands	0.473	0.474	0.484	0.424	0.426	0.426	−0.047
Portugal		0.436	0.490	0.479	0.542	0.521	0.085
Spain						0.461	
Sweden	0.404	0.408	0.438	0.446	0.432	0.426	0.022
UK	0.419	0.439	0.453	0.512	0.500	0.506	0.087
US	0.436	0.450	0.477	0.476	0.486	0.486	0.050
Japan	0.345		0.403	0.432	0.443	0.462	0.117
Gini coefficient for households' disposable income:							
Austria	0.236		0.238	0.252	0.265	0.261	0.025
Belgium	0.274		0.287	0.289	0.271	0.259	−0.015
Finland	0.209		0.218	0.247	0.254	0.259	0.050
France	0.300	0.290	0.277	0.287	0.288	0.293	−0.007
Germany	0.251	0.256	0.266	0.264	0.285	0.295	0.044

Greece	0.336		0.336	0.345	0.321	0.307	−0.029
Ireland	0.331		0.324	0.304	0.314	0.293	−0.038
Italy	0.309	0.297	0.348	0.343	0.352	0.337	0.028
Netherlands	0.272	0.292	0.297	0.292	0.284	0.294	0.022
Portugal		0.329	0.359	0.356	0.385	0.353	0.024
Spain	0.371	0.337	0.343	0.342	0.319	0.317	−0.054
Sweden	0.198	0.209	0.211	0.243	0.234	0.259	0.061
UK	0.309	0.354	0.336	0.352	0.331	0.342	0.033
US	0.337	0.348	0.361	0.357	0.38	0.378	0.041
Japan	0.304		0.323	0.337	0.321	0.329	0.025

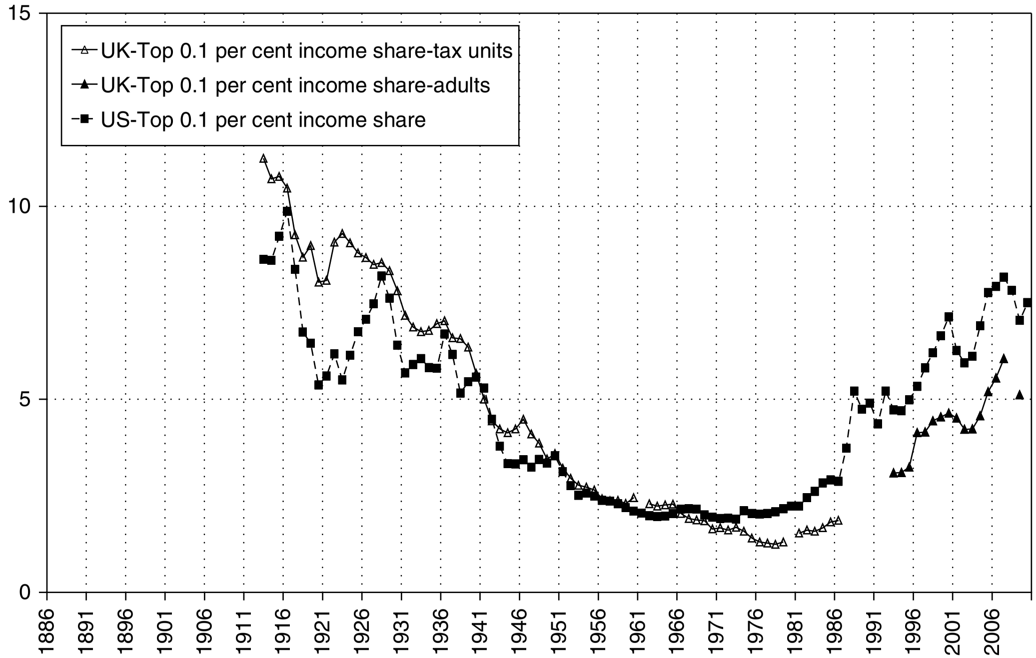
Note: Gini coefficient is based on equivalized household income.

Source: Hein (2014, p. 7). Data source: OECD (2012b); author's calculations.

Third, as data based on tax reports provided by Alvaredo et al. (2012) have shown, there has been an explosion of the shares of the very top incomes since the early 1980s in the US and the UK, which prior to the crisis had again reached the levels of the mid-1920s in the US and the mid-1930s in the UK (Figure 10.3). In France, Germany, the Netherlands, Spain, Portugal, Italy, Ireland, Japan and Sweden (Figures 10.4 to 10.7), however, the shares of the top 0.1 per cent have not returned to the high levels of the period prior to the Second World War. However, with the exception of Germany, Ireland and the Netherlands, a slightly upward trend can be observed in these countries since the early 1980s, too. Although Germany has not yet seen such an increase, it should be noted that the share of the top 0.1 per cent has been substantially higher in this country for longer periods of time than in the other countries, and that it has only been surpassed by the US and the UK in the mid-1980s and the mid-1990s, respectively (Figure 10.4).[5]

Taking a look at the composition of top incomes, the increase in the income share of the top 0.1 per cent in the US has mainly been driven by an increase in top salaries (wages and salaries, bonuses, exercised stock options and pensions) since the 1970s, and since the mid-1980s also in entrepreneurial income (Figure 10.8). Remuneration of top management (the 'working rich') therefore contributed significantly, but not exclusively, to rising inequality in the US. The decomposition of top incomes is only provided for a few countries in the dataset by Alvaredo et al. (2012). Out of these, the 'working rich' phenomenon can also be found in Spain, where the share of top management salaries in the top 0.1 per cent incomes has seen a rising trend from the early 1980s until the early 2000s, and in the Netherlands, where such an increase could be observed in the course of the 1990s. In Italy we only find a slightly increasing tendency since the early 1980s, and in France there has not been such an increase at all.[6] Whereas top management salaries have contributed up to more than 50 per cent to the income of the top 0.1 per cent income share in the US, in Germany top management salaries have played a minor role. However, their share increased from 15 per cent in 1992 to 22.4 per cent in 2003 (Bach et al. 2009). Therefore, the 'working rich' phenomenon seems to arise in Germany as well.

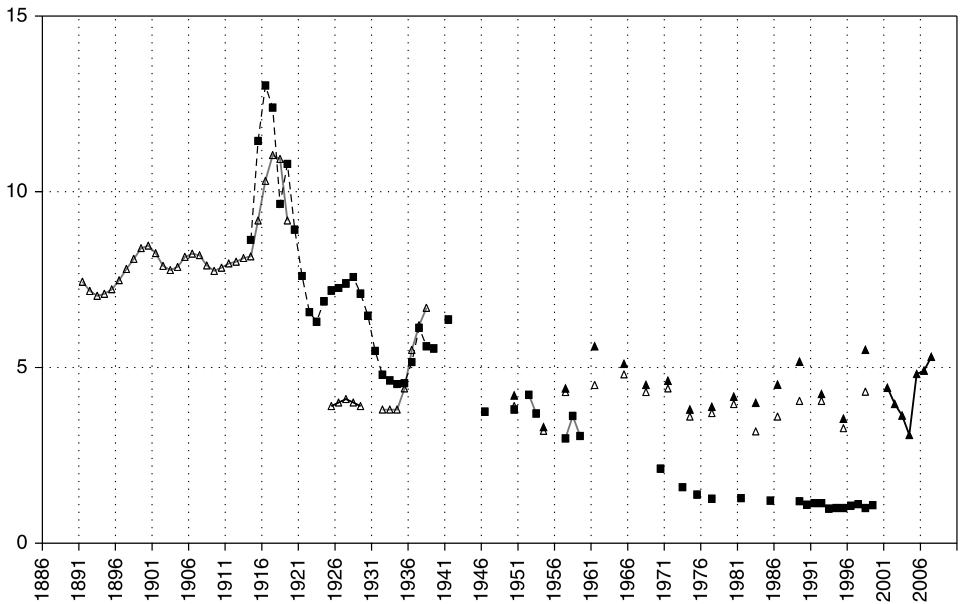
Since top management salaries are part of the compensation of employees in the national accounts and are thus included in the labour income share considered above, the increase in top management salaries has dampened the fall in the measured labour income share since the early 1980s. Excluding top management salaries from the labour income share would therefore give an even more pronounced fall in the share of direct labour, as has been shown by Buchele and Christiansen (2007) and Glyn (2009)



Note: In percentages.

Source: Hein (2014, p. 9). Data source: Alvaredo et al. (2012).

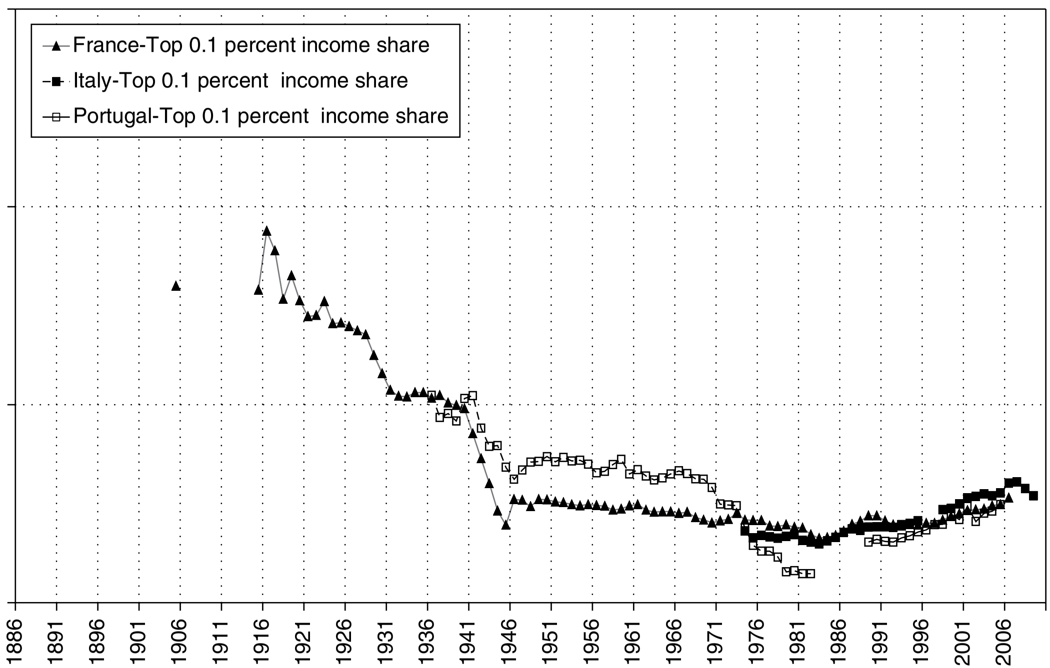
Figure 10.3 Top 0.1 per cent share in national income in the UK and the US



Note: In percentages.

Source: Hein (2014, p. 9). Data source: Alvaredo et al. (2012).

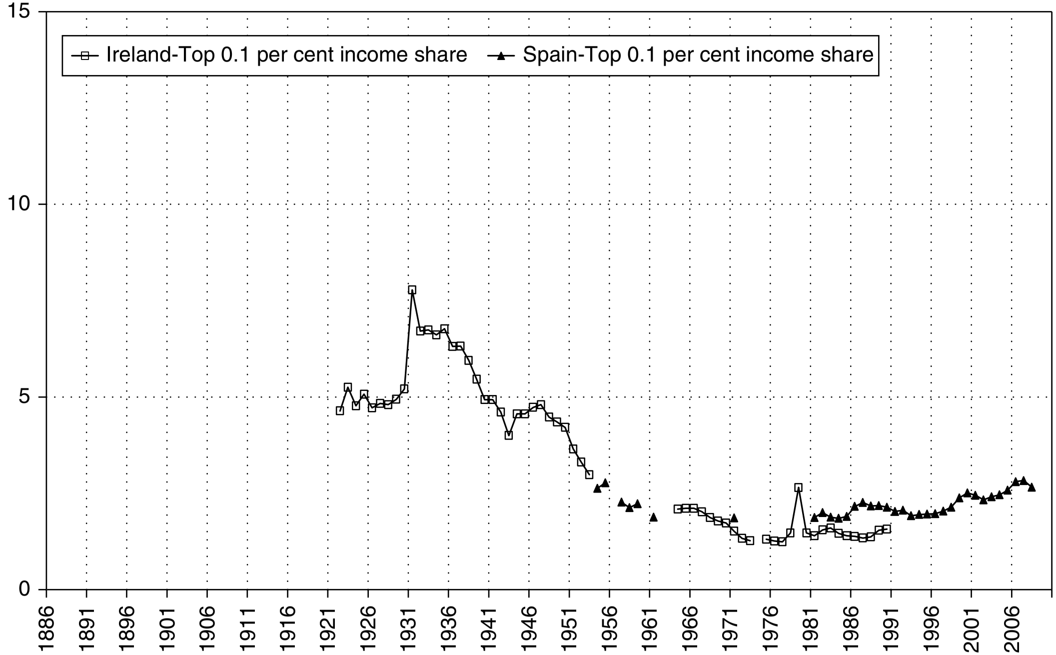
Figure 10.4 *Top 0.1 per cent share in national income in Germany and the Netherlands*



Note: In percentages.

Source: Hein (2014, p. 10). Data source: Alvaredo et al. (2012).

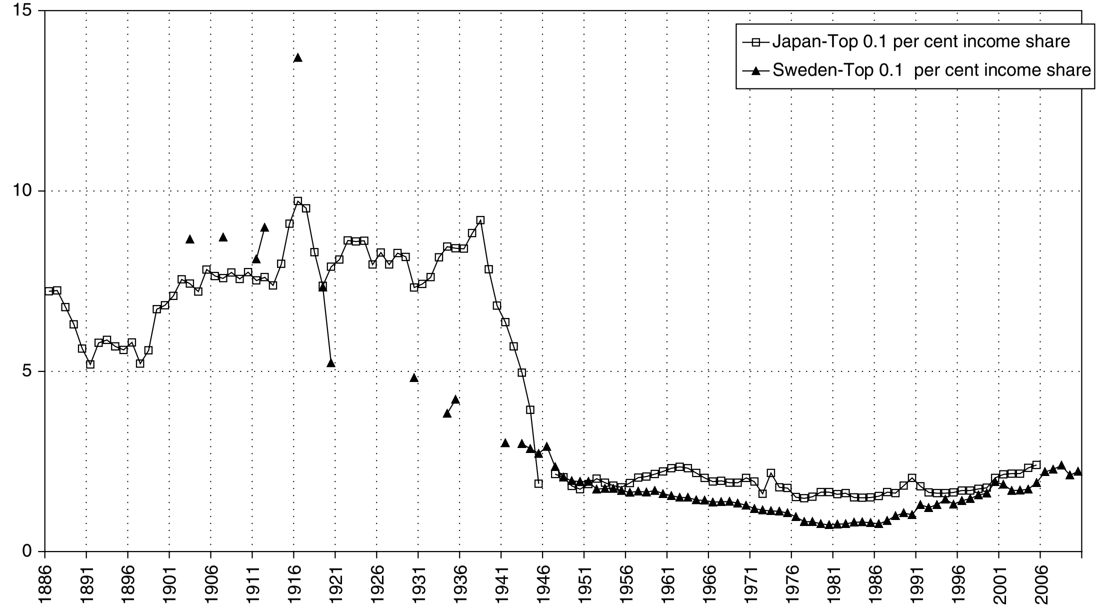
Figure 10.5 Top 0.1 per cent share in national income in France, Italy and Portugal



Note: In percentages.

Source: Hein (2014, p. 10). Data source: Alvaredo et al. (2012).

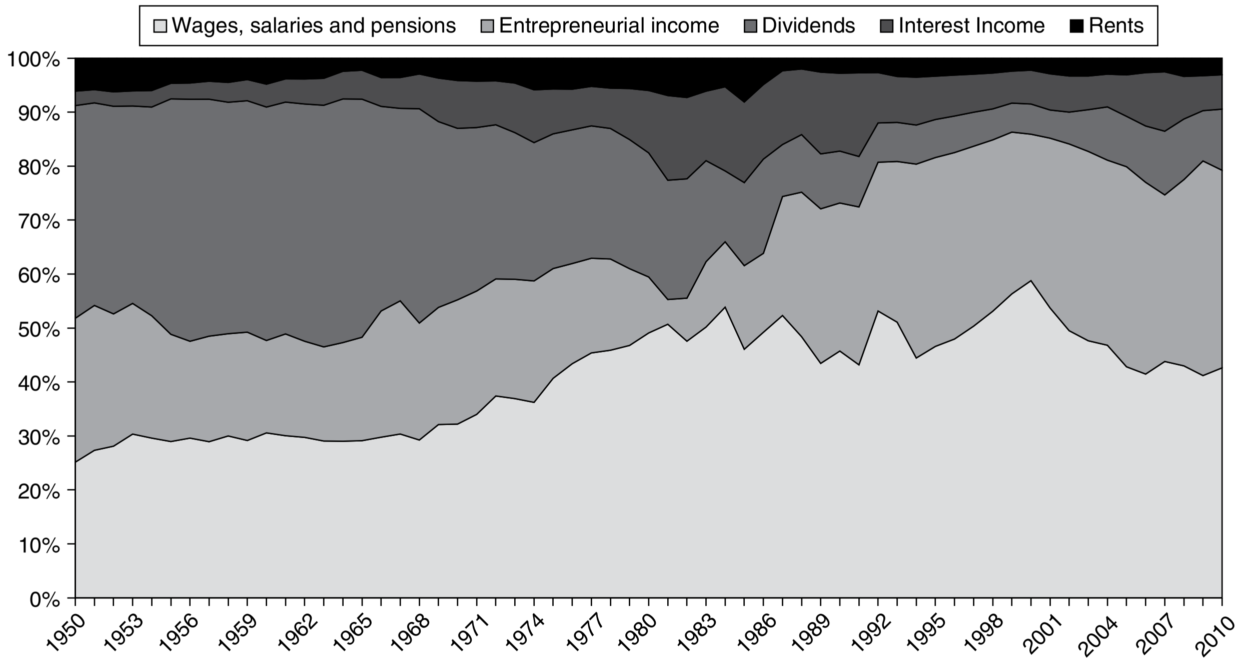
Figure 10.6 Top 0.1 per cent share in national income in Ireland and Spain



Data: In percentages.

Source: Hein (2014, p. 11). Data source: Alvaredo et al. (2012).

Figure 10.7 Top 0.1 per cent share in national income in Japan and Sweden



Source: Hein (2014, p. 12). Data source: Alvaredo et al. (2012).

Figure 10.8 Composition of top 0.1 per cent incomes, US, 1950–2010 for the US, Atkinson (2009) for the UK, Dünhaupt (2011) for Germany and the US, and the OECD (2012a, chap. 3) for Canada, France, Italy, Japan, the Netherlands and the US.

10.2.2 A Kaleckian Interpretation of the Effects of Financialization on Income Shares

According to Atkinson (2009), the trends and determinants of functional income distribution provide the key to the explanation of the other dimensions of redistribution. The analysis of factor shares provides the link between incomes at the macroeconomic or the national accounting level and incomes at the level of a household, thus helping in understanding the development of inequality in personal income distribution, and providing an indicator of the relative powers of different groups. For example, an increase in the profit share and a decrease in the wage share will also increase the inequality of income distribution across households, if financial and economic wealth generating profits is distributed unequally.

Hein (2012a, chap. 2, 2014) has therefore reviewed the recent empirical literature on the determinants of income shares against the background of the Kaleckian theory of distribution, which was presented in Chapter 5 of this book, in order to identify the channels through which financialization and neo-liberalism have affected functional income distribution (Table 10.3).[7] Before summarising the results, we briefly repeat the major determinants of the gross profit share in national income, according to Kalecki. Gross profits here include retained earnings, dividends, interest and rent payments, as well as overhead costs, and thus top management salaries. The determinants of the gross profit share are listed at the top of Table 10.3.

First, the gross profit share is affected by firms' pricing in incompletely competitive goods markets, hence by the mark-up on unit variable costs. The mark-up itself is determined by the degree of industrial concentration and by the relevance of price competition relative to other instruments of competition (marketing, product differentiation) in the respective industries or sectors, thus by the degree of price competition in the goods market; by the bargaining power of trade unions, because, in a heterogeneous environment with differences in unit wage cost growth between firms, industries or sectors, the firm's or the industry's ability to shift changes in nominal wage costs to prices is constrained by competition with other firms or industries which do not have to face the same increase in unit wage costs; and by overhead costs and gross profit targets, because the mark-up has to cover overhead costs and distributed profits.

Second, with mark-up pricing on unit variable costs, that is material plus

Table 10.3 Financialization and the gross profit share – a Kaleckian perspective

Stylized facts of financialization (1–7) and neo-liberalism (8–9)	Determinants of the gross profit share (including (top) management salaries)				
	1 Mark-up			2 Price of imported raw materials and semi-finished products	3 Sectoral composition of the domestic economy
	1a) Degree of price competition in the goods market	1b) Bargaining power and activity of trade union	1c) Overhead costs and gross profit targets		
1. Increasing shareholder value orientation and short-termism of management	. . .	+	+	. . .	. . .
2. Rising dividend payments	. . .	. . .	+	. . .	. . .
3. Increasing interest rates or interest payments	. . .	. . .	+	. . .	. . .
4. Increasing top management salaries	. . .	. . .	+	. . .	. . .
5. Increasing relevance of financial to non-financial sector (investment)	. . .	+	. . .	. . .	+
6. Mergers and acquisitions	+	. . .	. . .	. . .	. . .
7. Liberalization and globalization of international finance and trade	−	+	. . .	+/−	+/−
8. Deregulation of the labour market	. . .	+	. . .	. . .	. . .
9. Downsizing of government	. . .	+	. . .	. . .	+

Notes: + positive effect on the gross profit share; − negative effect on the gross profit share; . . . no direct effect on the gross profit share.

Source: Hein (2014, p. 15).

wage costs, the profit share in national income is affected by unit imported material costs relative to unit wage costs. With a constant mark-up an increase in unit material costs relative to unit wage costs will thus increase the profit share in national income.

And, third, the aggregate profit share of the economy as a whole is a weighted average of the industry or sector profit shares. Since profit shares differ among industries and sectors, the aggregate profit share is affected by the industry or sector composition of the economy.

Integrating some stylized facts of financialization and neo-liberalism, listed in the left-hand column of Table 10.3, into this approach and reviewing the respective empirical literature, it can be argued that there is some convincing empirical evidence that financialization and neo-liberalism have contributed to the rising gross profit share and hence to the falling wage and labour income share since the early 1980s through three main channels.

First, the shift in the sector composition of the economy from the public sector and the non-financial business sector with higher labour income shares towards the financial business sector with a lower labour income share has contributed to the fall in the labour income share for the economy as a whole. To the extent that financialization and neo-liberalism are associated with downsizing government this will, *ceteris paribus*, reduce the economy-wide wage share and increase the profit share, because the government sector is a non-profit sector in the national accounts. An increasing share of value added of financial corporations relative to the non-financial corporations will also push up the economy-wide gross profit share if the sectoral wage share in the financial sector falls short of that in the non-financial sector. In a decomposition study for Germany (1980–2008) and the US (1970–2008), Dünhaupt (2012) shows that in these two countries this was indeed the case. But only in the US did the sectoral composition in the economy shift considerably towards the financial corporate sector and thus contribute to a fall in the wage share, whereas in Germany this was only of minor importance for the observed fall in the overall wage share.

Second, the increase in management salaries as a part of overhead costs together with rising profit claims of rentiers, that is rising interest and dividend payments of the corporate sector, have in sum been associated with a falling wage and labour income share, although management salaries are part of the compensation of employees in the national accounts, and thus of the labour income share. Empirical data supplied by Epstein and Power (2003), Duménil and Lévy (2005), Epstein and Jayadev (2005) and Dünhaupt (2012), as well as the econometric study by Hein and Schoder (2011) focusing in particular on the effect of interest payments of the firm sector on the wage share, but some of them also including dividend payments, have supported this conclusion. We have already reviewed these studies in Chapter 9 of this book. Furthermore, Dünhaupt (2013) in a panel econometric study for 13 OECD countries (1986–2007) supplies econometric evidence for the negative effect of dividend payments on the wage share. And Tomaskovic-Devey and Lin (2013) in a panel econometric study for 35–40 non-financial, non-agricultural industries of the private sector of the US economy (1970–2008) find that an increasing degree of financialization, approximated by the ratio of financial receipts (interest, dividends and capital gains) to business receipts, is associated with a long-run increase in the corporate officers' share of compensation, and a fall in the labour income share. This also lends some support to the overhead costs and gross profits targets channel through which financialization affects income shares.

Third, financialization and neo-liberalism have weakened trade union bargaining power through several channels: the increasing shareholder value and short-term profitability orientation of management, sectoral shifts away from the public sector and the non-financial business sector with stronger trade unions in many countries to the financial sector with weaker unions, abandonment of government demand management and high employment policies, deregulation of the labour market, and liberalization and globalization of international trade and finance. The panel econometric studies by Dünhaupt (2013) and Tomaskovic-Devey and Lin (2013) mentioned above lend support to these conclusions. They are also supported by the results of further panel econometric studies by Stockhammer (2009) on 15 OECD countries (1982–2003), by Kristal (2010) on 16 OECD countries (1961–2005) and by Stockhammer (2013a, 2013b) on up to 71 advanced, emerging and developing economies (1970–2007).

10.3 FINANCIALIZATION, SHAREHOLDER VALUE ORIENTATION AND CAPITAL ACCUMULATION

10.3.1 Empirical Results

Econometric evidence in favour of the hypothesis that financialization has caused a slowdown in capital accumulation through the 'preference channel' and the 'internal means of finance channel',[8] as explained in the introduction to this chapter, has been presented by Stockhammer (2004a, 2004c, chap. 6), Orhangazi (2008a), van Treeck (2008) and Onaran et al.

(2011). Stockhammer (2004a, 2004c, chap. 6) takes the share of interest and dividends in profits of non-financial business as an indicator for the dominance of short-term profits in firms' or management's preferences. Short-term financial investment is hence preferred over long-term real investment in capital stock, and the share of dividends and interest in profits should therefore be negatively associated with real investment. Using annual data for the business sector and applying time series estimations for France (1978–97), Germany (1963–90), the UK (1970–96) and the US (1963–97), Stockhammer finds evidence in favour of his hypothesis for France, the US and maybe also the UK, but not for Germany. Van Treeck (2008) introduces interest and dividend payments, each in relation to the capital stock, into the estimation of the determinants of the rate of capital accumulation in the non-financial corporate sector of the US (1965–2004) using annual data for his time series estimations. He finds that dividend and interest payments each have a statistically significant negative effect on capital accumulation, indicating the finance constraint given by internal means of finance. The value of the negative coefficient on dividend payments also exceeds that on interest payments, which is interpreted as evidence for the shareholder value orientation of management: dividend payments thus negatively affect investment not only via internal means of finance but also via firms' (or management's) preferences. Onaran et al. (2011) in their time series study for the US (1962–2007) find a positive effect of the non-rentier profit share on real gross private domestic investment, but a negative effect of the rentier profit share (net dividends and net interest payments of domestic industry as a share of nominal GDP), which severely dampens the positive impact of unit gross profits on investment through the internal means of finance channel. Orhangazi (2008a) has used firm-level data on non-financial firms in the US (1972–2003) with a focus on the manufacturing sector in a dynamic panel estimation approach. He finds that financial profits have a negative impact on real investment for large firms, indicating a shift in favour of short-term financial profits and at the expense of long-term profits from investment in capital stock. For small firms, however, the effect of financial profits (the sum of interest and equity income in net earnings) on real investment is positive, because financial profits seem to ease the financing constraint for these firms. The effect of financial payments (interest expenses, cash dividends, purchase of firms' own stocks) on investment is negative for the whole panel, lending empirical support to the internal means of finance channel.

10.3.2 Post-Keynesian–Kaleckian Macroeconomic Models Deriving Different Regimes

Based on these effects of financialization on investment in capital stock, and including the effects on functional income distribution outlined in Section 10.2, post-Keynesians have presented different models examining the long-run growth and stability effects of financialization, as reviewed in Hein and van Treeck (2010a) and Hein (2012a, chap. 3), without including open economy issues yet.[9] Depending on the values of the model parameters, 'finance-led growth' regimes, as suggested by Boyer (2000), 'profits without investment' regimes, as found by Cordonnier (2006), or 'contractive' regimes may emerge.

Only in the finance-led growth regime is increasing shareholder power overall expansive with respect to the rates of capacity utilization, as indicator for aggregate demand, profit and capital accumulation. In the profits without investment regime the effects on the rates of capacity utilization and profit remain expansive, but capital accumulation gets depressed. And in the contractive regime there is a depressing effect on all three endogenous variables of the model. As will be shown below, only the finance-led growth regime yields long-run stability of the financial structure of the firm sector and of capital accumulation. This regime, however, requires a very special parameter constellation: only weakly negative effects of increasing shareholder power on management's animal spirits regarding real investment in capital stock, a low rentiers' propensity to save out of current income (based on strong wealth effects on consumption, for example), a low profit share, a low elasticity of investment with respect to distributed profits and internal funds, and a high responsiveness with regard to capacity utilization (and to Tobin's q in some models). In particular, a long-run increase in the gross profit share associated with financialization may turn the stable financial structure unstable. More realistic parameter constellations giving rise to profits without investment or contractive regimes have turned out to yield cumulatively unstable long-run results regarding the financial structure of the corporate sector and the rate of capital accumulation. In the face of rising shareholder power, a rising rentiers' rate of return, that is increasing dividend rates and/or interest rates, and falling management's animal spirits regarding investment in capital stock, these regimes are liable to systemic instability characterized by increasing outside finance–capital ratios, that is rising debt plus rentiers' equity–capital ratios, and falling goods market equilibrium rates of capital accumulation. Falling labour income shares triggered by financialization increase the likelihood of these unstable regimes. Therefore, under the conditions of the contractive and the profits without investment regimes there exists a considerable systemic long-run instability potential regarding the financial structure of the corporate sector of the economy and regarding capital accumulation. These results can be demonstrated using an extended post-Kaleckian model with fixed prices in the goods and financial markets, as suggested by Hein (2010b, 2012a, chap. 3).

10.3.3 A Post-Kaleckian Model of Financialization, Shareholder Dominance, Distribution and Growth[10]

The basic model

Let us again assume a closed economy without economic activity of the state, which produces just one type of commodity, which can be used for consumption and investment purposes, with a fixed coefficients production technology. The basic model can be described by the following equations.

Pricing and distribution

$$p = [1 + m(\rho)]wa, \quad m > 0, \frac{\partial m}{\partial \rho} \geq 0, \tag{10.1}$$

$$h = \frac{\Pi}{pY} = 1 - \frac{1}{1 + m(\rho)}, \quad \frac{\partial h}{\partial \rho} \geq 0, \tag{10.2}$$

$$r = \frac{\Pi}{pK} = \frac{\Pi}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = hu\frac{1}{v}. \tag{10.3}$$

Financing of capital stock and rentiers' income

$$pK = B + E_R + E_F, \tag{10.4}$$

$$\gamma = \frac{B + E_R}{pK}, \tag{10.5}$$

$$\varphi = \frac{E_F}{pK}, \tag{10.6}$$

$$\Pi = \Pi_F + R, \tag{10.7}$$

$$R = \rho(E_R + B). \tag{10.8}$$

Saving, investment and goods market equilibrium

$$\sigma = \frac{S}{pK} = \frac{\Pi - R + s_R R}{pK} = r - (1 - s_R)\rho\gamma, \quad 0 < s_R \leq 1, \tag{10.9}$$

$$g = \frac{I}{pK} = \alpha + \beta u + \tau h - \theta\rho\gamma, \quad \beta,\tau,\theta \geq 0, \tag{10.10}$$

$$g = \sigma, \tag{10.11}$$

$$\frac{\partial\sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \quad \Rightarrow \quad \frac{h}{v} - \beta > 0. \tag{10.12}$$

Firms set prices (p) according to a mark-up (m) on unit labour costs (wa), which are constant up to full capacity output. The mark-up is determined by the degree of price competition in the goods market, by the bargaining power of labour in the labour market and by overhead costs and gross profit targets (equation 10.1, Table 10.3). The profit share (h), that is the proportion of profits (Π) in nominal output (pY), is therefore determined by the mark-up (equation 10.2). The mark-up and the profit share may become elastic with respect to the rentiers' rate of return on equity and bonds (ρ) in the long run. The profit rate (r) relates the annual flow of profits to the nominal capital stock and can be decomposed into the rate of capacity utilization (u), the profit share (h) and the inverse of the capital–potential output ratio (v) (equation 10.3).

Long-term finance of the capital stock (pK) consists of firms' accumulated retained earnings (E_F), long-term credit granted by rentiers' households (B) and equity issued by the firms and held by rentiers' households (E_R) (equation 10.4). The rentiers' share in capital stock finance, the outside finance–capital ratio, is given by γ (equation 10.5), whereas φ denotes the accumulated retained earnings–capital ratio or the inside finance–capital ratio (equation 10.6). It is assumed that these ratios are constant in the short run, but become variable and hence to be endogenously determined in the long run of the model. The balance sheet matrix in Table 10.4 summarizes the financing of the capital stock. It slightly extends the balance sheet matrix we introduced in Chapter 9 (Table 9.1).

Total profits (Π) split into firms' retained profits (Π_F), on the one hand, and dividends plus interest paid to rentiers' households (R), on the other hand (equation 10.7). Interest payments to rentiers' households are

Table 10.4 Balance sheet matrix

	Workers	Rentiers	Firms	Σ
Loans		$+B$	$-B$	0
Equities		$+E_R$	$-E_R$	0
Capital		0	pK	pK
Σ	0	$+B+E_R$	$+E_F$	$pK = B + E_R + E_F$

given by the rate of interest and the stock of debt. The rate of interest is a distribution parameter and an exogenous variable for income generation and capital accumulation, mainly determined by monetary policies and risk and liquidity assessments of banks and rentiers, following the post-Keynesian 'horizontalist' view of endogenous money and credit, as explained in Chapter 9 of this book. Dividend payments, given by the dividend rate and the stock of equity held by rentiers' households, are also determined by the power struggle between rentiers (shareholders) and firms (management), with rentiers being interested in high dividends for income purposes and management being in favour of retained earnings for firms' real investment and growth purposes. Since we are not interested in rentiers' portfolio choice and in order to simplify further analysis, dividend and interest payments to rentiers are synthesized and just one rentiers' rate of return on bonds and equity (ρ) is considered, which together with the stock of equity and bonds held by rentiers determines rentiers' income (equation 10.8).

Changes in the rentiers' rate of return may cause a change in the mark-up in firms' pricing in incompletely competitive goods markets (equation 10.1). If these changes occur, distribution between gross profits, as the sum of retained firms' profits and interest and dividends received by rentiers' households, on the one hand, and wages, on the other hand, will be affected (equation 10.2). In the face of increasing shareholder power, we consider the mark-up to be dividend-inelastic in the short run. Therefore, in the short run only the distribution of income between firms and rentiers is affected by rising shareholder power. But, in the long run, the mark-up and hence the profit share are likely to become dividend-elastic, for the reasons outlined in Section 10.2.

In order to simplify the analysis, workers are assumed not to save. The part of profits retained is completely saved by definition. The part of profits distributed to rentiers' households, the interest and dividend payments, is used by those households according to their propensity to save (s_R). Therefore, we get the saving rate (σ) in equation (10.9) which relates total saving to the nominal capital stock. The accumulation rate (g) relates net investment (I) to the capital stock, and the accumulation function in equation (10.10) is an extended version of the post-Kaleckian investment function introduced by Bhaduri and Marglin (1990) and Kurz (1990). Investment decisions are assumed to be positively affected by animal spirits (α), expected sales and unit profits (or the profit share), because both increase the (expected) profit rate. Expected sales are determined by the rate of capacity utilization. Unit profits are given by the profit share and are thus determined by the mark-up in firms' pricing in the goods market. Distributed profits, the dividend and interest payments to rentiers, have

Table 10.5 Transaction flow matrix

	Workers	Rentiers	Firms' current	Firms' capital	Σ
Consumption	$-pC_W$	$-pC_R$	$+pC_W + pC_R$		0
Investment			$+pI$	$-pI$	0
Wages	$+W$		$-W$		0
Retained profits			$-\Pi_F$	$+dE_F$	0
Distributed profits: dividends and interest		$+R$	$-R$		0
Change in equity		$-dE_R$		$+dE_R$	0
Change in loans		$-dB$		$+dB$	0
Σ	0	0	0	0	0

a negative impact on investment, because they reduce retained earnings and hence firms' own means of finance, which are required for investment following Kalecki's (1937) 'principle of increasing risk', as explained in Chapter 5. The goods market equilibrium is determined by the equality of saving and investment decisions (equation 10.11). The goods market stability condition requires that the saving rate responds more elastically to changes in capacity utilization than the capital accumulation rate does (condition 10.12). The transactions in our post-Kaleckian model are summarized in Table 10.5, which slightly extends the transaction flow matrix we introduced in Chapter 9 (Table 9.2).

Short-run equilibrium and the effects of financialization and increasing shareholder power

The model generates the following short-run goods market equilibrium values:

$$u^* = \frac{\alpha + \tau h + \rho\gamma(1 - s_R - \theta)}{\frac{h}{v} - \beta}, \tag{10.13}$$

$$g^* = \frac{\frac{h}{v}(\alpha + \tau h) + \rho\gamma\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]}{\frac{h}{v} - \beta}, \tag{10.14}$$

$$r^* = \frac{\frac{h}{v}[\alpha + \tau h + \rho\gamma(1 - s_R - \theta)]}{\frac{h}{v} - \beta}. \tag{10.15}$$

As can easily be seen from these equations, higher animal spirits (α) in firms' investment function will raise the short-run equilibrium rates of capacity utilization, capital accumulation and profit. A higher propensity to save out of rentiers' income will lower the short-run equilibrium values, and the paradox of thrift is valid here, too. The effects of a change in the profit share on the short-run equilibrium may be wage-led or profit-led, depending on the values of the coefficients on capacity utilization and the profit share in the accumulation function (10.10) – the conditions are the same as derived in Chapter 9, and we refer to these.

For the short-run analysis of the effects of increasing shareholder power, firms' outside finance–capital ratio is assumed to be constant (or only slowly changing), and the mark-up and hence the profit share are considered to be dividend-inelastic, because the determinants of the mark-up change rather slowly. An increase in shareholder power will thus affect the goods market equilibrium, firstly through the effects on management's preferences regarding real investment in capital stock (as compared to more profitable financial investments in the short run) and hence through the animal spirit variable in the accumulation function, and secondly through the effects of a higher rentiers' rate of return (higher dividend payments) on firms' internal means of finance in the accumulation function. An increase in the shareholder value orientation of management, and hence a decrease in animal spirits as indicated by α in the investment function, has uniquely negative effects on the endogenous variables, as can easily be seen from equations (10.13) to (10.15): $\partial u^*/\partial\alpha > 0$, $\partial g^*/\partial\alpha > 0$ and $\partial r^*/\partial\alpha > 0$. An increase in the rentiers' rate of return, however, has ambiguous effects. It affects firms' investment through the availability of internal funds and the access to external financing, but it also has an influence on the income of rentiers' households and hence on their consumption demand:

$$\frac{\partial u^*}{\partial\rho} = \frac{(1 - s_R - \theta)\gamma}{\frac{h}{v} - \beta}, \tag{10.13a}$$

$$\frac{\partial g^*}{\partial\rho} = \frac{\gamma\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]}{\frac{h}{v} - \beta}, \tag{10.14a}$$

$$\frac{\partial r^*}{\partial \rho} = \frac{\frac{h}{v}(1 - s_R - \theta)\gamma}{\frac{h}{v} - \beta}. \tag{10.15a}$$

Assuming the stability condition (10.12) for the goods market equilibrium to hold, 'normal', 'intermediate' and 'puzzling' cases are obtained for the effects of increasing shareholder power through the internal means of finance channel. The conditions for these three cases are derived from equations (10.13a) to (10.15a), and they should be well familiar from Chapter 9:

$$\frac{\partial u^*}{\partial \rho} > 0, \quad \text{if:} \quad (1 - s_R) - \theta > 0, \tag{10.13a'}$$

$$\frac{\partial g^*}{\partial \rho} > 0, \quad \text{if:} \quad \frac{\beta v}{h}(1 - s_R) - \theta > 0, \tag{10.14a'}$$

$$\frac{\partial r^*}{\partial \rho} > 0, \quad \text{if:} \quad (1 - s_R) - \theta > 0. \tag{10.15a'}$$

From the goods market stability condition (10.12) it follows that $h/v > \beta$ and hence $\beta v/h < 1$. From this $(\beta v/h)(1 - s_R) < (1 - s_R)$ has to hold. Therefore, we obtain the three cases as shown in Table 10.6. And, adding the effects of increasing shareholder power through the preference channel, the regimes shown in Table 10.7 may emerge.

Table 10.6 Short-run cases for the effects of a change in the rentiers' rate of return

	$\frac{\partial u^*}{\partial \rho}$	$\frac{\partial g^*}{\partial \rho}$	$\frac{\partial r^*}{\partial \rho}$
Normal case	–	–	–
$\frac{\beta v}{h}(1 - s_R) - \theta < (1 - s_R) - \theta < 0$			
Intermediate case	+	–	+
$\frac{\beta v}{h}(1 - s_R) - \theta < 0 < (1 - s_R) - \theta$			
Puzzling case	+	+	+
$0 < \frac{\beta v}{h}(1 - s_R) - \theta < (1 - s_R) - \theta$			

Table 10.7 Short-run accumulation regimes under the conditions of financialization and rising shareholder power

	Effect via management's animal spirits	Effect via rentiers' rate of return
Contractive regime	Weak/strong	Normal case
Profits without investment regime	Weak	Intermediate case
Finance-led growth regime	Weak	Puzzling case

The normal case of a negative impact of an increase in the rentiers' rate of return throughout on the equilibrium values of capacity utilization, the profit rate and the rate of capital accumulation will be given if $(1 - s_R) - \theta < 0$. Therefore, this case is the more likely the higher is the rentiers' propensity to save and the higher the responsiveness of firms' real investment with respect to distributed profits and hence to internal funds. With this parameter constellation, the increase in consumption demand associated with a redistribution of income from firms to rentiers' households is insufficient to compensate for the negative effects on firms' investment. In the normal case, the effect of an increasing rentiers' rate of return on the equilibrium rates of capacity utilization, profit and capital accumulation amplifies the negative effects of rising shareholder power via management's animal spirits on these variables, and we obtain the overall contractive regime.

In the puzzling case, we have an opposite parameter constellation: $0 < (\beta v/h)(1 - s_R) - \theta$. A low propensity to save out of rentiers' income, a low responsiveness of investment with respect to distributed profits and internal funds, and a high elasticity with respect to capacity utilization allow for a positive effect of an increasing rentiers' rate of return on the equilibrium rates of capacity utilization, profit and capital accumulation. In the puzzling case, the effects of an increasing rentiers' rate of return on the equilibrium rates of capacity utilization, profit and capital accumulation may overcompensate for the negative effects of rising shareholder power via management's animal spirits. If this condition holds, we will obtain a finance-led accumulation regime and, hence, an overall positive effect of increasing shareholder power on the rates of capacity utilization, profit and capital accumulation.

Finally, an intermediate case may arise if $(\beta v/h)(1 - s_R) - \theta < 0 < (1 - s_R) - \theta$. In this case, an increase in the rentiers' rate of return is accompanied by rising rates of capacity utilization and profit, but by a falling equilibrium rate of capital accumulation. What is required for the intermediate case, on the one hand, is a low rentiers' propensity to save, which boosts consumption demand in the face of redistribution in favour of rentiers, and a low responsiveness of firms' investment with respect to distributed profits and, hence, internal funds, which limits the negative effects of redistribution on firms' investment. On the other hand, however, in the intermediate case we also have a low responsiveness of investment with respect to capacity utilization, which, in sum, is not able to overcompensate for the negative effects of a rise in the rentiers' rate of return through internal funds. Under the conditions of the intermediate case, the negative effects of increasing shareholder power via management's preferences (animal spirits) may be overcompensated by the effects of a rising rentiers' rate of return with respect to capacity utilization and the profit rate, but the negative effect on capital accumulation is not. For the former, it is again required that increasing shareholder power is associated with a strong effect of the increase in the rentiers' rate of return, but with a low effect via management's animal spirits. If these conditions hold, we will obtain a profits without investment regime.

Long-run equilibrium and (in)stability

In the long run of the model, the financial structure of the economy and hence the inside and outside finance–capital ratios are no longer exogenous, but have to be determined endogenously. Since $\gamma + \phi = 1$, it is sufficient to analyse the dynamics of γ in the face of changing shareholder power and rentiers' rates of return. The accumulation of bonds and equity held by rentiers is given by rentiers' income and the propensity to save out of this income:

$$d(E_R + B) = s_R \rho (E_R + B). \tag{10.16}$$

For the growth rate of debt plus equity held by rentiers we get:

$$\frac{d(E_R + B)}{(E_R + B)} = s_R \rho. \tag{10.17}$$

If we assume that prices remain constant, which means that mark-ups and distribution may change but not the price level, the growth rate of the outside finance–capital ratio depends on the growth rate of outside finance and on the growth rate of the real capital stock. From equations (10.5) and (10.17) we get:

$$\hat{\gamma} = \frac{d(E_R + B)}{(E_R + B)} - \hat{K} = s_R \rho - g. \tag{10.18}$$

In the long-run equilibrium the endogenously determined value of γ has to be constant: $\hat{\gamma} = 0$. Introducing this condition into equation (10.18) and making use of equation (10.14) yields the following long-run equilibrium value for the outside finance–capital ratio:

$$\gamma^{**} = \frac{s_R\rho\left(\frac{h}{v} - \beta\right) - \frac{h}{v}(\alpha + \tau h)}{\rho\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]}. \tag{10.19}$$

This long-run equilibrium will be stable if $\partial\hat{\gamma}/\partial\gamma < 0$. Starting from equation (10.18) and making use of equation (10.14) yields:

$$\frac{\partial\hat{\gamma}}{\partial\gamma} = \frac{-\rho\left[\beta(1 - s_R) - \theta\frac{h}{v}\right]}{\frac{h}{v} - \beta}. \tag{10.18a}$$

Taking into account that we assume the goods market equilibrium to be stable, it follows for the long-run stability condition of the outside finance–capital ratio:

$$\frac{\partial\hat{\gamma}}{\partial\gamma} < 0 \quad \text{if:} \quad \beta(1 - s_R) - \theta\frac{h}{v} > 0 \quad \Leftrightarrow \quad \beta\frac{v}{h}(1 - s_R) - \theta > 0. \tag{10.18a'}$$

As can easily be checked with Tables 10.6 and 10.7, this is the condition which gives the puzzling case as a precondition for the finance-led growth regime. Only in this regime hence will the financial structure be stable in the long run, whereas the financial structure in the contractive and the profits without investment regimes will be unstable. In these regimes, slight deviations of the actual outside finance–capital ratio from its equilibrium value will make it further diverge from this value.

For the long-run equilibrium rate of capital accumulation which is associated with a constant outside finance–capital ratio, we obtain from equation (10.18):

$$g^{**} = s_R\rho. \tag{10.20}$$

This long-run equilibrium rate of capital accumulation is again a 'warranted rate' (g^{**}), because it is the rate of accumulation which is required for the constancy of the outside finance–capital ratio. For this purpose, the capital stock has to grow at the same rate as the stock of debt and equity held by rentiers. However, it is by no means guaranteed that the short-run goods market equilibrium rate of capital accumulation from equation (10.14) will adjust to the warranted rate in equation (10.20): Only in the finance-led growth regime will a higher rate of growth of the stock of debt and equity held by rentiers trigger a higher rate of growth of the capital stock. Therefore, only in this regime will a higher rentiers' rate of return associated with financialization and increasing shareholder power be associated with a stable financial structure of the firm sector. In the profits without investment and the contractive regimes, however, capital stock growth will fall under these conditions. This will make the rate of capital accumulation further diverge from the warranted rate – and the actual outside finance–capital ratio will rise cumulatively and diverge from its long-run equilibrium value.

The disequilibrium mechanisms in the long-run unstable case are the same as those explained in Chapter 9 on the instability of the debt–capital ratio and the respective warranted rate of capital accumulation. Similar to the results from Chapter 9, and discussed more extensively in Hein (2010b, 2012a, chap. 3), these disequilibrium processes may then show a macroeconomic 'paradox of outside finance' in the case of the present model: a rise (fall) in the outside finance–capital ratio will induce firms to reduce (raise) capital accumulation in order to reduce (raise) their individual outside finance–capital ratio. However, the macroeconomic outcome will be such that the outside finance–capital ratio will continue to rise (fall) and capital accumulation will continue to fall (rise). Furthermore, it should be noted that a rise in the mark-up and the profit share in the long run may turn a stable finance-led growth regime into an unstable profits without investment regime, as the conditions (10.14a') and (10.18a') show.[11]

These are the major results of this simple model: Even if the goods markets are stable, contractive regimes and profits without investment regimes, the latter having prevailed during the pre-2007 crisis financialization period in several economies (van Treeck et al. 2007; van Treeck 2009a, 2009b; Hein 2012a, chap. 6; Hein and Mundt 2012, 2013; van Treeck and Sturn 2012, 2013), are prone to considerable systemic long-run instability potentials regarding the financial structure of the firm sector of the economy and regarding capital accumulation. Of course, there may be other forces in the economy which either dampen or exacerbate instability in more complex models, as has been analysed by Meirelles and Lima (2006), Lima and Meirelles (2007), Charles (2008a, 2008b), Fujita and Sasaki (2011) and Ryoo (2013), who have added the Minskyan distinction between 'hedge', 'speculative' and 'Ponzi' finance to similar models and derived more complex results for the (in)stability issues.

So far, profits without investment regimes in this section have been based on low propensities to save out of distributed profits, without yet considering wealth effects on consumption and household debt. This will be the focus of the next section.

10.4 FINANCIALIZATION, HOUSEHOLD DEBT AND CONSUMPTION

10.4.1 Empirical Evidence

Several econometric studies have shown that (financial and housing) wealth is a statistically significant determinant of consumption – not only in the US. For the US, Ludvigson and Steindel (1999) and Mehra (2001) have estimated marginal propensities to consume out of wealth between 3 and 7 per cent, applying time series econometrics to different periods. Onaran et al. (2011), carefully distinguishing between propensities to consume out of wages, non-rentier profits, rentier profits, financial wealth and housing wealth, find smaller values for the US (1962–2007): the propensity to consume out of net financial wealth is estimated to be 0.7 per cent, whereas the estimate for the propensity to consume out of gross housing wealth is 2 per cent. Boone and Girouard (2002) find marginal propensities to consume out of wealth between 2 and 4 per cent for the US, the UK, France, Italy and Japan (1980–99), with a higher value only for Canada. Applying dynamic panel regression for 14 OECD countries (1979–99), Dreger and Slacalek (2007) obtain that the marginal propensity to consume out of financial and housing wealth in capital-market-based countries is 3.7 per cent, whereas in bank-based countries it is only 0.7 per cent.

Furthermore, Cynamon and Fazzari (2008, 2013), Zezza (2008), Barba and Pivetti (2009), Guttmann and Plihon (2010), Palley (2012a, chap. 3) and van Treeck and Sturn (2012, 2013), among others, have presented extensive case studies on the importance of wealth-based and debt-financed consumption, focusing on the US. Some of them highlight in particular imitation and conspicuous consumption effects in the face of increasing inequality of household incomes ('keeping up with the Joneses'), building on the relative income hypothesis (Duesenberry 1949); others focus on the role of financial innovations, in particular securitization of credit card and mortgage debt. We consider both to be important. With respect to consumption demand, increases in household debt, based on (notional) financial or housing wealth and/or conspicuous consumption, as well as on financial innovations, may thus become a substitute for higher wages:

> Household debt thus appears to be capable of providing the solution to the fundamental contradiction between the necessity of high and rising levels of consumption, for the growth of the system's actual output, and a framework of antagonistic conditions of distribution, which keeps within limits the real income of the vast majority of the society. (Barba and Pivetti 2009, p. 127)

However, in a recent empirical study, Kim (2013) has found that, although new credit to households will boost aggregate demand and output, the effect of household debt variables on output in the US was negative for the 1982–2009 period, whereas for the 1951–81 period no effect could be detected. The contradictory effects of the flow of new credit and the stock of debt on consumption have also been in the focus of several theoretical assessments of the issue, as will be outlined in the next section.

10.4.2 Debt-Financed Consumption in Post-Keynesian–Kaleckian Macroeconomic Models

Bhaduri et al. (2006) have explicitly focused on the wealth effect on consumption in their model, implying that increases in financial wealth stimulate households' willingness to consume.[12] However, stock market wealth (and also housing wealth) is purely 'virtual wealth', and increasing consumption is hence associated with increasing gross indebtedness of private households. Therefore, a wealth-based credit boom may be maintained over a considerable period of time. Finally, however, the expansive effects of consumer borrowing may be overwhelmed in the long run by rising interest obligations, which reduce households' creditworthiness and eventually require higher saving. A debt-led consumption boom will then turn into a debt-burdened recession. Although the authors consider the debt–income ratio of households as a major determinant of creditworthiness and hence of access to new borrowing, the dynamics of this ratio are not traced in the medium or long run of their model. Potential paradoxes of debt are not at issue, and distributional and investment effects of finance-dominated capitalism on household indebtedness and growth are also missing in the long-run dynamics. The same is true for Bhaduri's (2011a, 2011b) extensions of this approach, which attempt to show how a debt-financed consumption boom supported by rising asset prices ultimately leads to a credit crunch and debt deflation, and how the tendency towards Ponzi finance increases the fragility of the financial sector.

Kapeller and Schütz (2012) have integrated the Veblenian concept of conspicuous consumption into a post-Kaleckian distribution and growth model in the tradition of Bhaduri and Marglin (1990). They argue that relative consumption and imitation issues matter primarily within a social group, here within the working class. It is assumed that an increase in the profit share is distributed unevenly among workers. Efforts to 'keep up with the Joneses' may then increase consumption and generate a consumption driven profit-led regime. However, this regime is based on increasing the debt of those workers who have suffered from income losses, and thus may not be sustainable. However, the debt dynamics and the sustainability conditions are not examined explicitly.

The contradictory macroeconomic effects of household indebtedness for consumption purposes have already been included by Palley (1994b) in a multiplier–accelerator business cycle model: An increase in household debt initially stimulates aggregate demand, transferring purchasing power from lending high income households with a low propensity to consume to borrowing low income households with a high propensity to consume. But interest payments on debt subsequently become a burden on aggregate demand, because purchasing power is redistributed in the opposite direction. However, this business cycle model in level variables does not treat the development of a stock–flow (debt–income) or a stock–stock (debt–capital) ratio, and neither are the changes in income distribution or in the propensities to invest in real capital stock examined.

Kim et al. (2014), applying the relative income hypothesis to a stationary economy with zero net investment, have slightly modified Palley's basic result, arguing that the dampening effects of an increasing stock of household debt on consumption only show up if debtor households do not or cannot use their saving as a buffer in order to service debt and to maintain the level of consumption simultaneously. The obvious limitation of this argument is that we have increasing debt (and hence debt services) but constant income in the model, so that such a kind of behaviour will only be able to postpone but not to eliminate the depressing effect of the stock of debt on consumption. As soon as net debt-servicing obligations exceed saving out of current income, consumption has to contract – or debtor households have to default – and the economy will have to face a 'sudden stop' and/or a financial crisis.

Dutt (2005c, 2006b) has analysed the effects of conspicuous consumption and easier access to consumer credit associated with deregulation of the financial sector within a neo-Kaleckian model of growth and income distribution, making use of a mechanism similar to that of Palley (1994b). Credit-based consumption of workers, facilitated by the deregulation of the financial system allowing home equity lending, adjustable consumer loans and securitization, stimulates effective demand and growth in the short run. However, in the long run, contractive effects arise because interest payments imply redistribution of income from workers to capitalists who have a lower propensity to consume. These effects may overwhelm the expansive effects so that higher workers' debt has long-run contractive effects on capital accumulation and growth under certain conditions. However, with a low rate of interest, high levels of autonomous investment and a low profit share, the long-run effects of workers' debt may remain expansive, according to Dutt.

The model outlined in Subsection 10.4.3 is similar to Dutt's models. However, Dutt's models include a built-in stabilizer, because he assumes that the desired lending of capitalists (or rentiers) to workers, or the desired debt of workers from the perspective of the capitalists (or rentiers), is determined and thus restricted by workers' income net of interest payments. He thus excludes cumulative increases, and hence instability, of workers' debt–income or debt–capital ratios. The model below will not make such a restrictive assumption and rather assume that creditors, because of the institutional changes in the age of financialization mentioned above, do not care much about workers' net income or wealth when granting credit. This allows us to focus on the issue of the long-run stability of workers' debt–capital ratios, and to treat the major effects of finance-dominated capitalism in a direct and explicit way.

10.4.3 A Neo-Kaleckian Model of Financialization, Redistribution, Household Debt and Growth[13]

The basic model and the short-run equilibrium

The assumptions in the extended neo-Kaleckian model in this subsection regarding production, pricing and distribution are as in the model outlined in Section 10.3. We assume a closed one-good economy without a government, operating with a fixed coefficient technology in which functional income distribution is determined by mark-up pricing of firms in the incompletely competitive goods market. The share of profits in national income ($h = \Pi/pY$) is therefore a function of those variables determining the mark-up (m), in particular the degree of competition in the goods market, the bargaining power of trade unions in the labour market and overhead costs and gross profit targets:

$$h = h(m). \tag{10.21}$$

There are two types of households, rentiers and workers, and a firm sector in the model. It is assumed that the capital stock of the firm sector (pK) is completely financed by equity issued by the firms and held by the rentiers' households (E_R). Rentiers receive all the profits made by the firms (Π) as dividend payments (Π_R), and there are no retained earnings of the firm sector in this model:

$$\Pi = \Pi_R = hpY. \tag{10.22}$$

From this it also follows that the dividend rate ($\delta = \Pi_R/E_R$) is equal to the rate of profit on capital stock ($r = \Pi/pK$), which can be decomposed into the profit share (h), the rate of utilization of productive capacities given by the capital stock (u), and the capital–potential output ratio (v):

$$\delta = \frac{\Pi_R}{E_R} = \frac{\Pi}{pK} = \frac{\Pi}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = hu\frac{1}{v} = r. \tag{10.23}$$

Workers' consumption (pC_W) is determined by their wage income [$W = (1 - h)pY$], on the one hand, and by credit received from rentiers (dB_W) net of interest payments on their stock of debt (iB_W) to rentiers, on the other hand:

$$pC_W = W + dB_W - iB_W = (1 - h)pY + dB_W - iB_W. \tag{10.24}$$

Loans from rentiers to workers thus have a twofold effect. On the one hand, they increase available financial resources and boost consumption. On the other hand, they increase workers' stock of debt, and thus interest payments, which reduce workers' consumption. The net effect may be positive or negative. The rate of interest is again given by monetary policies of the central bank, setting the base rate of interest in the money market, and by rentiers' liquidity and risk assessments as well as the degree of competition in the credit and financial market, determining the mark-up on the base rate, and thus the rate of interest in this market. The rate of interest is an exogenous variable in the model.

Rentiers' consumption (pC_R) is determined by their total income, consisting of distributed profits of firms ($hpY = \Pi_R$) plus the interest payments from workers (iB_W), and their propensity to consume (c_R):

$$pC_R = c_R(hpY + iB_W), \quad 0 < c_R < 1. \tag{10.25}$$

There are only two types of assets available for rentiers' saving: equity issued by the firm sector and debt of workers. It is assumed that rentiers' saving (S_R), determined by their propensity to save ($s_R = 1 - c_R$) out of total income, is split into fixed proportions between additional lending to workers and buying additional equity issued by the firms:

$$dB_W = \pi S_R = \pi s_R(hpY + iB_W), \tag{10.26}$$

$$dE_R = (1 - \pi)S_R = (1 - \pi)s_R(hpY + iB_W). \tag{10.27}$$

Table 10.8 Balance sheet matrix

	Workers	Rentiers	Firms	Σ
Loans	$-B_W$	$+B_W$		0
Equities		$+E_R$	$-E_R$	0
Capital			pK	pK
Σ	$-B_W$	$+B_W+E_R$	0	$pK = E_R$

Different from Dutt (2005c, 2006b), rentiers tend not to care much about workers' net income or indebtedness when granting credit, because of the institutional changes in the age of financialization. Therefore, as a first approximation, rentiers' loans to workers are considered to be a fixed proportion (π) of rentiers' saving. This proportion is determined by several factors: workers' willingness to go into debt, rentiers' willingness to supply credit to workers, hence workers' creditworthiness as perceived by rentiers and affected potentially but not necessarily by workers' debt–capital or debt–income ratios, the regulation of the credit market, and thus the standards for creditworthiness, and other factors influencing creditworthiness. The basic structure of the model is summarized by the balance sheet matrix in Table 10.8 and the transaction flow matrix in Table 10.9.

Introducing workers' debt into the neo-Kaleckian distribution and growth model, we start by normalizing equations (10.24) to (10.26) by the capital stock:

$$\frac{pC_W}{pK} = (1 - h)\frac{u}{v} + \hat{B}_W\lambda_W - i\lambda_W, \tag{10.28}$$

$$\frac{pC_R}{pK} = c_R\left(h\frac{u}{v} + i\lambda_W\right), \tag{10.29}$$

$$\frac{dB_W}{pK} = \hat{B}_W\lambda_W = \pi s_R\left(h\frac{u}{v} + i\lambda_W\right). \tag{10.30}$$

The workers' debt–capital ratio ($\lambda_W = B_W/pK$) is treated as a constant in the short-run analysis but will be endogenously determined in the long run of the model. Finally, $\hat{B}_W = dB_W/B_W$ is the rate of change of workers' debt. Including the creditor–debtor relationship between rentiers and workers into the three basic equations of the neo-Kaleckian model and the stability condition for the goods market equilibrium yields:

Table 10.9 Transaction flow matrix

	Workers	Rentiers	Firms' current	Firms' capital	Σ
Consumption	$-pC_W$	$-pC_R$	$+pC_W+pC_R$		0
Investment			$+pI$	$-pI$	0
Wages	$+W$		$-W$		0
Retained profits					0
Distributed profits (dividends)		$+\Pi_R$	$-\Pi_R$		0
Change in equity		$-dE_R$		$+dE_R$	0
Interest on loans	$-iB_W$	$+iB_W$			0
Change in loans	$+dB_W$	$-dB_W$			0
Σ	0	0	0	0	0

$$g = \frac{pI}{pK} = \alpha + \beta u, \quad \alpha,\beta > 0, \tag{10.31}$$

$$\sigma = \frac{S}{pK} = s_R\left(h\frac{u}{v} + i\lambda_W\right), \quad 0 < s_R \leq 1, \tag{10.32}$$

$$g = (1 - \pi)\sigma, \tag{10.33}$$

$$(1 - \pi)s_R\frac{h}{v} - \beta > 0. \tag{10.34}$$

The rate of investment in capital stock (g) is determined by (expected) sales and, hence, by the rate of capacity utilization and by animal spirits of the firm sector (α), so that the basic neo-Kaleckian function for capital accumulation in equation (10.31) is obtained. Equation (10.32) defines the saving rate (σ), saving in relation to the capital stock, which is determined by rentiers' income normalized by the capital stock and their propensity to save. Equation (10.33) is the goods market equilibrium condition, and condition (10.34) presents the usual Kaleckian–Keynesian goods market stability condition.

For the short-run equilibrium the workers' debt–capital ratio is taken as given and constant. From equations (10.31) to (10.33) and (10.23), the short-run equilibrium rates of capacity utilization, capital accumulation and profit are obtained:

$$u^* = \frac{\alpha - (1 - \pi)s_R i\lambda_W}{(1 - \pi)s_R\frac{h}{v} - \beta}. \tag{10.35}$$

$$g^* = \frac{(1-\pi)s_R\left(\alpha\frac{h}{v} - \beta i\lambda_W\right)}{(1-\pi)s_R\frac{h}{v} - \beta}, \tag{10.36}$$

$$r^* = \frac{\frac{h}{v}[\alpha - (1-\pi)s_R i\lambda_W]}{(1-\pi)s_R\frac{h}{v} - \beta}. \tag{10.37}$$

Let us again only consider short-run stable equilibria. As can easily be seen from equations (10.35) to (10.37), a change in animal spirits is positively associated with the goods market equilibrium. An increase in the rate of interest will have a negative effect on the goods market equilibrium, because income is redistributed from workers to rentiers who have a lower propensity to consume. For the same reason, an increase in the short-run exogenous workers' debt–capital ratio means lower goods market equilibrium rates of capacity utilization, capital accumulation and profit. Furthermore, a higher propensity to save out of rentiers' income implies lower values for the short-run goods market equilibrium, which means that the paradox of saving remains valid:

$$\frac{\partial u^*}{\partial s_R} = \frac{-(1-\pi)\left(i\lambda_W + h\frac{u}{v}\right)}{(1-\pi)s_R\frac{h}{v} - \beta} < 0, \tag{10.35a}$$

$$\frac{\partial g^*}{\partial s_R} = \frac{-\beta(1-\pi)\left(i\lambda_W + h\frac{u}{v}\right)}{(1-\pi)s_R\frac{h}{v} - \beta} < 0, \tag{10.36a}$$

$$\frac{\partial r^*}{\partial s_R} = \frac{-\frac{h}{v}(1-\pi)\left(i\lambda_W + h\frac{u}{v}\right)}{(1-\pi)s_R\frac{h}{v} - \beta} < 0. \tag{10.37a}$$

A higher profit share will cause lower values for the short-run equilibrium rates of capacity utilization, capital accumulation and profit. Demand and capital accumulation/growth are thus wage-led and the paradox of costs is valid:

$$\frac{\partial u^*}{\partial h} = \frac{-(1-\pi)s_R\frac{u}{v}}{(1-\pi)s_R\frac{h}{v}-\beta} < 0, \tag{10.35b}$$

$$\frac{\partial g^*}{\partial h} = \frac{-\beta(1-\pi)s_R\frac{u}{v}}{(1-\pi)s_R\frac{h}{v}-\beta} < 0, \tag{10.36b}$$

$$\frac{\partial r^*}{\partial h} = \frac{-\beta\frac{u}{v}}{(1-\pi)s_R\frac{h}{v}-\beta} < 0. \tag{10.37b}$$

Finally, an increase in the share of rentiers' saving lent to workers is expansive in the short run with workers' debt–capital ratio given and raises the three endogenous variables. The short-run equilibrium values are thus debt-led:

$$\frac{\partial u^*}{\partial \pi} = \frac{s_R\left(i\lambda_W + h\frac{u}{v}\right)}{(1-\pi)s_R\frac{h}{v}-\beta} > 0, \tag{10.35c}$$

$$\frac{\partial g^*}{\partial \pi} = \frac{\beta s_R\left(i\lambda_W + h\frac{u}{v}\right)}{(1-\pi)s_R\frac{h}{v}-\beta} > 0, \tag{10.36c}$$

$$\frac{\partial r^*}{\partial \pi} = \frac{\frac{h}{v}s_R\left(i\lambda_W + h\frac{u}{v}\right)}{(1-\pi)s_R\frac{h}{v}-\beta} > 0. \tag{10.37c}$$

Long-run equilibrium and stability

In the long run, the workers' debt–capital ratio is considered to be variable and has to be determined endogenously. A long-run equilibrium requires the endogenously determined value of this ratio to be constant. If we assume again goods market prices to be constant – mark-ups may change but the price level remains the same, which means that unit labour costs will have to vary inversely with the mark-up – the rate of change in the workers' debt–capital ratio is given as:

$$\hat{\lambda}_W = \hat{B}_W - \hat{K} = \hat{B}_W - g. \tag{10.38}$$

In long-run equilibrium $\hat{\lambda}_W = 0$ is required, and therefore:

$$\hat{B}_W = g. \tag{10.39}$$

From equations (10.30) and (10.35) it is obtained:

$$\hat{B}_W = \frac{\pi s_R\left(\alpha\frac{h}{v} - \beta i\lambda_W\right)}{\lambda_W\left[(1-\pi)s_R\frac{h}{v} - \beta\right]}. \tag{10.40}$$

Inserting equation (10.36) and equation (10.40) into equation (10.39) yields two long-run equilibrium values for the workers' debt–capital ratio:

$$\lambda_{W1}^{**} = \frac{\pi}{1-\pi} \tag{10.41}$$

and

$$\lambda_{W2}^{**} = \frac{\alpha h}{\beta i v}. \tag{10.42}$$

Stability of the long-run equilibrium workers' debt–capital ratio requires again that $\partial\hat{\lambda}_W/\partial\lambda_W < 0$. Starting from equation (10.38), inserting equations (10.36) and (10.40) yields:

$$\hat{\lambda}_W = \frac{s_R\left[\alpha\pi\frac{h}{v}\lambda_W^{-1} + \beta(1-\pi)i\lambda_W - \alpha(1-\pi)\frac{h}{v} - \beta\pi i\right]}{(1-\pi)s_R\frac{h}{v} - \beta}. \tag{10.43}$$

From this it is obtained:

$$\frac{\partial\hat{\lambda}_W}{\partial\lambda_W} = \frac{s_R\left[\beta(1-\pi)i - \alpha\pi\frac{h}{v}\lambda_W^{-2}\right]}{(1-\pi)s_R\frac{h}{v} - \beta}. \tag{10.43a}$$

Since the denominator will be positive, if only stable short-run goods market equilibria are considered, stability of the long-run equilibrium is given if the numerator in equation (10.43a) is negative. Therefore, stability is obtained under the following condition:

$$\frac{\partial \hat{\lambda}_W}{\partial \lambda_W} < 0 \quad \text{if: } \lambda_W < \sqrt{\frac{\pi}{(1-\pi)}\frac{\alpha h}{\beta i v}} \Rightarrow \lambda_W < \sqrt{\lambda_{W1}^{**}\lambda_{W2}^{**}}. \qquad (10.43a')$$

Instability will hence prevail under the following condition:

$$\frac{\partial \hat{\lambda}_W}{\partial \lambda_W} > 0 \quad \text{if: } \lambda_W > \sqrt{\frac{\pi}{(1-\pi)}\frac{\alpha h}{\beta i v}} \Rightarrow \lambda_W > \sqrt{\lambda_{W1}^{**}\lambda_{W2}^{**}}. \qquad (10.43a'')$$

Since two equilibrium values for the workers' debt–capital ratio are obtained and the benchmark for stability is given by the root of the product of these two values, only the lower value is stable whereas the upper value is unstable. This is shown in Figure 10.9, where it is assumed that $\lambda_{W1}^{**} = \pi/(1-\pi) < \lambda_{W2}^{**} = (\alpha h)/(\beta i v)$. In this case, λ_{W1}^{**} is stable, whereas λ_{W2}^{**} is unstable. As shown below this is the only constellation which is consistent with economically meaningful stable goods market equilibrium values for capacity utilization and capital accumulation.

The long-run equilibrium values for the rates of capacity utilization,

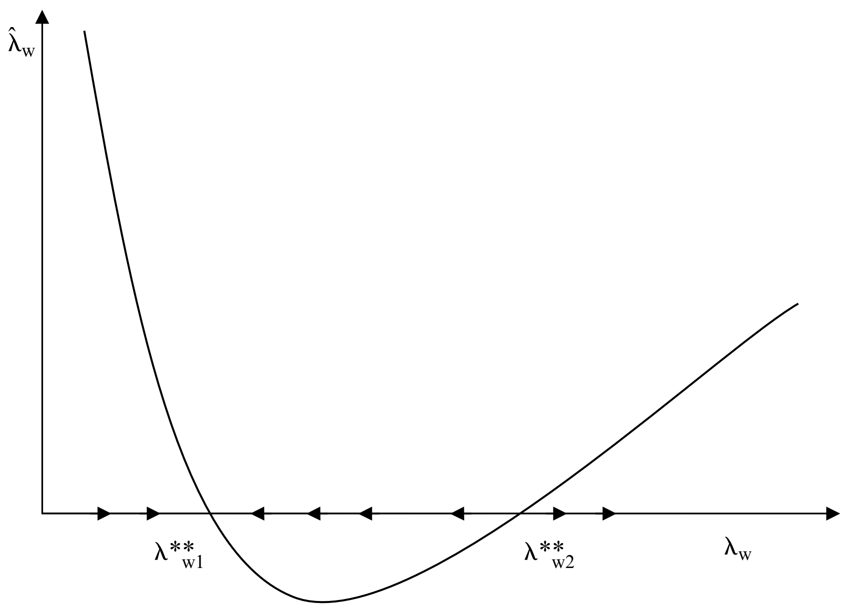


Figure 10.9 Long-run equilibrium values for workers' debt-capital ratio and their stability with positive stable goods market equilibrium at λ_{w1}^{**}

capital accumulation and profit associated with the first long-run equilibrium value for the workers' debt–capital ratio in equation (10.41) are:

$$u_1^{**} = \frac{\alpha - \pi s_R i}{(1-\pi)s_R\frac{h}{v} - \beta}, \tag{10.44}$$

$$g_1^{**} = \frac{s_R\left[\alpha(1-\pi)\frac{h}{v} - \beta\pi i\right]}{(1-\pi)s_R\frac{h}{v} - \beta}, \tag{10.45}$$

$$r_1^{**} = \frac{\frac{h}{v}(\alpha - \pi s_R i)}{(1-\pi)s_R\frac{h}{v} - \beta}. \tag{10.46}$$

For a positive long-run equilibrium rate of capacity utilization, with short-run goods market equilibrium stability assumed to hold, we need $\alpha > \pi s_R i$, and for a positive equilibrium rate of capital accumulation it is required that: $\alpha > [\pi/(1-\pi)][(\beta i v)/h]$. Note that the latter implies that:

$$\lambda_{W1}^{**} = \frac{\pi}{1-\pi} < \lambda_{W2}^{**} = \frac{\alpha h}{\beta i v}. \tag{10.47}$$

For the second (unstable) long-run equilibrium value for the workers' debt–capital ratio given in equation (10.42) the related long-run equilibrium rates of capacity utilization, capital accumulation and profit are:

$$u_2^{**} = \frac{\alpha\left[1 - (1-\pi)\frac{s_R h}{\beta v}\right]}{(1-\pi)s_R\frac{h}{v} - \beta}, \tag{10.48}$$

$$g_2^{**} = 0, \tag{10.49}$$

$$r_2^{**} = \frac{\frac{h}{v}\alpha\left[1 - (1-\pi)\frac{s_R h}{\beta v}\right]}{(1-\pi)s_R\frac{h}{v} - \beta}. \tag{10.50}$$

For stable short-run goods market equilibria we get $u_2^{**} < 0$ and $r_2^{**} < 0$, because the goods market stability condition (10.34) implies that $[(1-\pi)s_R h]/(\beta v) > 1$, which would make the numerators in equations

(10.48) and (10.50) negative. The long-run equilibrium value for capital accumulation is zero for the second value of the long-run equilibrium workers' debt–capital ratio.

Only looking at the stable long-run equilibrium values for the workers' debt–capital ratio in equation (10.41), the related long-run equilibrium rates of capacity utilization, capital accumulation and profit in equations (10.44) to (10.46) and the unstable equilibrium workers' debt–capital ratio in equation (10.42) as the upper bound for the stability corridor, we obtain the following results. Improved animal spirits will have no effect on the stable equilibrium workers' debt–capital ratio, raise the upper bound of stability given by the unstable equilibrium workers' debt–capital ratio, and improve the long-run equilibrium rates of capacity utilization, capital accumulation and profit. A higher rate of interest will have no effect on the stable equilibrium workers' debt–capital ratio, it will lower the upper bound of stability, and it will also decrease the long-run equilibrium rates of capacity utilization, capital accumulation and profit. A higher propensity to save from rentiers' income has no effect on the two long-run equilibrium workers' debt–capital ratios, and it will depress the equilibrium rates of capacity utilization, capital accumulation and profit – the paradox of thrift is therefore valid in the long run, too:

$$\frac{\partial u_1^{**}}{\partial s_R} = \frac{-[\pi i + (1-\pi)r]}{(1-\pi)s_R\frac{h}{v} - \beta} < 0, \tag{10.44a}$$

$$\frac{\partial g_1^{**}}{\partial s_R} = \frac{-\beta[\pi i + (1-\pi)r]}{(1-\pi)s_R\frac{h}{v} - \beta} < 0, \tag{10.45a}$$

$$\frac{\partial r_1^{**}}{\partial s_R} = \frac{-\frac{h}{v}[\pi i + (1-\pi)r]}{(1-\pi)s_R\frac{h}{v} - \beta} < 0. \tag{10.46a}$$

A higher profit share has no effect on the stable equilibrium workers' debt–capital ratio, and it lifts the upper bound of stability given by the unstable equilibrium workers' debt–capital ratio. The effects on the long-run equilibrium rates of capacity utilization, capital accumulation and profit remain wage-led:

$$\frac{\partial u_1^{**}}{\partial h} = \frac{-(1-\pi)s_R\frac{u}{v}}{(1-\pi)s_R\frac{h}{v} - \beta} < 0, \tag{10.44b}$$

$$\frac{\partial g_1^{**}}{\partial h} = \frac{-\beta(1-\pi)s_R\frac{u}{v}}{(1-\pi)s_R\frac{h}{v}-\beta} < 0, \tag{10.45b}$$

$$\frac{\partial r_1^{**}}{\partial h} = \frac{-\beta\frac{u}{v}}{(1-\pi)s_R\frac{h}{v}-\beta} < 0. \tag{10.46b}$$

Finally, an increase in the proportion of rentiers' saving lent to workers raises the stable equilibrium workers' debt–capital ratio and has no effect on the upper bound of stability, which means that the upper stability corridor gets squeezed. The effects on the equilibrium rates of capacity utilization, capital accumulation and profit are not unique and depend on the rate of profit, which is endogenously determined via the endogenous rate of capacity utilization and which is equal to the dividend rate in our model, and on the exogenous rate of interest:

$$\frac{\partial u_1^{**}}{\partial \pi} = \frac{s_R(r-i)}{(1-\pi)s_R\frac{h}{v}-\beta} = \frac{s_R(\delta-i)}{(1-\pi)s_R\frac{h}{v}-\beta}, \tag{10.44c}$$

$$\frac{\partial g_1^{**}}{\partial \pi} = \frac{\beta s_R(r-i)}{(1-\pi)s_R\frac{h}{v}-\beta} = \frac{\beta s_R(\delta-i)}{(1-\pi)s_R\frac{h}{v}-\beta}, \tag{10.45c}$$

$$\frac{\partial r_1^{**}}{\partial \pi} = \frac{\frac{h}{v}s_R(r-i)}{(1-\pi)s_R\frac{h}{v}-\beta} = \frac{\frac{h}{v}s_R(\delta-i)}{(1-\pi)s_R\frac{h}{v}-\beta}. \tag{10.46c}$$

If the rate of interest falls short of the (endogenously determined) rate of profit, a higher proportion of rentiers' saving lent to workers will be expansive, and aggregate demand, capital accumulation and the rate of profit will be debt-led. The stimulating effect of additional credit also dominates the contractive effect of the stock of workers' debt in the long run. However, if the interest rate on the stock of debt exceeds the endogenously determined profit rate, a higher proportion of rentiers' saving lent to workers will be contractive, and aggregate demand, capital accumula-

Table 10.10 Short-run and long-run effects of changes in exogenous model variables, assuming $\alpha > \pi s_R i$

	α	h	π	i	s_R	λ_W
Short run						
u* (stable)	+	– (wage-led)	+ (debt-led)	–	–	–
g* (stable)	+	– (wage-led)	+ (debt-led)	–	–	–
r* (stable)	+	– (wage-led)	+ (debt-led)	–	–	–
Long run						
λ_{W1}^{**} (stable)	0	0	+	0	0	. . .
λ_{W2}^{**} (unstable)	+	+	0	–	0	. . .
u_1^{**} (stable)	+	– (wage-led)	+ for $r = \delta > i$ (debt-led) – for $r = \delta < i$ (debt-burdened)	–	–	. . .
g_1^{**} (stable)	+	– (wage-led)	+ for $r = \delta > i$ (debt-led) – for $r = \delta < i$ (debt-burdened)	–	–	. . .
r_1^{**} (stable)	+	– (wage-led)	+ for $r = \delta > i$ (debt-led) – for $r = \delta < i$ (debt-burdened)	–	–	. . .

tion and the rate of profit will be debt-burdened. The stimulating effect of additional credit is now overcompensated by the contractive effect of the stock of workers' debt. Table 10.10 summarizes the short- and long-run effects of changes in exogenous variables in our model.

Short- and long-run effects of financialization

Based on the results summarized in Table 10.10 we can now discuss the short- and long-run effects of financialization in our model. In the short run, taking the workers' debt–capital ratio as given, falling animal spirits of the firm sector with respect to investment in real capital and redistribution at the expense of workers both have negative effects on capacity utilization, capital accumulation and the rate of profit. However, these contractive effects of financialization may be compensated by increasing lending of rentiers to workers for consumption purposes. A lower rentiers' propensity to save and a lower rate of interest on workers' debt also help to stabilize private consumption and thus contribute to compensate for the depressing effects of low animal spirits and redistribution of income at the expense of workers.

In the long run, the endogeneity of the workers' debt–capital ratio has to be taken into account. The model yields two potential long-run equilibrium values for this ratio. For economically meaningful results for stable equilibrium capacity utilization, the lower equilibrium value for the workers' debt–capital ratio is stable, whereas the upper value is unstable. Therefore, within the limits given by the unstable upper equilibrium value, the workers' debt–capital (and debt–income) ratio will converge towards a definite value. Only if it exceeds the upper equilibrium will it become unstable and explode.

Lower animal spirits of the firm sector with respect to real investment, and a higher rate of interest each have a negative effect on the upper equilibrium value for workers' debt–capital ratio and thus compress the corridor of stability, whereas a higher profit share extends it. A higher proportion of rentiers' saving lent to workers increases the stable equilibrium value of workers' debt–capital ratio, but this compresses the corridor of upwards stability.

The long-run effects of lower animal spirits, a higher profit share, and also a higher rate of interest or a higher rentiers' propensity to save, on equilibrium capacity utilization, capital accumulation and the rate of profit are each negative. However, increasing lending of rentiers to workers can also be expansive in the long run, taking the negative feedback effects of increasing debt and higher interest payments on workers' consumption into account, provided that the exogenous rate of interest is lower than the endogenously determined rate of profit. But, if the rate of interest is higher than the rate of profit, the negative feedback effect of increasing debt and higher interest payments overcompensates the short-run expansive effect of increasing lending to workers and turns it contractive in the long run.

Depending on the rate of interest relative to the rate of profit, we may therefore have two stable long-run constellations in the face of higher lending of rentiers to workers. With a relatively low rate of interest a higher proportion of rentiers' saving being lent to workers, causing a higher workers' debt–capital ratio, will be accompanied by higher rates of capacity utilization, capital accumulation and profit. Aggregate demand and growth will hence be debt-led. With a relatively high rate of interest, however, a higher proportion of rentiers' saving lent to workers, causing a higher workers' debt–capital ratio, will be accompanied by lower rates of capacity utilization, capital accumulation and profit. In this case, aggregate demand and growth will be debt-burdened. Both constellations are locally stable. However, the upwards corridor of stability will shrink owing to the increase in the equilibrium workers' debt–capital ratio in each constellation.

Since the model economy in the short run is always debt-led, a higher proportion of rentiers' saving lent to workers will always be accompanied by higher rates of capacity utilization and capital accumulation. Moving from the short to the long run, the stock–flow dynamics may turn the short-run debt-led into a long-run debt-burdened constellation if the rate of interest is too high relative to the rate of profit. With a low rate of interest relative to the rate of profit, however, this will not happen, and the economy will remain debt-led in the long run, too.

In the long run, a shift from debt-led aggregate demand and growth to a debt-burdened constellation will only take place if there is a change in parameters which affect the long-run equilibrium rate of profit relative to the rate of interest: a fall in animal spirits, a rise in the profit share, an increase in the rentiers' propensity to save or a rise in the exogenous rate of interest will each lower the long-run equilibrium rate of profit and may make it fall below the rate of interest.

It should be noted that the considerations so far only apply if $\alpha > \pi s_R i$, because this condition ensures that there is a stable and economically meaningful goods market equilibrium associated with a stable long-run workers' debt–capital ratio. If this condition is violated in the course of finance-dominated capitalism, by the decrease in animal spirits, by the increase in the proportion of rentiers' saving lent to workers, by an increasing rate of interest or by an increasing rentiers' propensity to save, economically meaningful goods market equilibria would have to be unstable (or the stable goods market equilibrium rate of capacity utilization would be negative), and the system would turn unstable in the short and in the long run.

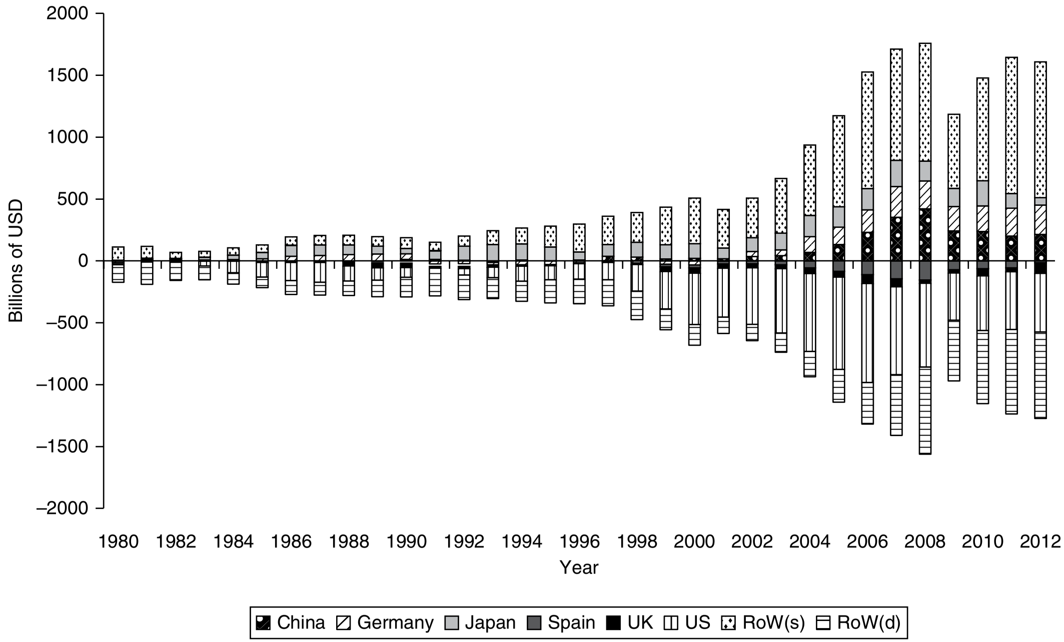
Summing up, what this model shows is that increasing (workers') household debt for consumption purposes may indeed have expansive effects, overcompensating the contractive effects of financialization on aggregate demand and growth via redistribution and via repressed capital accumulation, both in the short and in the long run.[14] However, the conditions for such expansive and stable effects are highly restrictive. And, even if they exist, they tend to be undermined by financialization itself, through redistribution at the expense of the labour income share, which has a depressing effect on income growth in a wage-led economy and may turn a debt-led economy debt-burdened, through lending too much to deficit households and through depressing animal spirits, which may each turn a stable workers' debt–capital ratio unstable.

10.5 FINANCIALIZATION, OPEN ECONOMY EFFECTS AND CURRENT ACCOUNT IMBALANCES

10.5.1 Empirical Evidence

Against the background of redistribution of income at the expense of the labour income share and lower income households, weak investment in capital stock and a lack of income-led domestic demand, different types of capitalism under financialization developed, as analysed in Hein (2012a, chap. 6).[15] At the extremes, there were the debt-led consumption boom and the export-led mercantilist type.[16] These two types mutually reinforced each other and, in the context of international financial liberalization, they contributed to rising global current account imbalances, as can be seen in Figure 10.10. The debt-led consumption boom type generated a profits without investment regime relying on debt-financed consumption demand for the realization of profits, as we have outlined in Section 10.4. Since this strategy was associated with higher inflation and more dynamic domestic demand than in the export-led mercantilist economies, it meant large current account deficits as a consequence. The export-led mercantilist type, which may also give rise to a profits without investment regime, relied instead on trade and current account surpluses as an alternative for generating demand and realising profits. As a result, current account imbalances increased globally until the Great Recession 2008/09,[17] when the collapse of GDP and imports dampened these imbalances. However, since then there seems again to be a tendency towards rising imbalances.

In Hein (2012a, chap. 6) cyclical average data for the trade cycle of the early 2000s were analysed with the aim of distinguishing the two types mentioned above – the debt-led consumption boom and the export-led mercantilist type – and identifying the countries which followed each of these patterns.[18] The US, the UK, Greece, Ireland and Spain are found to have followed the debt-led consumption boom type of aggregate demand and growth. It is notable that all these economies saw considerable increases in residential property prices and/or in wealth–income ratios in the cycle of the early 2000s. This was conducive to soaring consumption demand based on rising household debt, and hence to considerable growth contributions of private consumption and domestic demand. Strong domestic demand growth in the debt-led consumption boom countries was accompanied by negative growth contributions of the balance of goods and services in all of these countries.[19] The reason for this was more dynamic domestic demand growth than in the rest of the world, and in some countries also higher unit labour cost growth and inflation and hence a real appreciation



Notes: RoW(s): rest of the world (current account surplus countries); RoW(d): rest of the world (current account deficit countries).

Source: IMF (2013); own calculations.

Figure 10.10 Current account balances, 1980–2012 of the currency. The debt-led consumption boom economies were thus the world demand engines of the cycle from the early 2000s to 2008. As a counterpart to these economies, an export-led mercantilist group is identified containing the economies of, notably, China and Germany, but also of Austria, Belgium, the Netherlands, Sweden and Japan. With the exception of China, these countries were characterized by weak domestic demand growth, and also lower unit labour cost growth and inflation, and hence a real depreciation of the currency in most of these countries with respect to the debt-led consumption boom economies. Positive and rising balances of goods and services were the main drivers of demand and growth in these countries, leading to rising current account surpluses.

The global current account imbalances created a highly fragile constellation before the Great Recession. The dynamic debt-led consumption boom type of development in the US and the other countries following this model had to rely on the willingness and the ability of private households to go into debt, and thus on ever rising notional wealth, in particular rising residential property prices (seemingly) providing collateral for credit, and on the willingness of the rest of the world to run current account surpluses and thus to supply credit – notably the export-led mercantilist countries – in order to finance the related current account deficits in the debt-led consumption boom economies. The slowly growing or stagnating export-led mercantilist economies, on the other hand, had to rely on the willingness and the ability of the rest of the world – notably the debt-led consumption boom economies – to go into debt, because their moderate or weak growth rates were dependent on dynamic growth of world demand and their export markets.

Empirically, the link between rising inequality of personal incomes and the current account was tested by Kumhof et al. (2012). In a panel econometric study for 18 OECD countries (1968–2006), the authors confirm that an increase in top income shares and financial liberalization are associated with larger current account deficits. A one percentage point increase in the top 5 per cent income share is associated with a current account–GDP deterioration of 0.8 percentage points. Similarly, Behringer and van Treeck (2013) find a strong negative link between top-end income inequality and the current account balance in a panel regression of 20 countries (1972–2007). In addition, they show that an increase in the corporate financial balance and a concomitant decline in the wage share leads to an improvement of the current account. Therefore, according to their view, it makes a huge difference whether redistribution at the expense of labour leads to an improvement in the share of retained profits or to a rise in distributed profits and thus in top household income. The former means a drain of domestic consumption and demand, which however is partly compensated by improved competitiveness in international markets and hence improved net exports. This will give rise to the export-led mercantilist type of development, as for example in Germany or in China. The latter means higher consumption of rich households and also imitation and emulation processes by lower income households, applying Duesenberry's (1949) relative income hypothesis, which lead to 'expenditure cascades' (Frank et al. 2014) financed by household debt. This will then give rise to the debt-led consumption boom type of development, as for example in the US and the UK.

In the following subsection we will analyse the conditions for a profits without investment regime driven by an export-led mercantilist type of development in a neo-Kaleckian model, and we will examine the sustainability of such a regime and its counterpart at the global level, the debt-led consumption boom type of development.

10.5.2 A Neo-Kaleckian Model of Financialization, Redistribution, Current Account Imbalances and Growth

The basic model

In this subsection we sketch a simple open economy neo-Kaleckian distribution and growth model without economic activity of the government, in which a profits without investment regime under the conditions of increasing financialization is driven by net exports or current account surpluses. The basic model is similar to the one presented in Chapter 7; however, we now assume a neo-Kaleckian investment function and disregard positive saving out of wages. We assume again a fixed coefficient production technology, no technological progress, and functional income to be mainly determined by mark-up pricing of firms in incompletely competitive goods markets. Financialization is assumed to have the following effects:

- first, a redistribution of income at the expense of the wage share in favour of the gross profit share, as outlined in Section 10.2;
- second, decreasing animal spirits of firms with respect to investment in capital stock (preference channel), as outlined in Section 10.3 – for the sake of simplicity we do not explicitly consider the effect of increasing dividend payments and share buybacks (internal means of finance channel) here; and
- third, rising demand in the foreign economy, which is assumed to follow a debt-led consumption boom type of development, that is rising consumption demand based on increasing (workers') household debt, as discussed in Section 10.4.

We will analyse the effects on domestic capacity utilization and capital stock growth, derive the conditions for a profits without investment regime of the domestic economy driven by net exports and current account surpluses, and finally consider the sustainability of such a regime.

Let us start with the familiar goods market equilibrium condition for an open economy without economic activity of the state: Planned saving (S) has to be equal to net investment (pI) plus net exports (NX), the difference between the value of exports (pX) and imports (ep_fM) of goods and services:

$$S = pI + pX - ep_fM = pI + NX, \qquad (10.51)$$

with e denoting the exchange rate and p_f the foreign price level. Normalizing equation (10.51) by the nominal capital stock (pK) yields the following goods market equilibrium between the saving rate ($\sigma = S/pK$), the accumulation rate ($g = I/K$) and the net export rate ($b = NX/pK$):

$$\sigma = g + b. \qquad (10.52)$$

For the sake of simplicity we assume that saving only consists of saving out of profits (S_Π) – workers are assumed not to save. Since the rate of capacity utilization is the relation of output to potential output ($u = Y/Y^p$) and the capital–potential output ratio relates the capital stock to potential output ($v = K/Y^p$), we obtain for the saving rate:

$$\sigma = \frac{S_\Pi}{pK} = \frac{s_\Pi \Pi}{pK} = s_\Pi h \frac{u}{v}, \quad 0 < s_\Pi \leq 1. \qquad (10.53)$$

Investment is modelled following the neo-Kaleckian approach introduced in Chapter 6, making investment decisions of firms dependent on animal spirits (α) and on aggregate demand relative to productive capacities and hence on the rate of capacity utilization:

$$g = \alpha + \beta u, \quad \alpha, \beta > 0. \qquad (10.54)$$

This investment function makes sure that the effect of a change in functional income distribution on domestic demand and accumulation – leaving the effects on net exports aside – is wage-led; an increase in the profit share causes lower rates of capacity utilization, profit and capital accumulation. As we have outlined in Chapter 7, this is the econometric result found for most countries in many empirical studies based on the post-Kaleckian investment function proposed by Bhaduri and Marglin (1990) and Kurz (1990).

The net export rate is positively affected by international price competitiveness, provided that the Marshall–Lerner condition can be assumed to hold and the sum of the absolute values of the price elasticities of exports and imports exceeds unity. Under this condition, the real exchange rate will have a positive effect on net exports. The real exchange rate itself is assumed to be positively related to the profit share.[20] But net exports also depend on the developments of foreign and domestic demand. An increase in domestic demand, and hence in the domestic rate of capacity utilization, has a negative impact on net exports, *ceteris paribus*, and an increase in foreign demand, and hence in the foreign rate of capacity utilization (u_f), has a positive effect, with the coefficients being affected by the income elasticities of the demand for exports and imports, respectively:

$$b = \psi e^r(h) - \phi u + \zeta u_f, \quad \psi, \phi, \zeta > 0. \tag{10.55}$$

Stability of the goods market equilibrium requires that saving responds more elastically to a change in the endogenous variable, the rate of capacity utilization, than investment and net exports do together:

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} - \frac{\partial b}{\partial u} > 0 \quad \Rightarrow \quad s_\Pi \frac{h}{v} - \beta + \phi > 0. \tag{10.56}$$

The equilibrium rates of capacity utilization, capital accumulation and net exports are given by:

$$u^* = \frac{\alpha + \psi e^r(h) + \zeta u_f}{s_\Pi \frac{h}{v} - \beta + \phi}, \tag{10.57}$$

$$g^* = \frac{\alpha\left(s_\Pi \frac{h}{v} + \phi\right) + \beta[\psi e^r(h) + \zeta u_f]}{s_\Pi \frac{h}{v} - \beta + \phi}, \tag{10.58}$$

$$b^* = \frac{\left(s_\Pi \frac{h}{v} - \beta\right)[\psi e^r(h) + \zeta u_f] - \phi\alpha}{s_\Pi \frac{h}{v} - \beta + \phi}. \tag{10.59}$$

Whereas equilibrium capacity utilization indicates equilibrium activity with given productive capacities, equilibrium capital accumulation determines the development of productive capacities or potential output. The effects of a change in the profit share on the equilibrium rates of capacity utilization, capital accumulation and net exports are as follows:

$$\frac{\partial u^*}{\partial h} = \frac{\psi\frac{\partial e^r}{\partial h} - s_\Pi\frac{u}{v}}{s_\Pi\frac{h}{v} - \beta + \phi}, \tag{10.57a}$$

$$\frac{\partial g^*}{\partial h} = \frac{\beta\left(\psi\frac{\partial e^r}{\partial h} - s_\Pi\frac{u}{v}\right)}{s_\Pi\frac{h}{v} - \beta + \phi}, \tag{10.58a}$$

$$\frac{\partial b^*}{\partial h} = \frac{\left(s_\Pi\frac{h}{v} - \beta\right)\psi\frac{\partial e^r}{\partial h} + \phi s_\Pi\frac{u}{v}}{s_\Pi\frac{h}{v} - \beta + \phi}. \tag{10.59a}$$

As equations (10.57a) and (10.58a) show, the negative effect of a change in the profit share on the rates of capacity utilization and capital accumulation via domestic demand may be overcompensated by the positive effect on net exports via improved price competitiveness, so that the total demand and growth regime may turn profit-led. In this case equation (10.59a) will have to be positive, too.

The effects of financialization in an export-led mercantilist economy

As pointed out above, we would like to examine the effects of the following features of financialization (Ω) with the help of our model:

1. declining animal spirits of firms with respect to investment in capital stock: $\partial\alpha/\partial\Omega < 0$;
2. redistribution at the expense of the wage share: $\partial h/\partial\Omega > 0$;
3. acceleration of foreign demand due to a debt-led consumption boom type of development in the foreign economy: $\partial u_f/\partial\Omega > 0$.

Through these channels, increasing financialization has the following effects on the equilibrium values of the domestic economy:

$$\frac{\partial u^*}{\partial \Omega} = \frac{\frac{\partial\alpha}{\partial\Omega} + \frac{\partial h}{\partial\Omega}\left(\psi\frac{\partial e^r}{\partial h} - s_\Pi\frac{u}{v}\right) + \frac{\partial u_f}{\partial\Omega}\zeta}{s_\Pi\frac{h}{v} - \beta + \phi}, \tag{10.57b}$$

$$\frac{\partial g^*}{\partial \Omega} = \frac{\frac{\partial \alpha}{\partial \Omega}\left(s_\Pi \frac{h}{v} + \phi\right) + \beta\left[\frac{\partial h}{\partial \Omega}\left(\psi\frac{\partial e^r}{\partial h} - s_\Pi\frac{u}{v}\right) + \frac{\partial u_f}{\partial \Omega}\zeta\right]}{s_\Pi \frac{h}{v} - \beta + \phi}, \quad (10.58b)$$

$$\frac{\partial b^*}{\partial \Omega} = \frac{-\frac{\partial \alpha}{\partial \Omega}\phi + \frac{\partial h}{\partial \Omega}\left[\left(s_\Pi\frac{h}{v} - \beta\right)\psi\frac{\partial e^r}{\partial h} + s_\Pi\frac{u}{v}\phi\right] + \frac{\partial u_f}{\partial \Omega}\zeta\left(s_\Pi\frac{h}{v} - \beta\right)}{s_\Pi \frac{h}{v} - \beta + \phi}. \quad (10.59b)$$

A profits without investment regime driven by trade and current account surpluses requires: $\partial u^*/\partial\Omega > 0, \partial g^*/\partial\Omega < 0, \partial b^*/\partial\Omega > 0$. Assuming the stability condition for the goods market equilibrium to hold, we therefore have:

$$\frac{\partial u^*}{\partial \Omega} > 0, \quad \text{if:} \quad \frac{\partial \alpha}{\partial \Omega} + \frac{\partial h}{\partial \Omega}\left(\psi\frac{\partial e^r}{\partial h} - s_\Pi\frac{u}{v}\right) + \frac{\partial u_f}{\partial \Omega}\zeta > 0, \quad (10.57b')$$

$$\frac{\partial g^*}{\partial \Omega} < 0, \text{if:} \frac{\partial \alpha}{\partial \Omega}\left(s_\Pi\frac{h}{v} + \phi\right) + \beta\left[\frac{\partial h}{\partial \Omega}\left(\psi\frac{\partial e^r}{\partial h} - s_\Pi\frac{u}{v}\right) + \frac{\partial u_f}{\partial \Omega}\zeta\right] < 0, (10.58b')$$

$$\frac{\partial b^*}{\partial \Omega} > 0, \quad \text{if:} \quad -\frac{\partial \alpha}{\partial \Omega}\phi + \frac{\partial h}{\partial \Omega}\left[\left(s_\Pi\frac{h}{v} - \beta\right)\psi\frac{\partial e^r}{\partial h} + s_\Pi\frac{u}{v}\phi\right] + \frac{\partial u_f}{\partial \Omega}\zeta\left(s_\Pi\frac{h}{v} - \beta\right) > 0. \quad (10.59b')$$

A positive effect of increasing financialization on equilibrium capacity utilization requires that the negative effect via the animal spirits channel is overcompensated by the increase of aggregate demand through the foreign demand channel and the redistribution channel, as is shown in condition (10.57b'). The former depends on the increase of foreign demand (through a debt-led consumption boom) and on a high income elasticity of the demand for exports of the domestic economy. The latter requires that aggregate demand of the domestic economy is profit-led and that the dampening effects of redistribution on domestic demand are overcompensated by an increase in net exports via higher price competitiveness, which has to rely on high price elasticities of demand for exports, in particular. However, it should be noticed that, even if overall demand were wage-led, increasing financialization could nonetheless have expansionary effects on capacity utilization, if the negative effects via depressed animal spirits and redistribution in favour of profits are small, and the foreign demand effects via a dynamic debt-led consumption boom in the foreign economy are extremely strong. If none of these constellations are given, an increase in financialization will depress domestic capacity utilization, and the domestic economy will rather enter a contractive regime.

If the effects of increasing financialization on domestic capacity utilization are expansionary through the foreign demand and the redistribution channels, the effect on domestic equilibrium capital accumulation may be negative nonetheless. As shown in condition (10.58b'), this will occur in particular if the accelerator term in the investment function is weak. The increase in domestic capacity utilization will then have only small effects on capital accumulation, which will be insufficient to compensate for the negative direct effects through weakened animal spirits. With a strong accelerator effect, however, capital accumulation would be stimulated overall and the economy would then enter a finance-led growth regime driven by net exports.

Condition (10.59b') shows the requirements for a positive effect of increasing financialization on the equilibrium net export rate. The effect via the animal spirits channel will be positive, whereas the effects via distribution and foreign demand channels will be definitely positive only if $s_{\Pi}h/v - \beta > 0$. This is rather likely for a profits without investment regime, because this regime implies a low accelerator effect of capacity utilization on capital accumulation and thus a low β. Furthermore, a high domestic propensity to save from profits will support a positive effect of increasing financialization on the net export rate.

Having so far spelled out the conditions for a profits without investment regime driven by net exports, we finally take a look at the associated dynamics of foreign assets and liabilities and the sustainability of such a regime.

Dynamics of foreign assets and liabilities – the sustainability of a profits without investment regime driven by net exports

For the sake of simplicity we do not explicitly treat cross-border flows of primary incomes, in particular interest and dividend payments associated with foreign assets or liabilities, and therefore we consider net exports of goods and services to be equivalent to the current account balance. Positive net exports and hence current account surpluses for the domestic economy mean that its stock of net foreign assets increases: $NX = dA_d$, whereas the reverse is true for the foreign economy. In a two-country model, net foreign assets of the domestic economy (A_d), which we continue to assume to be in a profits without investment regime driven by net exports and current account surpluses, and hence to follow an export-led mercantilist type of development, are equal to net foreign liabilities of the foreign economy (L_f), which we assume to be in a profits without investment regime driven by debt-financed household consumption, thus following a debt-led consumption boom type of development accepting concomitant negative net exports and current account balances:

$$A_d = L_f. \tag{10.60}$$

Positive (negative) net exports and current accounts mean a change in net foreign assets (liabilities) and hence:

$$dA_d = dL_f. \tag{10.61}$$

Dividing equation (10.61) by equation (10.60), it follows that the growth rate of net foreign assets of the domestic economy has to be equal to the growth rate of net foreign liabilities of the foreign economy:

$$\hat{A}_d = \frac{dA_d}{A_d} = \hat{L}_f = \frac{dL_f}{L_f}. \tag{10.62}$$

A constant net foreign assets–GDP ratio, or a constant net foreign liabilities–GDP ratio, requires that net foreign assets, or net foreign liabilities, and nominal GDP ($pY = Y^n$) of the respective economy grow at the same rate:

$$\frac{A_d}{Y_d^n} \text{ constant, if:} \quad \hat{A}_d = \hat{Y}_d^n, \tag{10.63}$$

$$\frac{L_f}{Y_f^n} \text{ constant, if:} \quad \hat{L}_f = \hat{Y}_f^n. \tag{10.64}$$

Taking into account equation (10.62) this means that the constancy of both, the net foreign assets–GDP ratio of the domestic economy and the net foreign liabilities–GDP ratio of the foreign economy, requires that the two economies have to grow at the same rate:

$$\frac{A_d}{Y_d^n} \text{ and } \frac{L_f}{Y_f^n} \text{ constant, if } \hat{A}_d = \hat{Y}_d^n = \hat{L}_f = \hat{Y}_f^n. \tag{10.65}$$

From equations (10.62) to (10.64) we also obtain that the constant net foreign assets–GDP ratio for the domestic economy and the constant net foreign liabilities–GDP ratio of the foreign economy are given as:

$$\hat{A}_d = \frac{dA_d}{A_d} = \frac{\frac{dA_d}{Y_d^n}}{\frac{A_d}{Y_d^n}} \Rightarrow \frac{A_d}{Y_d^n} = \frac{\frac{dA_d}{Y_d^n}}{\hat{Y}_d^n}, \tag{10.66}$$

$$\hat{L}_f = \frac{dL_f}{L_f} = \frac{\frac{dL_f}{Y_f^n}}{\frac{L_f}{Y_f^n}} \Rightarrow \frac{L_f}{Y_f^n} = \frac{\frac{dL_f}{Y_f^n}}{\hat{Y}_f^n}. \tag{10.67}$$

Therefore, with constant current account surplus–GDP ratios, or current account deficit–GDP ratios, and constant nominal GDP growth rates, the net foreign assets–GDP ratio, or the net foreign liabilities–GDP ratio, will converge towards a definite value. As should be clear from the arguments put forward above, this can only hold for both economies simultaneously if their GDP growth rates are the same.

By definition, in a two-countries model net foreign assets have to grow at the same rate as net foreign liabilities. However, nominal GDP growth rates of the domestic economy and the foreign economy will not necessarily be equal. If this is the case, only one country can see a constant net foreign liabilities–/net foreign assets–GDP ratio, whereas the other will face continuously falling or rising net foreign liabilities–/net foreign assets–GDP ratios. Let us distinguish two constellations:

1. In the first constellation the current account deficit country, the foreign economy following the debt-led consumption boom type of development, grows at a higher rate than the current account surplus country, the domestic economy following the export-led mercantilist strategy: $\hat{Y}_d^n < \hat{Y}_f^n$. In this case, either a constant foreign assets–GDP ratio of the domestic economy will be accompanied by a falling foreign liabilities–GDP ratio of the foreign economy; or a rising foreign assets–GDP ratio of the domestic economy will be accompanied by a constant foreign liabilities–GDP ratio of the foreign economy. Or one may obtain both, rising foreign assets–GDP ratios of the domestic economy and falling foreign liabilities–GDP ratios of the foreign economy.
2. In the opposite constellation, the current account deficit debt-led consumption boom economy grows at a lower rate than the current account surplus export-led mercantilist economy: $\hat{Y}_d^n > \hat{Y}_f^n$. In this case, either a constant foreign assets–GDP ratio of the domestic economy will be accompanied by a rising foreign liabilities–GDP ratio of the foreign economy, or a falling foreign assets–GDP ratio

of the domestic economy will be accompanied by a constant foreign liabilities–GDP ratio of the foreign economy. Or we obtain both, falling foreign assets–GDP ratios of the domestic economy and rising foreign liabilities–GDP ratios of the foreign economy.

In the first constellation, in which the current account deficit country grows at a higher rate than the current account surplus country, there is no immanent dynamics towards ever rising foreign liabilities–GDP ratios and, hence, towards over-indebtedness with the foreign sector. Of course, this constellation may run into problems associated with increasing household debt being the driver of growth in the current account deficit country – as analysed in Section 10.4. And there may also arise long-run growth problems due to weak investment and capital stock growth in this country. However, this might not affect the growth differential with respect to the current account surplus country, because both countries will suffer from the long-run growth problems immanent in a profits without investment regime. But in the first constellation there are no inherent or systemic problems of foreign indebtedness as such. This is completely different in the second constellation, in which the current account surplus country grows at a higher rate than the current account deficit country. This constellation generates a tendency towards cumulatively rising foreign liabilities–GDP ratios of the current account deficit country, which might finally trigger problems of over-indebtedness with the rest of the world.

10.6 SUMMARY AND CONCLUSIONS

In this chapter we have introduced issues of finance-dominated capitalism or financialization into different Kaleckian distribution and growth models. From a macroeconomic perspective we have examined four channels of transmission of financialization to the macroeconomy: first, the effect on income distribution; second, the effects on investment in capital stock; third, the effects on household debt and consumption; and, fourth, the effects on net exports and current account balances. For each of these channels we have briefly reviewed some empirical and econometric literature supporting the presumed channels, some theoretical and modelling literature examining the macroeconomic effects via these channels, and finally we have presented small Kaleckian distribution and growth models generating the most important macroeconomic effects. We have chosen as a starting point for all these considerations the empirical observation that several countries in the pre-Great Recession financialization period were characterized by redistribution in favour of profits and by profits without investment regimes – which require explanation from a macroeconomic perspective.

We started with the examination of the redistribution tendencies of financialization in different respects – functional distribution, personal or household distribution, and top incomes shares in national income – and have shown that the financialization period was characterized by increasing inequalities in all these dimensions. Then we applied a Kaleckian approach towards the explanation of the falling labour income shares in the financialization period, taking into account empirical research in this area. We have argued that this redistribution was mainly due to a shift in the sectoral composition of the economy from the public sector and the non-financial business sector with higher labour income shares towards the financial business sector with a lower labour income share, to rising profit claims of the rentiers, that is rising interest and dividend payments of the corporate sector, and to the weakening of trade union bargaining power through several channels.

Regarding the investment in capital stock, we have reviewed supportive econometric evidence for the preference channel and the internal means of finance channel. According to the first channel, financialization and shareholder value orientation have caused decreasing management animal spirits with respect to real investment in capital stock and long-run growth of the firm and increasing preferences for financial investment generating high profits in the short run. And, according to the second channel, financialization and shareholder value orientation have drained internal means of finance for real investment purposes from the corporations, through increasing dividend payments and share buybacks in order to boost stock prices and thus shareholder value. Implementing these channels into macroeconomic distribution and growth models yields different regimes, depending on the values of the model parameters: finance-led growth regimes, profits without investment regimes, or contractive regimes. Only the finance-led growth regime yields long-run stability of the financial structure of the firm sector and of capital accumulation, whereas the empirically more realistic profits without investment and contractive regimes yield cumulatively unstable long-run results regarding the financial structure of the firm sector and the rate of capital accumulation, which means rising debt plus rentiers' equity–capital ratios and falling rates of capital accumulation. Falling labour income shares triggered by financialization increase the likelihood of these unstable regimes. Therefore, under the conditions of the contractive and the profits without investment regimes there exists a considerable systemic long-run instability potential regarding the financial structure of the corporate sector of the economy and regarding capital accumulation.

Regarding the effects of financialization on consumption and household debt, we have argued that there is increasing evidence for (notional) wealth effects on household consumption, as well as for the relative income hypothesis regarding households' decisions to consume, each of them associated with increasing indebtedness in order to finance consumption expenditure exceeding current income. We have shown that increasing (workers') household debt for consumption purposes may indeed have expansive effects, overcompensating the contractive effects of financialization on aggregate demand and growth, via redistribution and via repressed capital accumulation, both in the short and in the long run. However, the conditions for such expansionary and stable effects are highly restrictive. Even if they exist, they tend to be undermined by financialization itself, through redistribution at the expense of the labour income share, which has depressing effects on income growth in a wage-led economy and which may turn a debt-led economy debt-burdened, and through lending too much to deficit households and through depressing animal spirits of firms, which may each turn a stable workers' debt–capital ratio unstable.

The alternative to a profits without investment regime driven by a debt-led consumption boom type of development is an export-led mercantilist type. In Section 10.5 we have therefore dealt with this international dimension of financialization, which led to increasing current account imbalances at the global level in the pre-crisis financialization period. We have specified the conditions for such a strategy and found that in particular strong growth in current account deficit countries, driven by debt-led consumption booms, high income elasticities of the demand for exports of the current account surplus country and also high price elasticities are supportive, as are only weakly negative effects on investment in capital stock. Examining the dynamics of foreign assets and liabilities associated with export-led mercantilist strategies, we have found that there is no immanent or systemic dynamics towards ever rising foreign liabilities–GDP ratios and hence towards foreign over-indebtedness, if the current account deficit countries grow at a higher rate than the current account surplus countries. However, as soon as this constellation turns into its opposite, a tendency towards cumulatively rising foreign liabilities–GDP ratios of the current account deficit country will arise, which might finally trigger problems of over-indebtedness with the rest of the world.

Summing up, we have shown that against the background of redistribution of income at the expense of the labour income share and depressed investment in capital stock, each a major feature of financialization, dynamic profits without investment regimes may emerge. However, each type of these regimes, the debt-led consumption boom type and the export-led mercantilist type, contains internal contradictions, with respect to household debt in the first regime and with respect to foreign debt of the counterpart current account deficit countries in the second regime, which may finally undermine the sustainability of these regimes and lead to financial and economic crises, such as the financial and economic crisis of 2007–09, which was triggered by over-indebtedness problems of private households in the leading debt-led consumption boom economy, the US. This crisis quickly spread to the export-led mercantilist economies. First, their export markets collapsed (foreign trade channel). Second, their capital exports into risky and now collapsing financial markets in the current account deficit countries, associated with persistent current account surpluses, were devalued (financial contagion channel).

Since the crisis and its severity reflect the contradictions and problems of finance-dominated capitalism and the two extreme types of development under financialization, the debt-led consumption boom type and the export-led mercantilist type, several authors have argued that a sustainable recovery strategy should focus on a 'wage-led' or 'mass income-led' type of development (ILO 2012; Lavoie and Stockhammer 2013b). Hein (2011, 2012a, chap. 7), Hein and Truger (2011, 2012/13) and Hein and Mundt (2012, 2013) have suggested that such a wage-led recovery strategy should be at the core of and should be embedded in a Global Keynesian New Deal, which more broadly would have to address the three main causes for the severity of the crisis: inefficient regulation of financial markets, increasing inequality in the distribution of income, and rising imbalances at the global (and at the regional) levels.[21] The three main pillars of the policy package of a Global Keynesian New Deal are the following: first, the re-regulation of the financial sector in order to prevent future financial excesses and financial crises; second, the reorientation of macroeconomic policies towards stimulating and stabilizing domestic demand, in particular in the current account surplus countries; and, third, the reconstruction of international macroeconomic policy coordination and a new world financial order in order to prevent export-led mercantilist and hence 'beggar thy neighbour' strategies. UNCTAD (2009) and Palley (2012a, chap. 9, 2013a, chap. 12), among others, have made similar suggestions.

NOTES

1. This chapter has benefited from simultaneous work on the same issues for the EU FP7 project 'Financialisation, Economy, Society and Sustainable Development' (FESSUD). See Hein and Dodig (2014). The present chapter provides a more detailed overview of the topics covered in Hein and Dodig (2014).
2. On the development of financialization in a broader set of countries see also the more

recent country studies published in the *FESSUD Studies in Financial Systems* (www.fessud.eu).

3. For the analysis of 'debt-led consumption boom' and 'export-led mercantilist' economies see, for example among others, Stockhammer (2010a, 2010b, 2012a, 2012b), Hein (2012a, chap. 6), Hein and Mundt (2012, 2013) and van Treeck and Sturn (2012, 2013), with slightly different terminologies.
4. This section draws and builds on Hein (2012a, chap. 2, 2014).
5. See Hein (2014) for results on further countries.
6. See Hein (2014) for results and figures for these countries.
7. Neo-liberalism is a broader concept than financialization, aiming at the deregulation of labour, financial and goods markets, reduction of government intervention into the market economy and of government demand management, and at redistribution of income from wages to profits.
8. See Stockhammer (2005/06), Dallery (2009), Hein and van Treeck (2010a, 2010b) and Hein (2012a, chap. 3) for a discussion of these channels against the background of the post-Keynesian theory of the firm, which we introduced in Chapter 5 of this book.
9. See for example Lavoie (2008, 2009), Skott and Ryoo (2008a, 2008b), van Treeck (2008), Hein (2009, 2010b, 2010c) and Hein and van Treeck (2010b).
10. This subsection draws and builds on Hein (2010b, 2012a, chap. 3). For a similar treatment of financialization and shareholder dominance in a neo-Kaleckian model, see Hein (2010c).
11. For further effects of a long-run increase in the profit share see Hein (2010b, 2012a, chap. 3).
12. For further models including wealth effects and debt, together with industrial concentration effects on distribution and technological change and thus on investment, see Rohit (2011) and Azad (2012).
13. This subsection draws and builds on Hein (2012a, chap. 5, 2012d).
14. For the treatment of household debt in more complex models, simultaneously with corporate debt, see Isaac and Kim (2013) and also the earlier work, using simulations in stock–flow consistent models, by Godley and Lavoie (2007, chap. 11), Lavoie (2008), and van Treeck (2009a).
15. For similar analyses see van Treeck et al. (2007), Bibow (2008), Fitoussi and Stiglitz (2009), Horn et al. (2009), Sapir (2009), UNCTAD (2009), van Treeck (2009b), Wade (2009), Hein and Truger (2010, 2011, 2012/13), Stockhammer (2010a, 2010b) and Hein and Mundt (2012, 2013).
16. A third type, according to Hein (2012a, chap. 6), is the 'domestic demand-led' type. And, in Hein and Mundt (2012, 2013), a 'weakly export-led' type with positive but falling net exports as a fourth type is distinguished from the 'strongly export-led mercantilist' type with rising net exports.
17. The current account of the Euro area as a whole was relatively balanced during the business cycle before the Great Recession, but massive intra-Euro area imbalances had built up, with Germany in particular accumulating surpluses, and the countries of Southern Europe experiencing rising current account deficits (Stockhammer 2010a, 2010b; Hein 2012a, chap. 8, 2013b, 2013/14; Hein, Truger et al. 2012).
18. See also Hein and Mundt (2012, 2013) for a similar exercise on the G20 countries and Hein (2013b, 2013/14) on the Euro area countries, in particular.
19. The exception here is Ireland, where the growth contribution of external demand was positive. Its current account deficit (and the positive financial balance of the external sector) was not due to a deficit in external trade but rather to a deficit in the cross-border flows of primary incomes.
20. As shown in Hein and Vogel (2008) and in Chapter 7 of this book, an increase in the real exchange rate, and hence in price competitiveness, may be associated with a fall in the profit share, if it is based on a fall in the mark-up. However, the econometric estimations by Stockhammer et al. (2009) for the Euro area and Stockhammer et al. (2011) for

Germany, for example, do not find such an effect. Their results suggest that improved price competitiveness is obtained by means of nominal wage moderation or nominal devaluation of the currency, which are both associated with an increase in the profit share.

21. Hein and Truger (2011) and Hein (2013b, 2013/14) have also applied this concept to the euro crisis.

11. The Kaleckian models and classical, Marxian and Harrodian critique

11.1 INTRODUCTION

As already noticed when introducing the basic Kaleckian models in Chapter 6 of this book, these models have been criticized in particular because of the treatment of the rate of capacity utilization as an adjusting variable, not only in the short run, but also in the medium to long run. From this it follows that the equilibrium rate of utilization may diverge from the 'normal' rate of utilization or from the target rate of the firms beyond the short run. This conclusion has been challenged by classical and Marxian authors, like Committeri (1986), Auerbach and Skott (1988), Duménil and Lévy (1995, 1999), Shaikh (2009) and Skott (2010, 2012). They have argued that such a deviation is not acceptable for long-period equilibrium, and that it will trigger responses by firms' investment decisions. The main point is that, if the rate of capacity utilization is higher (lower) than its normal or standard rate in the long run, then the rate of accumulation cannot remain constant, and must drift up (down). Therefore, the Kaleckian models are said to be prone to 'Harrodian instability', referring to the implications of Harrod's (1939) approach towards economic dynamics, which we have discussed in Chapter 2 of this book. The prevalence of this type of instability then requires other mechanisms to keep the long-run growth equilibrium stable. The critics of the Kaleckian model have, therefore, suggested different mechanisms which are to contain Harrodian instability in the medium to long run and to make the economy adjust to the normal rate of capacity utilization, which is independent of and thus exogenous to actual utilization and growth. Kaleckians, however, have defended their notion of a long-run endogenous rate of utilization – and they have criticized the alternative mechanisms put forward by the modern classicals, Marxians and Harrodians. In particular, Kaleckians have shown that, contrary to the position taken by several of the critics, the Kaleckian model is capable of maintaining the 'paradox of thrift' and the 'paradox of costs' in the long run, even if some normal or target rate of utilization is introduced into the model.

In this chapter we will deal with this debate.[1] In Section 11.2 we will start with a basic neo-Kaleckian model, include a normal rate of capacity utilization in the model and distinguish medium- to long-run Harrodian instability from short-run Keynesian instability within this framework. The focus will then be on Harrodian instability. In Section 11.3 we will discuss several mechanisms to contain and tame Harrodian instability with an exogenous normal rate of capacity utilization, as suggested by the critics of the Kaleckian models. Section 11.4 will then outline those Kaleckian approaches which question the notion of a normal rate of utilization – and thus the necessity of any adjustment of the actual rate of capacity utilization to the normal rate – and which therefore deny the problem of Harrodian instability altogether. Section 11.5 deals with a recent approach accepting the idea of a normal rate of capacity utilization but arguing that firms may have other, potentially more important, medium- to long-run targets so that an adjustment towards neither the utilization target nor Harrodian instability should be expected. In the following sections we discuss approaches which accept the equality of actual and normal rates of capacity utilization in long-run equilibrium, but argue that the normal rate may become endogenous to the actual rate. Whereas the model discussed in Section 11.6 focuses on the behaviour and expectations of entrepreneurs, Section 11.7 discusses the effects of applying monetary policies as a stabilizer in the face of Harrodian instability. Section 11.8 summarizes and concludes.

11.2 THE BASIC MODEL WITH A NORMAL RATE OF CAPACITY UTILIZATION AND HARRODIAN INSTABILITY

We start again with the basic neo-Kaleckian model which we introduced in Chapter 6 for a one-good closed economy without government activity, without technical progress, without depreciation of the capital stock and without overhead labour. But now we introduce a normal or target rate of capacity utilization (u_n) into the model:

$$r = h\frac{u}{v} = r_n\frac{u}{u_n}, \qquad (11.1)$$

$$\sigma = s_\Pi r = s_\Pi h\frac{u}{v}, \quad 0 < s_\Pi \leq 1, \qquad (11.2)$$

$$g = \alpha + \beta(u - u_n), \quad \alpha,\beta > 0. \qquad (11.3)$$

$$g = \sigma, \tag{11.4}$$

$$\frac{\partial \sigma}{\partial u} > \frac{\partial g}{\partial u} \quad \Rightarrow \quad s_{\Pi}\frac{h}{v} > \beta. \tag{11.5}$$

Equation (11.1) defines the realized profit rate (r), which depends on the realized rate of capacity utilization (u), on the profit share (h) being determined by mark-up pricing of firms, and on the capital–potential output ratio (v). The equation can also be rewritten in terms of the normal profit rate (r_n) and the normal rate of capacity utilization (u_n).

The normal rate can be interpreted as the rate of utilization which firms expect to prevail or target in the medium to long run when making their decisions to invest and thus to expand the capital stock. The normal rate of utilization in this sense does not imply that firms expect to operate at the technically given maximum capacity (u_{max}) in Figure 11.1. Nor does it mean that they will necessarily operate at the unit total cost minimum level of capacity utilization (u_{cmin}), if they have chosen to hold excess capacity in order to deter entry by threatening competitors with price wars, for example. As usual, p, mc, uvc, ufc and utc represent price, marginal costs, unit variable costs, unit fixed costs and unit total costs, respectively.

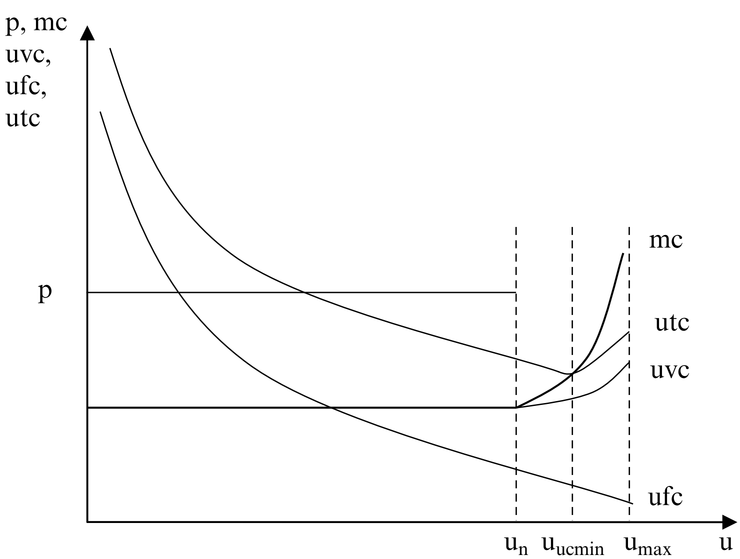


Figure 11.1 Maximum, unit total cost minimum and normal/target rate of capacity utilization

The normal rate as a target rate of utilization of firms differs from the goods market equilibrium rate of utilization, which is the rate of utilization at which output of firms is equal to aggregate demand in the goods market. As in the models in the previous chapters and as explained in Chapter 6, we assume that firms have expectations about demand in the goods market and they adjust capacity utilization towards actual demand within the period. The short-run goods market equilibrium rate of capacity utilization is thus the rate of utilization at which firms' short-run expectations regarding aggregate demand are met and no further adjustment of output and capacity utilization for this purpose is required.

The saving function in equation (11.2) relates saving to the nominal capital stock and is the standard classical function for the saving rate (σ), which assumes away saving out of wages, with a propensity to save out of profits equal to s_Π. Equation (11.3) is the investment function, where the rate of capital accumulation (g) depends on a parameter α, which represents 'animal spirits', and on the deviation of actual from normal capacity utilization. If actual utilization equals normal utilization, capital accumulation will be equal to α, which therefore can also be interpreted as the expected trend rate of growth of sales and output in the present model. Whenever the rate of capacity utilization is above its normal rate, firms will be accumulating capital at a rate that exceeds the assessed trend growth rate of sales; whenever capacity utilization is below its normal rate, firms will slow down capital accumulation. But, unless there is some kind of fluke, the actual and the normal rates of capacity utilization will differ in this neo-Kaleckian model without any further adjustment. That is the reason why we have omitted u_n from the investment functions in the previous chapters. Equation (11.4) is the goods market equilibrium condition, and in (11.5) we find the familiar Keynesian stability condition for the goods market equilibrium, saying that the saving rate has to respond more elastically to a change in capacity utilization than the rate of capital accumulation.

For the goods market equilibrium of the model the following utilization rate is obtained from equations (11.1) to (11.4) applying the familiar procedure:

$$u^* = \frac{\alpha - \beta u_n}{s_\Pi \frac{h}{v} - \beta}. \tag{11.6}$$

As condition (11.5) tells us, Keynesian stability in this model requires that capital accumulation is not too sensitive to changes in the rate of capacity utilization and the slope of the saving rate function exceeds the slope of the accumulation rate function with respect to capacity utilization, as we have analysed in more detail in Chapter 6 and as can also be seen in Figure 11.2.

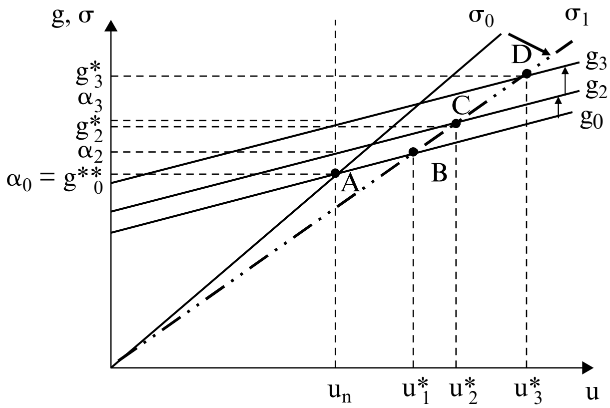


Figure 11.2 Harrodian instability

Keynesian instability would arise when the accumulation rate function is steeper than the saving rate function, and capital accumulation responds more vigorously towards changes in capacity utilization than the saving rate in the short run.

From this short-run Keynesian instability we can distinguish Harrodian instability as a medium- to long-run problem, which arises because of a deviation of the short-run equilibrium rate from the long-run normal rate of utilization. Harrodian instability can be introduced into our model if we treat the parameter α of the investment function not as a constant but as a rising (decreasing) variable whenever the short-run equilibrium rate of capacity utilization persistently exceeds (is below) its normal rate:

$$d\alpha = \upsilon(u^* - u_n), \quad \upsilon > 0. \tag{11.7}$$

The reason for this is that in equation (11.3) the parameter α is interpreted as the assessed trend growth rate of sales and output, and thus as the expected secular rate of growth of the economy. When the short-run equilibrium rate of utilization is consistently higher than the normal rate ($u^* > u_n$), this implies that the growth rate of the economy is consistently above the assessed secular growth rate of sales ($g^* > \alpha$). Thus, as long as entrepreneurs react to this in an adaptive way, they should eventually make a new, higher assessment of the trend growth rate of sales and output, thus making use of a larger parameter α in the investment function.

Equation (11.7) may be interpreted as a slow process: entrepreneurs react with enough inertia to generate short-run Keynesian stability.[2] When rates of utilization rise above their normal rates (or fall below their normal rates), entrepreneurs take a 'wait and see' attitude, not modifying their parametric behaviour immediately, until they are convinced that the discrepancy is there to stay. If during a certain number of periods the achieved short-run equilibrium rate of utilization exceeds the normal rate, then the investment function will start shifting up, thus leading to ever rising rates of capacity utilization and hence to an unstable process. This is illustrated with the help of Figure 11.2.

Let us assume that the economy is in an initial equilibrium at the normal rate of utilization in point A, and now the propensity to save out of profits declines or the profit share is reduced, so that the saving rate function rotates clockwise from σ_0 to σ_1. Since the paradox of thrift and the paradox of costs each hold in the simple neo-Kaleckian model, the economy achieves a higher short-run equilibrium at point B, with a higher rate of capital accumulation and the rate of capacity utilization exceeding the normal rate of utilization ($u_1^* > u_n$). If this equilibrium persists, the constant in the investment function will move up from α_0 to α_2 and shift the accumulation function up to g_2, and short-run equilibrium capacity utilization will hence be moved to point C and to u_2^*, which is even further away from the normal rate. This will then after some time shift the constant in the accumulation function up to α_3, pushing the accumulation function to g_3, the new short-run equilibrium to point D, and equilibrium capacity utilization to u_3^*, and so on. Thus, according to the critics, the equilibrium described by the Kaleckian model in point B will not be sustainable, but will shift to C, D and further on, and will hence not last in the long run.

11.3 TAMING HARRODIAN INSTABILITY WITH AN EXOGENOUS NORMAL RATE OF CAPACITY UTILIZATION

Since, with an exogenous normal rate of capacity utilization, Harrodian instability arises as in Figure 11.2, but real world economies are not continuously exploding or collapsing, there should be other mechanisms than those favoured by the Kaleckians which contain instability and bring the system back to equilibrium at this exogenous normal rate of utilization in the long run. In our simple model this can be achieved by two principal mechanisms, an appropriate rotation of the saving function or a counter-shift in the investment function as soon as the Harrodian instability as outlined in Section 11.2 occurs.

The first mechanism would then have to rotate the saving function counter-clockwise from σ_1 to σ_2, as is shown in Figure 11.3, such that the point of intersection with the shifted accumulation function is again at the

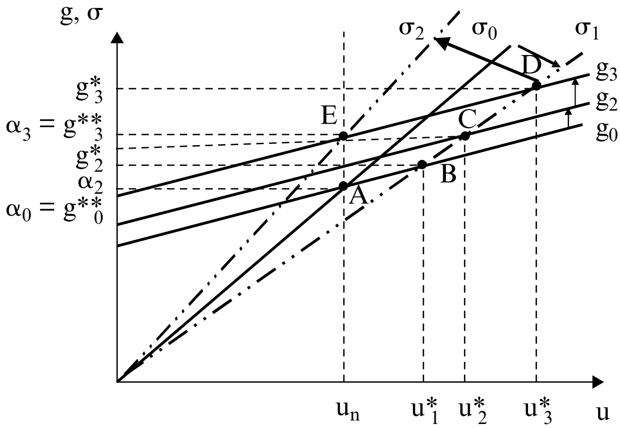


Figure 11.3 Taming Harrodian instability I – rotation of the saving rate function

normal rate of utilization, here in point E. If it can be assumed that this will not hurt the firms' assessment of the trend rate of growth of sales and that this rate will stay at α_3, and the accumulation function thus at g_3, the long-run equilibrium accumulation rate (g^{**}_3) in E will fall short of the temporary short-run equilibrium rate of accumulation (g^*_3) in D, but it will exceed the initial long-run equilibrium rate of accumulation (g^{**}_0) at the normal rate of utilization in A. In other words, improved animal spirits or improved expectations regarding the long-run growth rate of sales and output, each shifting the constant α in the investment function upwards, will mean a higher equilibrium rate of accumulation and growth in the long run. In order to achieve this rate at the exogenous and given normal rate of utilization, however, the determining variables of the saving rate have to adjust: either the propensity to save out of profits will have to rise or the profit share will have to increase, so that the saving function rotates in the required way, as equation (11.2) tells us.

The second potential mechanism which could bring the rate of capacity utilization back to the normal rate in the long run is a downward shift of the accumulation function, from g_3 to g_4 in Figure 11.4, so that the accumulation function intersects with the rotated saving rate function at the normal rate of utilization in point F. Of course, this new long-run equilibrium rate of capital accumulation and growth (g^{**}_4) again falls short of the temporary short-run equilibrium rate (g^*_3) in point D, but it will also be lower than the rate of accumulation in the initial long-run equilibrium (g^{**}_0) at the normal rate of utilization in point A. This means that a lower

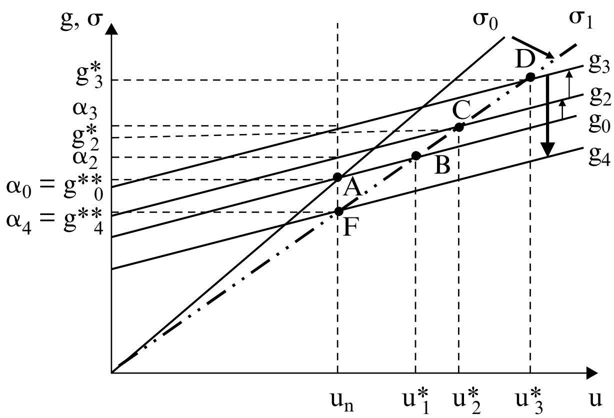


Figure 11.4 Taming Harrodian instability II – shift of the accumulation rate function

profit share or a lower propensity to save out of profits, each causing an initial clockwise rotation of the saving rate function, is expansionary in the short run, but it will mean a lower long-run equilibrium rate of capital accumulation when the system returns to the exogenously given normal rate of capacity utilization.

Of course, a combination of these two mechanisms would also bring the system back to the normal rate of utilization. And these two mechanisms, which we have discussed for a positive deviation of the short-run equilibrium rate of capacity utilization from the normal rate, should also work for a negative deviation, and thus for an adjustment of capacity utilization towards the normal rate from below. In this case, either the saving rate function would have to rotate clockwise, and thus the propensity to save out of profits or the profit share would have to fall, or the accumulation function would have to be shifted upwards again. Or a combination of these two mechanisms would have to bring the economy back to normal capacity utilization.

This purely technical discussion so far has revealed that containing Harrodian instability and bringing the economy back to an exogenously given normal rate of capacity utilization in the long run means that both the paradox of saving and the paradox of costs, although valid in the short run, disappear in the long run. In the short run, a lower propensity to save and a lower profit share each lead to higher equilibrium rates of capacity utilization and capital accumulation. But, in the long run, when the economy is back to the normal rate of utilization and the lower propensity to save and the lower profit share are each sustained, equilibrium capital accumulation will be lower than it was initially. This can clearly be seen in

Figure 11.4. Furthermore, improved animal spirits or an improved assessment of the long-run trend rate of growth of sales and output by firms will be expansionary in the short run and lead to higher short-run equilibrium rates of capacity utilization and capital accumulation. And they will also cause a higher long-run equilibrium rate of capital accumulation than the initial one, but only if either the propensity to save out of profits or the profit share rises. This can clearly be seen in Figure 11.3. A higher long-run equilibrium rate of accumulation and growth requires a higher propensity to save and/or a higher profit share and thus a lower wage share. Therefore, if the economy is to return to an exogenously given normal rate of capacity utilization in the long run, one can be 'Keynesian in the short term', but has to be 'classical in the long term', as Duménil and Lévy (1999) have argued.

Let us now briefly turn to the economic mechanism proposed in the literature which should contain Harrodian instability in the long run and bring the economy back to an exogenously given normal rate of utilization. A detailed discussion is beyond the scope of the present chapter, but is provided in Hein et al. (2011).

A potential economic mechanism bringing the system back to normal capacity utilization in the long run is the Cambridge price mechanism, initially advocated by Kaldor (1955/56, 1957) and Joan Robinson (1956, 1962). It is the key adjustment mechanism in the post-Keynesian Kaldor–Robinson model discussed in Chapter 4 of this book, which assumes normal or full capacity utilization in long-run growth equilibrium. Whenever aggregate demand growth exceeds supply growth at the normal rate of capacity utilization and capacity utilization tends to exceed the normal rate, an increase in the price level and in the profit share – and hence in the normal rate of profit – brings the economy back towards the normal rate of utilization by means of restraining demand growth. In the present model, the Cambridge price mechanism would thus mean a rotation of the saving rate function such that an intersection with the accumulation rate function at the normal rate of utilization is re-established, as shown in Figure 11.3.[3] However, as we have already argued in Chapter 4, the Cambridge price mechanism is not generally convincing as a stabilizer, because lower real wages (or a lower wage share) bargained and accepted by workers and labour unions can hardly be squared with the low unemployment rates and more powerful labour unions that are associated with utilization rates exceeding the normal rate. Rising real wages and higher wage shares enforced by stronger labour unions and thus a falling profit share, as implied by Kalecki (1954, chaps 1–2, 1971, chaps 5–6, 14), or a price–wage–price spiral, hence Robinson's (1962, p. 58) 'inflation barrier', is therefore a more likely outcome. Redistribution in favour of the wage share would then bring our model farther away from the normal rate of utilization.[4] And accelerating inflation cannot be considered a long-run equilibrium condition either.

Accelerating inflation would require the introduction of economic policy responses in order to bring the system back to the normal rate of capacity utilization. This is the mechanism proposed in the model by Duménil and Lévy (1999). Whenever short-run equilibrium capacity utilization exceeds (falls short of) the normal rate, this will trigger inflationary (disinflationary) pressures; the monetary authorities will respond by restrictive (expansive) policies and bring the system back to stable inflation at the normal rate of utilization. In our simple model this would mean that we make the capital accumulation function in equation (11.3) interest-elastic, so that the adjustment towards the normal rate of capacity utilization would be achieved by a shift in the accumulation rate function, as shown in Figure 11.4. However, as we will discuss in more detail in Section 11.7, this adjustment process cannot be taken for granted as soon as the distribution effects of unexpected inflation and of changes in the monetary policy instrument – the interest rate – are taken into account. In particular, changes in the interest rate will have an influence both on the actual and on the normal rate of utilization. The normal rate as understood by Duménil and Lévy – a non-accelerating inflation rate of capacity utilization (NAICU) – is hence affected by the actual goods market equilibrium rate of utilization via monetary policy interventions, and the former becomes endogenous to the latter, albeit in an indirect and complex way, as will be seen below.

Apart from economic policies as a stabilizer in the face of Harrodian instability, other models have been suggested in which instability is contained or even prevented by the behaviour of capitalist firms themselves. Shaikh (2009) assumes that firms increase their retention ratio as soon as utilization exceeds its normal rate, thus leading to an increase in the overall saving rate, hence a rotation of the saving rate function as in Figure 11.3, bringing the economic system back to the normal rate of utilization. Harrodian instability is thus contained. However, the economic rationale for such behaviour is far from obvious. For example, Dallery and van Treeck (2011) argue that the retention ratio may be endogenous, but, under the current paradigm of shareholder value orientation, managers may not be able to change the retention ratio on the basis of the discrepancy between the actual and the normal rates of capacity utilization, because the decision to distribute profits is likely to be determined by the shareholders' power and claims on profitability, as will be discussed in Section 11.6. In an alternative model, Shaikh (2009) assumes that firms reduce their accumulation rate as soon as the actual growth rate of sales exceeds the assessed long-run rate, thus shifting the accumulation rate function down, as in Figure 11.4. Harrodian instability is hence avoided, and utilization is back at the normal rate. However, this kind of behaviour requires rational expectations on the side of the firms – firms have to know the growth rate of sales when making their investment decisions. But this rate is determined by the actual investment decisions of other firms. There is thus a coordination problem, which is swept away by Shaikh in this model.

In Skott's (2010, 2012) models of a 'mature economy', that is an economy with inelastic labour supply, Harrodian instability is bounded by a Marxian labour market mechanism which generates a limit cycle around the steady growth path determined by labour force growth and the normal rate of utilization. Capitalists reduce output growth as soon as actual utilization rates exceed the normal rate, because the rate of unemployment falls and approaches some critically low value, and firms are having increasing problems in recruiting additional labour. Workers and labour unions are strengthened vis-à-vis management, workers' militancy increases, monitoring and surveillance costs rise, and hence the overall business climate deteriorates. This negative effect of increasing employment finally dominates the production decisions of firms, output growth declines, capacity utilization rates fall, investment falters and finally profitability declines. In our simple model, this means again that the capital accumulation function gets shifted downwards whenever utilization exceeds the normal rate, as shown in Figure 11.4. But Skott's behavioural assumption also lacks plausibility when applied to a capitalist market economy characterized by decentralized production and investment decisions as well as competitive pressures. As already argued above, with tight labour markets either rising real wages and higher wage shares, which would move the actual rate of utilization further away from the normal rate in our model (and which would only be stabilizing in a profit-led regime generated in a post-Kaleckian model), or a destabilizing price–wage–price spiral can be expected – or a combination of both.

Summing up, the mechanisms that have been proposed by the critics of the Kaleckian model in order to tame Harrodian instability while bringing back the rate of utilization in line with its predetermined normal rate contain some serious problems and are far from being convincing. In the following sections we will therefore review the Kaleckian suggestions about how to deal with deviations of the short-run equilibrium rate of utilization from the normal rate.

11.4 QUESTIONING THE UNIQUENESS OF THE NORMAL RATE OF UTILIZATION AND THUS THE NECESSITY FOR ANY ADJUSTMENT

In our model in Section 11.2 of this chapter we have assumed that there exists a given and unique normal rate of capacity utilization, or a given target rate of utilization perceived by firms when making investment decisions. However, not all post-Keynesians–Kaleckians would agree that normal or target rates of utilization are unique. Neither would all of them agree that economic analysis must be conducted under the restriction that some mechanism brings back the economy towards normal rates of utilization.

Chick and Caserta (1997), among others, have argued that expectations and behavioural parameters, as well as norms, are changing so frequently that long-run analysis, defined as fully adjusted positions at normal rates of capacity utilization, is not a very relevant activity. Instead, they argue that economists should focus on short-run analysis and what they call medium-run or provisional equilibria, which are defined as arising from the equality between investment and saving, or between aggregate demand and aggregate supply. These equilibria are what we have defined as u^* equilibrium values of the rate of utilization in Section 11.2.

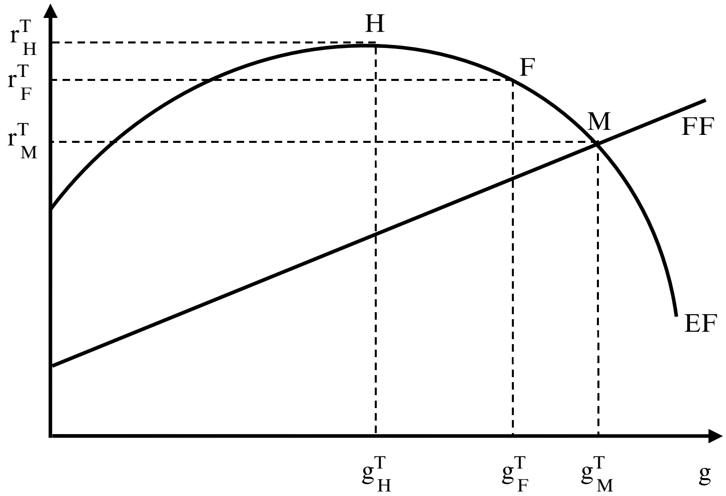
There is another post-Keynesian–Kaleckian way to avoid the need to examine mechanisms that would bring rates of utilization back to their normal value. As pointed out by Palumbo and Trezzini (2003, p. 128), Kaleckian authors tend to argue that 'the notion of "normal" or "desired" utilization should be defined more flexibly as a range of degrees rather than as a single value'. Hence, according to Dutt (1990a, pp. 58–60) and Lavoie (1992, pp. 327–332, 417–422), firms may be quite content to run their production capacity at rates of utilization that are within an acceptable range for the normal rate of utilization. With this interpretation, the normal rate of capacity utilization is more a conventional range than a strict target. If this is correct, our short-run equilibria could be considered as long-run equilibria as well, as long as the rate of capacity utilization remains within the acceptable range. Dutt (2010a) has provided some justification for this type of behaviour, referring to Shackle's (1961) theory of 'potential surprise'. Dutt argues that economic agents with cognitive limitations under the conditions of fundamental uncertainty will only respond towards some drastic changes in their environment and modify their behaviour. This means that firms expect a certain range of capacity utilization and only change investment behaviour when utilization falls out of this range. This thus produces a corridor of stability from which Harrodian instability is excluded.

As long as rates of utilization remain within an acceptable range, firms may consider discrepancies between the actual and the normal rates of utilization as a transitory rather than a permanent phenomenon. As a consequence, the Harrodian instability mechanism, which would induce firms to act along the lines of equation (11.7), with accelerating accumulation when actual utilization rates surpass the normal rate, might be very slow, getting implemented only when entrepreneurs are persuaded that the discrepancy is persisting. Given real world uncertainty and the fact that decisions to invest in the real capital stock are irreversible to a large extent, firms may be very prudent, so that the Harrodian instability may not be a true concern in actual economies, at least within a broad range of utilization rates.

11.5 FIRMS HAVE MULTIPLE TARGETS, THE REALIZATION OF WHICH MAY BE MUTUALLY EXCLUSIVE

Apart from questioning the uniqueness of the normal rate of capacity utilization, other Kaleckian authors have conceded that firms may have a definite target rate of utilization, hence a definite normal rate, but that they have other targets as well, which may prevent them from achieving each of their targets even in the long run. This line of response to the Harrodian challenge was initially considered by Lavoie (1992, pp. 417–421, 2002, 2003), and it has since been spelled out more explicitly and extended by Dallery and van Treeck (2011). The idea is to treat the normal rate of capacity utilization as a fixed target of firms, while recognizing that firms have various other important objectives, the realization of which may not necessarily coincide with the realization of the utilization target. Hence, firms need to trade off the utilization rate target with other targets.

Dallery and van Treeck (2011) present their approach of conflicting targets of different stakeholders of the firm in terms of target rates of return. Two conflicts surround the target or normal profit rate. The first conflict involves shareholders and managers, who oppose each other in the determination of the accumulation policies of firms. This conflict arises from the notion of a growth–profit trade-off faced by the individual firm, which we have discussed in Chapter 5 of this book. Fast expansion can only be obtained at the cost of lower profitability, owing to the costs involved with discovering new products, entering into new markets and so on (Penrose 1959; Wood 1975; Lavoie 1992, pp. 114–116). This is presented by the downward sloping part of the expansion frontier (EF) in Figure 11.5. As is traditionally assumed in the post-Keynesian theory of



Source: Based on Dallery and van Treeck (2011, p. 196).

Figure 11.5 Target rates of profit and growth of managers and shareholders

the firm (Galbraith 1967; Wood 1975), managers mainly seek growth, as a means to ensure the firm's survival by increasing its power and limiting uncertainty, and are willing to trade off profitability. They will be constrained only by the finance frontier (FF), which represents the maximum rate of accumulation they can finance with a given total rate of profit, because capital accumulation requires internal means of finance, owing to Kalecki's (1937) 'principle of increasing risk'. Therefore, managers will target point M in Figure 11.5, and thus a combination of g_M^T, r_M^T. By contrast, as discussed in Chapter 10 of this book, shareholders seek profitability, because they hold diversified portfolios and are hence not really committed to the long-term perspectives and the survival of specific individual firms (Crotty 1990; Stockhammer 2005/06). They will hence target point H in Figure 11.5, and thus a combination of g_H^T, r_H^T.

The target rate of profit of the firm (r_F^T) can then be derived as a weighted average of the profitability target formulated by shareholders (r_H^T), and the profit rate (r_M^T) that corresponds to the growth target formulated by managers (g_M^T), for a given technology and a given growth–profit trade-off. This is shown in point F in Figure 11.5, which represents the combination g_F^T, r_F^T. For the target profit rate of the firm we thus have:

$$r_F^T = \delta_1 r_H^T + (1 - \delta_1) r_M^T, \quad 0 \leq \delta_1 \leq 1. \tag{11.8}$$

The parameter δ_1 represents the power of shareholders vis-à-vis managers.

The second conflict around the target rate of profit involves firms (shareholders and managers), on the one hand, and workers, on the other. It concerns the distribution of income between gross profits, including retained profits and distributed profits (dividends, interest), and wages. As we know from Kaleckian theory, discussed in Chapter 5 of this book, this distribution conflict affects the mark-up in firms' pricing, and hence the profit share and the normal rate of profit. The latter is the rate of profit obtained at the exogenously given normal rate of capacity utilization, as equation (11.1) has made clear. Therefore, as workers have some bargaining power affecting the normal rate of profit, firms are not necessarily able to incorporate their profitability (or accumulation) target obtained from the shareholder management conflict and given by r_F^T in equation (11.8) into their price setting. The normal rate of profit (r_n) is thus not necessarily equal to the target rate of return of firms determined by the relative powers of management and shareholders (r_F^T). The normal rate of profit is rather given by the relative powers of firms and workers:

$$r_n = \delta_2 r_F^T + (1 - \delta_2) r_W^T, \quad 0 \leq \delta_2 \leq 1, \tag{11.9}$$

with r_W^T as the target rate of return of workers, which reflects in fact a real wage or a wage share target, and δ_2 representing the power of the firm vis-à-vis workers. Equation (11.9) can be based on standard conflicting claims price and wage inflation equations (Lavoie 1992, chap. 7.4):

$$\hat{p} = \Psi_1(r_F^T - r_n) + \Psi_2 \hat{w}_{-1}, \tag{11.10}$$

$$\hat{w} = \Phi_1(r_n - r_W^T) + \Phi_2 \hat{p}_{-1}, \tag{11.11}$$

where $\hat{p}$ is price inflation, $\hat{w}$ is the nominal wage inflation, ψ_1 and ψ_2 are indicators of the bargaining power of firms, and ϕ_1 and ϕ_2 indicate the bargaining power of workers. The parameter δ_2 in equation (11.9), representing the power of the firm in the distribution conflict with workers, can be determined from equations (11.10) and (11.11) and the condition that $\hat{p} = \hat{p}_{-1} = \hat{w} = \hat{w}_{-1}$ has to hold in long-run equilibrium:

$$\delta_2 = \frac{(1 - \Phi_2)\Psi_1}{[(1 - \Phi_2)\Psi_1 + (1 - \Psi_2)\Phi_1]}. \tag{11.12}$$

Obviously, the stronger the reaction of price inflation towards wage inflation and towards a deviation of the target profit rate of firms, determined by the shareholder–management conflict, from the rate of profit at normal utilization, and the weaker the reaction of wage inflation towards price inflation and towards a deviation of the target profit rate of workers from the rate of profit at normal utilization, the larger will be δ_2 and thus the weight of the target rate of profits of firms in the determination of the normal rate of profit and hence in the distribution of income between gross profits and wages.

It can be seen from equations (11.1) and (11.9) that generally only one of the two targets, either the normal rate of capacity utilization (u_n) or the target rate of profit of firms (r_F^T) can be achieved, while the other target will not. In the short-run goods market equilibrium, sales corresponding to the normal rate of capacity utilization ($u^* = u_n$) allow for the realization of the profitability objectives of the firms ($r^* = r_F^T$) if and only if there is no conflict over income distribution between wages and gross profits in the firm, which would then give $r^* = r_n = r_F^T = r_W^T$. As soon as workers' target real wage rate or target wage share implies a rate of profit which falls short of the firms' target rate ($r_F^T > r_W^T$) and workers have some bargaining power ($\delta_2 < 1$), we will obtain $r_F^T > r_n > r_W^T$. In order to achieve the target rate of profit of the firm – which is the outcome of the distribution conflict between shareholders and managers – firms will have to persistently operate at rates above the normal rate of capacity utilization ($u^* > u_n$) in order to reach their profitability objective, and hence $r^* = r_F^T > r_n$.

The main conclusion of this section is that, in a world where different groups within the firm have different objectives, the equality of actual and normal rates of capacity utilization should not be treated as the (only possible) long-run equilibrium condition. On the contrary, the long-run endogeneity of the utilization rate may help to reconcile the conflicting claims of capitalists and workers. As shown by Lavoie (2002, 2003) and Dallery and van Treeck (2011), in the long run the paradox of saving and the paradox of costs may then indeed hold in the type of model discussed in the present section.

11.6 ENTREPRENEURS ADJUST THEIR ASSESSMENT OF THE NORMAL RATE OF CAPACITY UTILIZATION

While classical or Marxian and Harrodian economists would argue that the actual rate of capacity utilization needs to tend towards the normal rate, post-Keynesians–Kaleckians have proposed as an alternative reversing the causality of the mechanism, and argued instead that the normal rate of capacity utilization tends towards the actual rate. As Park (1997, p. 96) puts it, 'the degree of utilisation that the entrepreneurs concerned conceive as "normal" is affected by the average degree of utilisation they experienced in the past'. And Joan Robinson (1956, pp. 186–190) has herself argued that normal rates of profit and of capacity utilization were subjected to adaptive adjustment processes:

> Where fluctuations in output are expected and regarded as normal, the subjective-normal price may be calculated upon the basis of an average or standard rate of output, rather than capacity . . . [P]rofits may exceed or fall short of the level on the basis of which the subjective-normal prices were conceived. Then experience gradually modifies the views of entrepreneurs about what level of profit is obtainable, or what the average utilisation of plant is likely to be over its lifetime, and so reacts upon subjective-normal prices for the future.

In this view firms are considered as organizations facing internal conflicts of interest and conflicting goals, as already described in Section 11.5, within an environment of fundamental uncertainty and an overload of information. As a result, firms or their managers are 'satisficers' rather than 'maximizers'. They set themselves goals that take the form of aspiration levels that define a satisfactory overall performance, and 'if goals are not met the firm readjusts downwards its aspiration levels' (Koutsoyiannis 1975, p. 397).

We can imagine various adaptive mechanisms that take into account both the flexibility of the normal degree of capacity utilization and the Harrodian instability principle. One possible mechanism deals only with the investment function, and was investigated by Lavoie (1995b, pp. 807–808, 1996b). As we have argued above, the parameter α in the investment function (11.3) can be interpreted as the secular growth rate of the economy, or the expected growth rate of sales. Firms are then interpreted as speeding up accumulation, relative to this secular growth rate, when current capacity utilization exceeds the target, thus trying to catch up. However, one can also imagine that the expected trend growth rate is influenced by past values of the actual growth rate. With normal rates of capacity utilization also being influenced by past actual rates, the two dynamic equations are given by:

$$du_n = \varsigma(u^* - u_n), \quad \varsigma > 0, \tag{11.13}$$

$$d\alpha = \xi(g^* - \alpha), \quad \xi > 0. \tag{11.14}$$

Making the proper substitutions using equations (11.3) and (11.6) for the accumulation rate and the short-run equilibrium rate of capacity utilization, these two equations can be written as:

$$du_n = \frac{\varsigma\left(\alpha - s_\Pi \frac{h}{v} u_n\right)}{s_\Pi \frac{h}{v} - \beta}, \tag{11.13a}$$

$$d\alpha = \frac{\xi\beta\left(\alpha - s_\Pi \frac{h}{v} u_n\right)}{s_\Pi \frac{h}{v} - \beta}. \tag{11.14a}$$

The differential function relevant to the perceived growth trend can thus be obtained from equations (11.13a) and (11.14a) as:

$$d\alpha = \frac{\xi\beta}{\varsigma} du_n. \tag{11.15}$$

We now have a continuum of long-run equilibria, which satisfy the condition that $d\alpha = du_n = 0$, as can be derived from equations (11.13a) and (11.14a) and as is shown in Figure 11.6:

$$g^{**} = \alpha^{**} = s_\Pi \frac{h}{v} u_n^{**}. \tag{11.16}$$

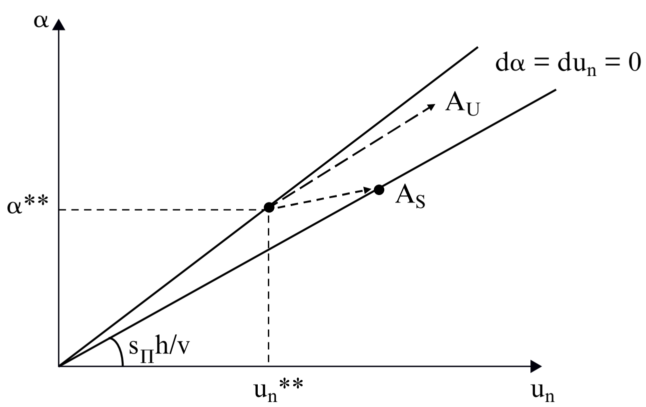


Figure 11.6 Long-run equilibrium rates of growth and capacity utilization

With a decrease in the propensity to save out of profits (s_Π), or with a decrease in the profit share (h), the continuum of long-run equilibria rotates clockwise, as shown in Figure 11.6, and two cases arise. If the dynamic equations (11.13) and (11.14) describe a stabilizing process, the normal rate of utilization and the perceived growth trend will rise up to a point such as A_S in Figure 11.6. The paradoxes of thrift and of costs thus still hold, even in the fully adjusted long-run equilibrium positions. The dynamic process, however, may be unstable, as shown by arrowhead A_U. The process will be stable, provided the transitional path has a smaller slope than that of the new demarcation line, that is provided we have $d\alpha/du_n = \xi\beta/\varsigma < s_\Pi h/v$. If the Keynesian stability condition (11.5) holds, we have that $s_\Pi h/v\beta > 1$ and then a sufficient condition for dynamic stability is simply $\xi/\varsigma < 1$ and hence $\xi < \varsigma$. In other words, the Harrodian instability effect, represented by equation (11.14), which tells us that firms will raise their expectations about future growth rates whenever current realized growth rates exceed the current trend estimate, must not be too strong as compared to the adjustment speed of the notion of normal utilization towards actual utilization.

An interesting characteristic of the present model is that it features what Setterfield (1993) calls 'deep endogeneity'. The new fully adjusted position depends on the previous fully adjusted position. Very clearly, it also depends on the reaction parameters during the transition or traverse process, and hence we may also say that it is 'path dependent'. A few other similar models, with an endogenous normal rate of capacity utilization and path dependence effects and features, have been constructed.[5] Dutt (1997) has equations that turn out to be similar to equations (11.13a) and (11.14a), but they are based on an entry deterrence mechanism – when demand is low firms try to protect their market shares using higher target excess capacity as an instrument. Lavoie (1996b, 2010) also considers a model where the mechanisms of equations (11.13) and (11.14) are extended to the pricing equation. Perhaps the most complete model is that of Cassetti (2006), where the trend growth rate (α), the normal rate of capacity utilization (u_n) and the normal profit rate (r_n) are all endogenized, reacting to their past values, while in addition the rate of capital scrapping gets speeded up as long as the actual rate of capacity utilization lies below its normal rate. Cassetti also finds path dependence effects, with the paradox of saving prevailing, while the paradox of costs may or may not occur in fully adjusted positions.

Another Kaleckian model with endogenous normal rates of utilization is that of Commendatore (2006), which involves non-linear changes in profit margins in a discrete-time framework. Commendatore shows that, at least for some parameter values, the average rate of utilization will be quite different from the initial normal rate of utilization, with aggregate demand thus playing an important role even in the long run. This is thus the lesson that can be drawn from all these models with endogenous normal rates of capacity utilization: High animal spirits and low propensities to save do have a positive long-run effect on the economy, while the paradox of costs may or may not hold.

Recently, Schoder (2012) has presented empirical support for the adjustment of the normal rate of capacity utilization towards the actual rate for US manufacturing data (1984–2007). And Nikiforos (2013) has even provided a microeconomic rationale based on cost minimization, more precisely on the choice of the cost minimizing number of shifts determining the normal rate of utilization. He starts from Kurz's (1986) model, which is often cited in support of the classical or Harrodian notion of a long-run equilibrium at the normal rate of capacity utilization representing a cost minimum choice of technique independently of aggregate demand considerations.[6] However, Nikiforos (2013) then allows for increasing returns to scale, but with a falling rate of the returns to scale, which then makes the cost minimizing number of shifts and thus the normal rate of capacity utilization endogenous to aggregate demand.

11.7 MONETARY POLICIES MAY STABILIZE THE SYSTEM – BUT WILL FEED BACK ON THE NORMAL RATE OF UTILIZATION

In the previous sections we have considered mechanisms explaining why firms themselves may be quite willing to perceive the rate of capacity utilization as an endogenous, accommodating variable. In this section we will deal with the effects of the actions of the monetary authorities in their aim to control inflation. As already briefly touched on in Section 11.3, this is the mechanism which Duménil and Lévy (1999) in their critique of the Keynesian–Kaleckian model have introduced in order to bring the economy back to a predetermined normal rate of capacity utilization which they associate with price stability. Upward (downward) deviations from the normal rate are said to trigger rising (falling) inflation. As we have shown above, their approach allows for Keynesian–Kaleckian results in the short run, but has definitively classical features in the long run when the adjustment towards the normal rate has taken place. The paradox of thrift and the paradox of costs are thus rejected for the long run. The Duménil/Lévy model, as shown by Lavoie (2003) and Lavoie and Kriesler (2007), is strongly reminiscent of the new consensus model (NCM) in modern mainstream macroeconomics, where properly conducted monetary policy is the means by which the economy is brought back to potential output, which is itself independent of monetary policy. As already argued in Section 11.3, and more extensively in Hein et al. (2011), the Duménil/Lévy model contains a lot of problems.

First, it has to be assumed that a deviation of u from u_n is indeed associated with rising or falling inflation. Duménil and Lévy (1999) do not present any precise rationale for this.[7] If we assume that inflation is of the conflicting claims type, their analysis supposes a rising Phillips curve in unexpected inflation and employment/utilization space. The normal rate of utilization is hence associated with what others have dubbed a non-accelerating inflation rate of capacity utilization (NAICU), as in Corrado and Mattey (1997), in analogy with the non-accelerating inflation rate of unemployment (NAIRU), or else a steady inflation capacity utilization rate (SICUR), as in McElhattan (1978), or a stable inflation rate of capacity utilization (SIRCU), as in Hein (2006c). However, if the Phillips curve has a horizontal segment, the NAICU, or the normal rate of utilization, can take a range of potential values. Within this range, the normal rate is determined by the goods market equilibrium and is hence endogenous with respect to the actual rate of utilization – therefore, this adds to the Kaleckian arguments regarding the non-uniqueness of the normal rate of utilization discussed in Section 11.3 above.[8]

Second, if there is a rising Phillips curve, not only does it have to be assumed that the monetary authorities are able to apply their monetary policy instrument, the short-run nominal interest rate, in the required way and that this has the required effects on aggregate demand and capacity utilization in order to bring about an adjustment of capacity utilization towards the normal rate. It also has to be assumed that monetary policy interventions have no adverse feedback effects on the NAICU or the normal rate in the long run. This latter issue will be discussed, in particular, extending our simple model framework. It will be seen that, from a Kaleckian perspective, interest rate policies may have rather complex effects on both actual and normal utilization, which only reinforces our contention from the previous sections that the long-run utilization rate should not be seen as a predetermined variable.

In order to capture the effects of unexpected inflation and changes in the interest rate as a monetary policy instrument to fight inflation, we have to modify our small neo-Kaleckian model, now made up of the following three equations:[9]

$$r = \frac{h}{v}u = r_n\frac{u}{u_n}, \qquad \frac{\partial h}{\partial i\lambda} \geq 0, \frac{\partial r_n}{\partial i\lambda} \geq 0, \tag{11.17}$$

$$\sigma = (r - i\lambda) + s_R i\lambda = h\frac{u}{v} - i\lambda(1 - s_R), \quad 0 \leq s_R \leq 1, \tag{11.18}$$

$$g = \alpha + \beta(u - u_n) - \theta i\lambda, \quad \alpha,\beta,\theta > 0. \tag{11.19}$$

Equation (11.17) includes the possibility that the mark-up in firms' pricing and hence the profit share and the normal rate of profit may be elastic with respect to 'real' interest payments relative to the capital stock, that is the product of the 'real' interest rate (i) and the debt-to-capital ratio (λ). As already discussed in Chapter 9, where we assumed a potential interest rate elasticity of the mark-up, this interest payments elasticity arises in the long run because the mark-up on variable costs has to cover interest costs. For the short run we may still consider the mark-up to be interest-inelastic owing to slow adjustment of the target mark-up. The real interest rate is given by the nominal interest rate, mainly determined by central bank policies, corrected for inflation.

The saving function (11.18) arises from the distinction between retained profits of firms, which are saved by definition, and saving out of rentiers' income. As in Chapter 9 of this book, we assume that the capital stock is financed by accumulated retained earnings, on the one hand, and by bond issues, held by rentiers' households, on the other. The saving rate in equation (11.18) is therefore given by profits minus rentiers' income, plus saving out of rentiers' income, each in relation to the capital stock. Rentiers' saving depends on interest payments received from the firm sector and the propensity to save out of rentiers' income (s_R).

Finally, the neo-Kaleckian investment function, now given by equation (11.19), has been modified by introducing the negative effect of interest payments by firms, in the same way as we have modified the post-Kaleckian investment function in Chapter 9. Following Kalecki's (1937, 1954, chap. 8, 1971, chap. 9) 'principle of increasing risk', distributed profits have a negative effect on the investment of firms because they diminish their internal means of finance for long-term investment, and also reduce their access to external finance, owing to incomplete capital markets.

From equations (11.4), (11.18) and (11.19) we obtain the goods market equilibrium rate of capacity utilization:

$$u^* = \frac{\alpha - \beta u_n + i\lambda(1 - s_R - \theta)}{\frac{h}{v} - \beta}. \tag{11.20}$$

In this version of the model, the stability condition (11.5) for the goods market equilibrium gets slightly modified and turns to:

$$\frac{\partial \sigma}{\partial u} > \frac{\partial g}{\partial u} \quad \Rightarrow \quad \frac{h}{v} > \beta. \tag{11.21}$$

Furthermore, a simple conflicting claims model of inflation can be described by the following equations:

$$h_F^T = h_0 + h_1 i\lambda, \quad h_0 > 0, h_1 \geq 0, \tag{11.22}$$

$$(1 - h)_W^T = \omega_0 + \omega_1 u, \quad \omega_0 > 0, \omega_1 \geq 0, \tag{11.23}$$

$$u_n = \frac{1 - \omega_0 - h_0 - h_1 i\lambda}{\omega_1}. \tag{11.24}$$

The target profit share (h_F^T) in equation (11.22) is given by mark-up pricing, with the mark-up being interest-inelastic in the short run, but interest-elastic in the long run. If there is no economy-wide incomes policy internalizing the macroeconomic externalities of wage setting at the firm or industry level, the workers' target wage share [$(1 - h)_W^T$] in equation (11.23) increases with the rate of employment, which, for simplification, we assume to move in step with the rate of capacity utilization.[10] For claims to be consistent, the rate of utilization needs to be at a certain level, which we can call the normal rate of utilization (u_n), as described by equation (11.24), implying a NAICU. The normal rate of utilization in this framework is thus not given, but is derived from distribution conflict. It is the rate of utilization which makes distribution targets of firms and workers consistent with each other, assuming that workers' targets are positively related to economic activity and hence to capacity utilization. To further simplify the analysis, we assume adaptive expectations and also that firms set prices once nominal wages have been set in the labour market. The latter assumption implies that firms can always realize their income distribution target, as in Duménil and Lévy (1999).

The upper part of Figure 11.7 shows the well-known goods market equilibrium; in the middle part, we have the target wage shares of firms [$(1 - h)_F^T$] and of workers [$(1 - h)_W^T$]; and the lower part of the figure shows a modified Phillips curve with the effects of capacity utilization on unexpected inflation ($\hat{p}^u$), that is the change in inflation. With the goods market equilibrium at $u_0^* = u_n$ in point A, income claims of firms and workers are mutually consistent and unexpected inflation is zero. If we start from this position and assume a decline in the propensity to save out of rentiers' income, the σ curve in the upper part of Figure 11.7 shifts downwards and the goods market equilibrium moves to u_1^* and point B. Income claims are no longer consistent, and inflation accelerates (with adaptive expectations we have positive unexpected inflation in each period). Further on, unexpected inflation will feed back on the

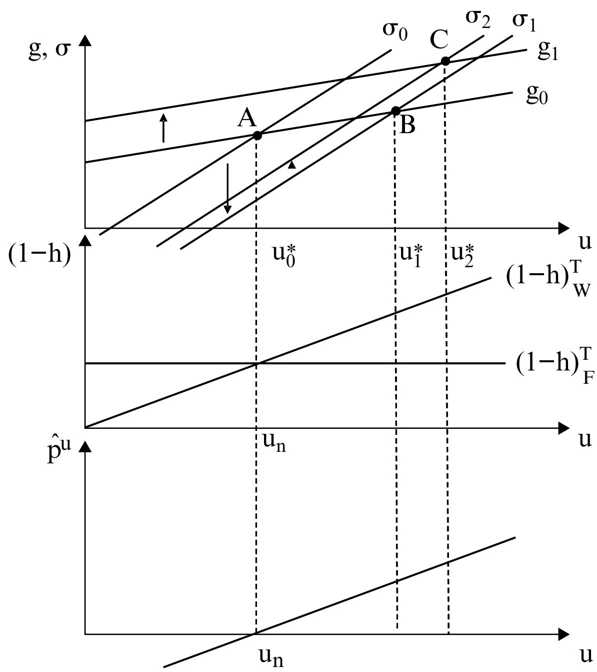


Figure 11.7 *Goods market equilibrium, distribution claims and unexpected inflation*

goods market equilibrium in the short run. With a given nominal interest rate, unexpected inflation will reduce the real interest rate, and, with credit and bonds not indexed to changes in inflation, the debt–capital ratio will decline. Taken together, unexpected inflation reduces the real interest payments relative to the capital stock ($i\lambda$), which is the important variable for the considerations that follow. The redistribution in favour of firms and at the expense of rentiers will affect the goods market equilibrium. In Figure 11.7, both the g and the σ curves will now shift upwards, so that whether this leads to a higher or lower rate of capacity utilization u^* depends on the parameter values. From equation (11.20), we obtain the short-run effect of a change in the real interest payments–capital ratio on the goods market equilibrium:

$$\frac{\partial u^*}{\partial i\lambda} = \frac{1 - s_R - \theta}{\frac{h}{v} - \beta}. \tag{11.20a}$$

Assuming Keynesian stability to hold ($h/v > \beta$), we get: $\partial u^*/\partial i\lambda < 0$, if $1 - s_R < \theta$. Therefore, if the propensity to consume of rentiers ($1 - s_R$) falls short of the interest payments elasticity of investment (θ), the income redistribution at the expense of rentiers and in favour of firms associated with unexpected inflation will stimulate aggregate demand, and u^* will move farther away from u_n. This 'normal case' (Lavoie 1995a), with respect to the demand effects of redistribution between firms and rentiers, already discussed in Chapter 9, is shown in Figure 11.7:[11] The upward shift in the g curve will exceed the upward shift in the σ curve, and the goods market equilibrium will move to u_2^* and point C, triggering even higher unexpected inflation, and so on.

In this normal case, the Duménil/Lévy (1999) (and the NCM) monetary policy rule, raising the nominal interest under control of the central bank and the real rate of interest, is likely to be successful in bringing the economy back down to u_n. This is because there is no upper limit to the real rate of interest that can be imposed by the monetary authorities, who can hike up nominal interest rates as high as they please. They can thus overcompensate the stimulating effects which real debt dynamics associated with unexpected inflation have on aggregate demand, capacity utilization and employment. As can be seen in Figure 11.8, the increasing real interest payments in relation to the capital stock force both curves, g and σ, to shift downwards, with the shift in g exceeding the one in σ. Finally, the economy will be back at u_n but at a lower equilibrium accumulation rate (g^*) in point D.

But this is not where the story ends. We need to go beyond the short run, and consider the medium- to long-run effects of changes in the real interest payments in relation to the capital stock induced by monetary policy reactions geared towards stabilizing the system.[12] Take Figure 11.8 and suppose that, in the short run, monetary policies have successfully brought the economy back from point C to point D and thus to $u_{n1} = u_0^*$. However, since real interest payments relative to the capital stock have increased, firms will (have to) raise their target mark-ups in the medium to long run.[13] This shifts their target wage share downwards, reduces the NAICU and the normal rate of capacity utilization, shifts the Phillips curve upwards, and generates unexpected inflation again, as can be seen in Figure 11.8. From equation (11.24) we get:

$$\frac{\partial u_n}{\partial i\lambda} = -\frac{h_1}{\omega_1} < 0. \tag{11.24a}$$

The immanent redistribution in favour of profits will also affect the goods market equilibrium. Inserting equations (11.22) and (11.24) into equation

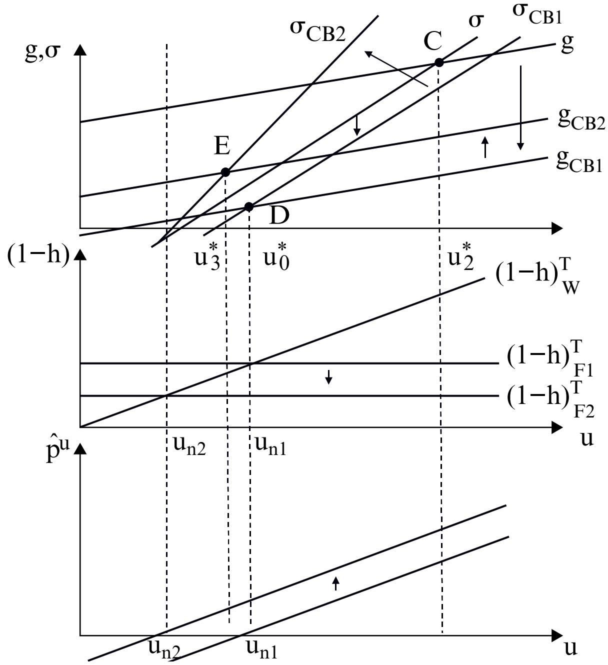


Figure 11.8 *Short- and long-run effects of inflation targeting monetary policies*

(11.20) and calculating the long-run effects of a change in iλ on the equilibrium rate of utilization yield an expansion of equation (11.20a):

$$\frac{\partial u^*}{\partial i\lambda} = \frac{(1 - s_R - \theta) + h_1\left(\frac{\beta}{\omega_1} - \frac{u}{v}\right)}{\frac{h_0 + h_1 i\lambda}{v} - \beta}. \qquad (11.20b)$$

Since we assume h_1 to be zero in the short run, but positive in the long run, we obtain a long-run effect on capacity utilization (the second term in brackets in the numerator) – on top of the short-run effect (the first term in brackets in the numerator). This long-run effect via redistribution at the expense of labour may be positive or negative – depending on the values taken by the parameters β and ω_1 and depending on initial conditions (u^*). Only by accident will the new goods market equilibrium u_3^* at point E in Figure 11.8 therefore be equal to the new normal rate u_{n2}, and further central bank interventions may be required – in this case an increase in the interest rate, dampening inflation in the short run, but pushing it up in the long run again, and so on. Graphically, this second-round effect of a rise in the real interest rate (the increased profit share and a lower normal rate of utilization) amounts to an upward shift of the investment function and a counter-clockwise rotation of the saving function in Figure 11.8. This is not the place to elaborate further on the complex interactions between the goods market equilibrium rate of utilization (u^*) and the normal rate (u_n) triggered by unexpected inflation and generated by monetary policy interventions.[14] What is important for the present chapter is that the normal rate of utilization as understood by Duménil and Lévy (1999) gets modified by monetary policy interventions. The normal rate is hence endogenous to the actual rate, albeit in an indirect and complex way, and in particular the paradox of costs might be maintained in the long run, as shown in Hein (2006c, 2008, chap. 17).[15]

11.8 CONCLUSIONS

In this chapter we have reviewed the main critique of the Kaleckian models put forward by classical, Marxian and Harrodian authors. This critique focuses on the Kaleckian notion of an endogenous rate of capacity utilization in the long run, which according to the critics violates the requirement that, in long-run equilibrium, capacity utilization should be equal to the normal rate. The latter is treated as being independent from the actual or the goods market equilibrium rate of utilization. In order to discuss and evaluate this critique we have introduced a normal rate of utilization into the neo-Kaleckian model, specified the notion of Harrodian instability as compared to Keynesian instability, and discussed several suggestions to tame Harrodian instability in the long run with an exogenous normal rate of capacity utilization. Since we have found these suggestions to be unconvincing, we have then taken a closer look at how Kaleckian authors have dealt with the classical, Marxian and Harrodian challenge.

Basically, we have distinguished three types of mechanisms designed to deal with this challenge. A first group of Kaleckian authors denies the uniqueness of the normal rate of utilization. According to these approaches, expectations and behavioural parameters, as well as norms, are changing so frequently in the real world that long-run analysis, in terms of fully adjusted positions at definite and unique normal rates of capacity utilization, is not a very relevant exercise. Although this may be a vital point, it could be considered to skirt the Harrodian challenge. We have therefore discussed a second type of response to this critique, which argues that a normal or target rate of utilization may be only one of several targets of the firm, and that the achievement of these targets may be mutually exclusive. Therefore, the adjustment of the economy towards a predetermined normal rate of utilization should not be expected for the long run. Finally, we have identified a third type of mechanism, implying that the normal rate of utilization becomes endogenous with respect to the actual rate of utilization through different channels. One channel could be that the firm's perception of the trend rate of growth and of the normal rate of utilization may be path dependent and hence be affected both by past actual rates of growth and capacity utilization. In addition, introducing monetary policies as stabilizer in a conflicting claims inflation framework with Harrodian instability yields another channel of endogeneity of the normal rate of utilization, understood as a non-accelerating inflation rate of capacity utilization (NAICU). The review of these approaches has shown that major results of the neo-Kaleckian model can be retained in a more complex setting than the simple textbook model, as provided in Chapter 6 of this book. The neo-Kaleckian (and the post-Kaleckian) models are capable of maintaining the paradox of thrift and the (potential for) the paradox of costs in the long run, even if the problem of Harrodian instability is included.

We do not claim that our review so far has been exhaustive. In particular, we have not dealt explicitly with two further types of approaches, which have also been suggested to deal with the adjustment of the rate of capacity utilization to its normal rate in the long run, and to maintain some important conclusions of the Kaleckian approach. The first approach focuses on an endogenous capital–potential output ratio ($v = K/Y^p$) instead of an endogenous rate of capacity utilization ($u = Y/Y^p$) as an adjustment variable in the long run, which makes the output–capital ratio Y/K variable, although the rate of capacity utilization may be equal to the normal rate. This approach can be based on Steindl (1979, p. 6), who has argued that 'a high growth rate and high utilization will tend to retard withdrawal of equipment . . . [and] a low growth rate and utilization will lead to some premature withdrawal of equipment'. As already noted above, Cassetti (2006) claims that the rate of capital scrapping gets speeded up (slowed down) as long as the actual rate of capacity utilization lies below (above) its normal rate. Similarly, Allain and Canry (2008) argue that low (high) rates of capacity utilization will lead to more (fewer) bankruptcies, which entail more (less) capital scrapping and hence a reduction (an increase) in the available capacity. As a result, demand will be spread over a reduced (enlarged) available capacity, thus tending to reduce the discrepancy between measured rates of capacity utilization and their normal value. And Schoder (2014) also claims that the capital–potential output ratio will rise (fall) when demand is low (high) and the rate of utilization has a tendency to fall short of (exceed) the normal rate. He also presents some empirical evidence for this argument based on US manufacturing data (1955–2012).

A second approach relies on an exogenous growth rate of a non-capacity increasing component of aggregate demand, which stabilizes the system around the normal rate of capacity utilization without contradicting the results of the Kaleckian approach, as Sawyer (2012) has pointed out. Again, this idea can be traced back to Steindl (1985), who has argued that fluctuations in the financial balances of the government and the external sector prevent severe fluctuations in the rate of capacity utilization in the course of economic growth. Modern Sraffians, like Serrano (1995), De-Juan (2005) and Cesaratto (2013), have claimed that the long-run growth rate of the economy is determined by the growth rate of autonomous demand, which means that the average propensity to save for the economy as a whole varies pro-cyclically and may thus stabilize the system around some normal rate of capacity utilization. Based on a model by Allain (2013), who relies on exogenous growth of government expenditure, Lavoie (2014, pp. 405–410) has recently shown that the system may indeed be stabilized around the normal rate of capacity utilization by a constant rate of growth of autonomous consumption, provided that Harrodian instability is not too strong. Although a lower marginal propensity to save or a lower profit share has no permanent effect on the long-run growth rate, which is given by the growth rate of autonomous expenditures in this model, it has short-run expansionary effects and thus shifts the long-run growth path upwards. Furthermore, although the rate of capacity utilization will be back at the normal rate in the long run, in the transitional period, and thus on average, it will exceed the normal rate. In these respects, the implications of the neo-Kaleckian model are maintained within this model, too.

Summing up, those statements arguing that one may be 'Keynesian in the short run' but needs to be 'classical in the long run', as Duménil and Lévy (1999) or Shaikh (2009) have put forward, seem to be rather premature. It also seems premature to argue, as Skott (2010, p. 127) does, that '[t]he current dominance of the Kaleckian model . . . is unfortunate' for post-Keynesian and structuralist macroeconomics. Kaleckian models are more flexible than the classical, Marxian and Harrodian critics suppose when attacking the simple textbook versions.

NOTES

1. This chapter draws and builds on Hein et al. (2011) and Hein, Lavoie et al. (2012). See also Lavoie (2014, chap. 6.5) for an overview of the debate.

2. See Lavoie (2010, 2014, chap. 6.4) for an extensive discussion of Keynesian instability in Kaleckian models, potential outcomes and solutions. As we have pointed out in Chapter 9 of this book, the estimation results of Hein and Schoder (2011) for a more complex and more realistic post-Kaleckian distribution and growth model for the US and Germany imply that the Keynesian short-run stability condition is met. Slow response of investment providing Keynesian stability in the short run is also the assumption being made by Skott (2012) criticizing the medium- to long-run implications of the Kaleckian investment function and the treatment of the rate of capacity utilization as an accommodating variable beyond the short run.
3. As we have shown in Chapter 4, the Kaldor–Robinson model does not contain the paradox of costs but the paradox of saving, that is a positive effect of a lower propensity to save out of profits on the long-run equilibrium rates of capital accumulation and profit. This is due to the investment function used in that model, in which the rate of capital accumulation depends on animal spirits and on the rate of profit. Therefore, whenever capacity utilization tends to exceed the normal rate of utilization, prices, profit shares and profit rates rise, which feeds back positively on capital accumulation. Therefore, in our model this would mean an upwards shift of the capital accumulation function during the adjustment process, and the result is similar to what is shown in Figure 11.3. The difference is that in Figure 11.3 we have the rise in the accumulation function before the rotation of the saving function sets in, whereas the Kaldor–Robinson model would have it simultaneously with the counter-clockwise rotation of the saving function.
4. See Hein and Stockhammer (2009, 2010) for an analysis of a neo-Kaleckian model with conflict inflation. Within a post-Kaleckian model, however, redistribution in favour of wages may dampen aggregate demand and capital accumulation and thus stabilize the economy around the normal rate of capacity utilization, provided that the economy is in a profit-led regime. See Stockhammer (2004b, 2004c, chap. 2) for a stability analysis of the post-Kaleckian model.
5. For an overview and a taxonomy of different methods with which path dependence can be included in distribution and growth models see Dutt (2009).
6. However, it should be mentioned that Kurz (1994, p. 414) acknowledged that 'it is virtually impossible for the investment–saving mechanism . . . to result in an optimal degree of capacity utilization'. And he adds that 'it is, rather to be expected, that the economy will generally exhibit smaller or larger margins of unutilized capacity over and above the difference between full and optimal capacity'.
7. On the one hand, Duménil and Lévy argue that in their view changes in prices are a function of supply–demand disequilibria. On the other hand, they consider their analysis as 'reminiscent of Joan Robinson's inflation barrier' (Duménil and Lévy 1999, p. 699), which indicates that they consider inflation to be the outcome of unresolved distribution conflict.
8. See Hein (2006c, 2006d, 2008, chaps 16–17), Kriesler and Lavoie (2007) and Hein and Stockhammer (2009, 2010) for models incorporating a Phillips curve with a horizontal segment.
9. See Hein (2006c, 2006d, 2008, chaps 16–17) and Hein and Stockhammer (2009, 2010) for more elaborated models.
10. For a more detailed treatment of the relationship between capacity utilization and employment in a similar model see Hein and Stockhammer (2010).
11. Theoretically, as we have discussed in Chapter 9, a 'puzzling case' (Lavoie 1995a) might also arise, in which redistribution in favour of firms and at the expense of rentiers has contractionary effects on aggregate demand and capacity utilization. For this case we would need: $1 - s_R > \theta$. However, as also argued in Chapter 9, empirically the normal case seems to prevail.
12. Focusing on real interest payments in relation to the capital stock means that we do not explicitly have to discuss the real debt dynamics associated with unexpected inflation and monetary policy reactions changing the real interest rate, because these are included in the ratio under consideration. See Hein (2006b, 2008, chap. 13) for a similar model,

in which the focus is on the debt dynamics induced by changes in interest rates. See also Chapter 9 of this book, where we have studied the dynamics of the debt–capital ratio in a post-Kaleckian model.

13. On empirical support for the cost-push channel of interest rate policies see the review and discussion in Chapter 9 of this book.
14. In Hein (2006c, 2008, chap. 17) these interactions are analysed in more detail and different cases are distinguished: a joint equilibrium $u_n = u^*$ by sheer luck; constant, converging or diverging oscillations of u_n and u^*; or monotonic decline of both u_n and u^*.
15. If the normal rate is understood as an inflation barrier or a NAICU, there are further endogeneity channels with respect to actual utilization which also become effective in the absence of monetary policy interventions, as the discussion on the endogeneity of the NAIRU has made clear: labour market persistence mechanisms, wage aspirations and conventional behaviour, as well as the effect of investment in fixed capital on the target profit share of firms (Hein and Stockhammer 2010).

12. Conclusions

12.1 SUMMARY

Based on some stylized facts on the trends of income distribution and economic development in mature capitalist economies, in this book we have reviewed theories of distribution and growth after Keynes, with a focus on post-Keynesian approaches and their empirical applications. The book is divided into two parts. First, Chapters 2–5 have given an overview of key contributions to the development of distribution and growth theories after Keynes. Second, Chapters 6–11 have introduced and developed in more detail different versions of the Kaleckian–Steindlian distribution and growth models, which have been prominently used and applied in post-Keynesian research during the last three decades or so.

We started with the contributions of Domar and Harrod in Chapter 2. They were the first explicitly to treat the capacity effect of investment, which was omitted in Keynes's (1936) *General Theory* and is usually disregarded in short-run macroeconomic theory. Domar merely formulated the conditions for a growth equilibrium in which capacity effects of investments are taken into account. Harrod went a step further and also studied the out-of-equilibrium dynamics, which he considered to be unstable. The determinants of long-run growth, however, were not treated by these two authors. In Chapter 2 we have also shown that the familiar and well-known Harrod–Domar textbook growth model is a misinterpretation of the intentions of Domar and Harrod, in particular because it eliminates problems of aggregate demand by assumption. This model then gave rise to the neoclassical growth model.

Chapter 3 dealt with the neoclassical distribution and growth theory. We started by reiterating that neoclassical general equilibrium microeconomics already contains a theory of distribution. Next we showed that at the macroeconomic level the aggregate marginal productivity theory of income distribution determines factor income shares exclusively by the production technology. Turning to growth we discussed the old neoclassical growth model put forward by Solow and Swan in the 1950s. The properties of this full employment growth model with exogenous technological progress, abstracting from any problems of aggregate demand growth, were outlined, and the implications of this approach with regard to productivity convergence were discussed. The treatment of technological progress as an exogenous and thus unexplained variable in the model gave rise to a second generation of neoclassical growth models, the so-called 'new growth theory' or 'endogenous growth models', starting in the 1980s with the works of Romer and Lucas. We discussed basic versions of these models, too. Finally, we presented the fundamental critique of the neoclassical distribution and growth theories, old and new, related to the 'Cambridge controversies in the theory of capital' or the 'Cambridge–Cambridge controversy' of the 1950s and 1960s, questioning the logical consistency of the neoclassical approach outside a one-good barter economy. Since the neoclassical distribution and growth theories abstract from the most important features of modern capitalism, the role of money, active investment of firms, aggregate demand failures, unemployment and distribution conflict, on the one hand, and are logically inconsistent outside a one-good barter economy, on the other hand, we turned to post-Keynesian approaches for the rest of the book.

In Chapter 4 we dealt with the first generation of post-Keynesian distribution and growth approaches, put forward by Kaldor and Robinson in the 1950s and early 1960s. We started by presenting Kaldor's full utilization–full employment equilibrium growth models, together with extensions and further developments suggested by Pasinetti. In these models, capital accumulation and full employment growth determine the rate of profit and thus functional income distribution. Productivity growth, and hence the natural rate of growth, become endogenous through Kaldor's technical progress function and the notion of capital-embodied technical change. Then we addressed Kaldor's applied economics of growth, considerably deviating from his full utilization–full employment equilibrium growth models, and we discussed the export-led growth model based on Kaldor's growth laws, and finally Thirlwall's model of a balance-of-payments-constrained growth rate. Next we turned to Robinson's contributions, her rejection of steady state growth models, her analysis of the relationship between the rate of profit and the rate of growth, and her distinctions between different accumulation scenarios or 'ages'. Finally in this chapter, we presented a textbook Kaldor–Robinson or post-Keynesian distribution and growth model, capturing some of the main characteristics of Kaldor's and Robinson's approaches. Since we found this model to be unpersuasive, in particular with respect to the assumed constancy of the rate of capacity utilization and the flexible adjustments of income shares towards the requirements of the demand-led growth equilibrium, we then dealt with the Kaleckian–Steindlian strand of post-Keynesian distribution and growth theory in the chapters that followed.

Chapter 5 introduced Kalecki's and Steindl's contributions to distribution and growth theories. The major differences of the Kalecki–Steindl approach as compared to the post-Keynesian Kaldor–Robinson approach are active cost-plus or mark-up price setting of firms in the industrial sector of the economy, which becomes a major determinant of functional income distribution, and the notion that the economy is characterized by unemployment and excess capacity beyond the short run. Therefore, the rate of utilization of productive capacities given by the capital stock is considered to be endogenous in the medium to long run, too. We started the overview with Kalecki's pricing and distribution theory, which was followed by an outline of his determination of national income and the level of profits. In this chapter we also touched on some of the debates of Kalecki's theory of pricing and distribution, and we dealt with some further developments of mark-up pricing and distribution theories, as proposed by Eichner, Harcourt and Kenyon, Wood, Steindl and Sylos-Labini. Next, we outlined Kalecki's views on the determination of investment and on economic dynamics and growth. Finally, we turned to Steindl's approach to distribution and growth and we sketched his theory of stagnation in mature capitalism. This chapter provided the foundations for the chapters dealing with modern Kaleckian–Steindlian distribution and growth in the second part of the book.

In the remaining chapters, starting with Chapter 6, we gradually developed Kaleckian models of distribution and growth. These models have in common the three main distinguishing features of the Kalecki–Steindl approach, that are active cost-plus price setting of firms as a major determinant of functional income distribution, excess labour supply and hence unemployment beyond the short run, and the notion of the medium- to long-run endogeneity of the rate of utilization of productive capacities given by the capital stock. In Chapter 6 we began by developing two baseline models, the neo-Kaleckian distribution and growth model based on the contributions by Dutt and Rowthorn, and the post-Kaleckian model based on the works of Bhaduri and Marglin, as well as of Kurz. The former model in its basic version generates uniquely wage-led results – a higher wage share is beneficial for the rates of capacity utilization, capital accumulation, growth and profit. The latter model, however, allows for wage- or profit-led regimes depending on the values of the model parameters and coefficients.

In Chapter 7 we extended the different versions of the basic Kaleckian models with the final purpose of assessing the empirical work which has been based on the post-Kaleckian model. We started by introducing saving out of wages into the closed economy versions of the neo-Kaleckian and the post-Kaleckian model. Since with this extension the neo-Kaleckian model is not uniquely wage-led any more, we then moved on with the post-Kaleckian model and integrated international trade into this model. This provided us with the version of the theoretical model which has been used in empirical research on wage- and profit-led demand and growth regimes since the early or mid-1990s. The main results of these empirical studies were finally reviewed and summarized.

In Chapter 8 we integrated productivity growth into the post-Kaleckian model. We distinguished between the demand regime and the productivity regime of our model, and we discussed the separate effects of changes in the profit share on each of these regimes. Finally, we analysed the overall effects of changes in distribution on aggregate demand, capital accumulation and productivity growth. Extending the post-Kaleckian model in this way contributes to an understanding of the long-run effects of redistribution on capital accumulation, productivity growth and hence the potential or the 'natural' rate of growth. We showed that, with the endogeneity of productivity growth, potential GDP growth becomes endogenous with respect to distributional changes and to actual GDP growth. Economic policies thus have long-lasting effects on growth through these channels. In this chapter we also provided an overview of empirical results on the estimations of the productivity growth regime of the model.

Chapter 9 explicitly integrated financial variables and a rentiers' class into the post-Kaleckian distribution and growth model. For this purpose, we relied on the post-Keynesian horizontalist approach towards interest rates, credit and money. We treated the monetary rate of interest as an exogenous variable, mainly determined by central bank policies and by the liquidity and risk considerations of commercial banks supplying credit to the productive sectors of the economy. The volumes of credit and money were considered as endogenous variables, determined by economic activity and payment conventions. In the first step, the short-run effects of changes in the rate of interest on income distribution, saving and investment were discussed, and the effects on the equilibrium rates of capacity utilization, capital accumulation and profit were derived, holding the degree of indebtedness of the firm sector constant. This allowed for the derivation of different potential regimes depending on the behavioural coefficients of the model. In the second step, we treated the firms' debt–capital ratio as a long-run endogenous variable, and we discussed its stability properties in the different regimes. Finally, empirical studies on the channels of transmission of changes in the interest rate on distribution, consumption and investment and on the respective overall regimes were reviewed.

In Chapter 10 issues in the macroeconomics of finance-dominated capitalism were studied, based on different versions of the Kaleckian distribution and growth model. From a macroeconomic perspective four channels of transmission of financialization, or the dominance of finance, to the macroeconomy were distinguished: first, the effects on income distribution; second, the effects on investment in capital stock; third, the effects on household debt and consumption; and, fourth, the effects on net exports and current account balances. We presented some stylized facts and econometric results regarding each of these channels, briefly reviewed some theoretical contributions and then presented Kaleckian models of distribution and growth incorporating these issues, based on either the post-Kaleckian or the neo-Kaleckian variant. We started by reviewing and interpreting the effects of 'financialization' on income distribution against the background of Kalecki's theory of distribution. Then we integrated the distribution effects of financialization with the effects on investment in capital stock and derived implications for capital accumulation and growth as well as for the stability of the financial structure of the firm sector. Next, we turned to the effects on consumption and household debt, and we discussed the implications for accumulation and growth as well as for the sustainability of household debt. Finally, we introduced an open economy dimension and presented a Kaleckian model of growth driven by net exports and current account surpluses, and we discussed the sustainability of such a regime as well.

Finally, Chapter 11 was devoted to the critique of the Kaleckian distribution and growth models put forward by classical, Marxian and Harrodian authors. The main point of this critique has been addressing the Kaleckian treatment of the rate of capacity utilization as an endogenous variable in the medium to long run, which may deviate from the normal rate of utilization. If the latter is considered as a definite target of the firm, deviations from this target will trigger reactions of firms' investment, thus causing 'Harrodian instability', according to the critics. In order to review this critique and to examine the implications we started with a basic neo-Kaleckian model, included a normal rate of capacity utilization in the model and defined medium- to long-run Harrodian instability. Then we discussed several mechanisms to contain and tame Harrodian instability with an exogenous normal rate of capacity utilization, as suggested by the critics of the Kaleckian models, and found them to be far from convincing. Next, we outlined Kaleckian responses to the critique starting with those Kaleckian approaches which question the notion of a normal rate of utilization in general or its uniqueness. Then we turned to a recent approach accepting the idea of a unique normal rate of utilization but arguing that firms may have other, potentially more important, medium- to long-run targets, so that neither an adjustment towards the utilization target nor Harrodian instability should be expected. Furthermore, we discussed approaches which accept the equality of actual and normal rates of capacity utilization in long-run equilibrium, but argue that the normal rate may become endogenous to the actual rate. Finally, we analysed the effects of applying monetary policies as a stabilizer in the face of Harrodian instability, and we showed that this may also generate an endogenous normal rate of capacity utilization.

Summing up, we hope to have shown that the post-Keynesian approaches, and in particular the Kaleckian–Steindlian variants, provide rich, applicable and empirically relevant models of distribution and growth for modern capitalism. These approaches are based on the principle of effective demand, include distributional conflict between different social groups and highlight the relevance of history and institutions when it comes to determining income distribution, investment in capital stock, technological change and growth. However, although we have dealt with a broad range of issues and presented a broad set of models, we neither claim that our presentation of the different versions of the post-Keynesian approach, and the Kaleckian models in particular, has been comprehensive, nor hold that there are no blind spots or omitted areas of analysis within this kind of approach. Let us touch on some of the open issues and questions in the remaining paragraphs.

12.2 OPEN ISSUES AND QUESTIONS – AND AREAS FOR FUTURE RESEARCH

In the Kaleckian models of distribution and growth in our book we have focused on functional income distribution between wages and profits, as well as the distribution of profits between profits retained in the firms and profits distributed to rentiers in terms of interest and dividends in the later chapters of the book. But, assuming away overhead labour, we have not dealt with the distribution of wages or with personal income distribution. However, Palley (2005, 2013d), Lavoie (2009) and Kapeller and Schütz (2012) have recently presented models with overhead labour or different types of workers, allowing for the treatment of changes in wage inequality within the framework of the Kaleckian approach towards distribution and growth.

We have also separated the determination of distribution from the analysis of the dynamics of aggregate demand, capacity utilization, capital accumulation and growth. For the latter we have treated functional income distribution as exogenous, and we have discussed extensively the effects of changes in distribution on capacity utilization and capital accumulation within the different model frameworks. Although we have presented an elaborated theory of income distribution, we have not dealt explicitly with any feedback effects of aggregate demand, capital accumulation and growth on income distribution, in order to keep the models as simple as possible. Another reason for this has been that there is not just one straightforward way to deal with the interdependences and feedbacks between growth and distribution in the Kaleckian framework, as the recent review by Dutt (2012) has demonstrated.

Starting with Kalecki's determination of functional income distribution, which we have reviewed in Chapter 5 of this book, and focusing on the determinants of the degree of monopoly or the mark-up only, Dutt (2012) has distinguished four potential feedback effects of aggregate demand and capital accumulation on functional income distribution. First, he considers that the mark-up in firms' pricing may positively depend on aggregate demand in the goods market and hence on the rate of capacity utilization, because of less competitive pressures when demand is soaring. However, Dutt (2012) also notices that this idea contradicts Kalecki's (1954, pp. 17–18, 39–41, 1971, pp. 50–51, 75–76) claim that the mark-up will tend to increase during a slump because of tacit agreements of firms in oligopolistic markets in the face of rising unit overhead costs, including overhead labour costs. Second, Dutt (2012) discusses that higher growth may reduce industrial concentration and hence the mark-up because of new entry into prospering markets. However, high growth may also be associated with more rapid technological change, higher minimum capital requirements and thus higher barriers to entry, as well as with product differentiation and higher marketing efforts as a tool of competition, which will each raise the mark-up. Third, Dutt (2012) explicitly considers the effect of aggregate demand and capital accumulation on overhead costs, and concludes that the effects on the mark-up are ambiguous. Without any change in technology or marketing efforts, unit overhead costs will fall with an increase in aggregate demand. But the stimulating effect of aggregate demand on capital accumulation and technological change might as well raise unit overhead costs because of higher R&D activity and higher sales efforts. Finally, Dutt (2012) discusses the effect of improved capacity utilization and growth on workers' bargaining power, and concludes that with employment growth exceeding exogenous growth of the labour force and thus falling unemployment the mark-up and the profit share will get squeezed. It is therefore difficult to come up with a straightforward story about the feedback effects of capital accumulation and growth on functional income distribution.

Whenever aggregate demand and growth have feedback effects on functional income distribution, the distinction between wage- and profit-led demand and growth, relative speeds of adjustment of quantities and prices and hence distribution, and potential non-linearities in these relationships become important with respect to the determination of long-run growth and its stability. This has recently been analysed in different Kaleckian model frameworks, several of them containing the effects of distribution conflict on inflation, too, for example by Cassetti (2003, 2006, 2012), Stockhammer (2004b, 2004c, chap. 2), Dutt (2006a, 2010c, 2012), Raghavendra (2006), Bhaduri (2008), Hein and Stockhammer (2010, 2011b), Lavoie (2010), Naastepad and Storm (2010), Blecker (2011), Sasaki (2011), Nikiforos and Foley (2012), Sawyer (2012), Schütz (2012), Storm and Naastepad (2012, 2013), Assous and Dutt (2013) and Palley (2014a). The interested reader should therefore turn to this literature.

Related to the general possibility of an interdependence between growth and distribution is the issue of the treatment of potential supply constraints in our Kaleckian distribution and growth models. In the respective chapters of the book we have assumed that labour supply is not a binding constraint to growth. However, this implies that, with a constant rate of labour supply growth exceeding the demand determined equilibrium growth rate, and with constant technical conditions of production, hence potential growth exceeding actual growth, our model economies would face rising unemployment. Alternatively, with demand determined equilibrium growth exceeding labour supply growth, our model economies would run into labour supply constraints, and the assumption made in most of the chapters on the Kaleckian growth models in our book would thus be violated. One potential way out of this problem is giving up the assumption of constant effective labour supply growth and to assume that the tendencies of labour supply growth flexibly adjust towards the tendencies of labour demand growth through changes in labour force participation rates of different groups, in life working time and through migration. This was basically the assumption we have made in most of the chapters on the Kaleckian growth models.

Another way of making potential output growth adjust towards demand determined equilibrium output growth is the introduction of technological progress as a function of labour shortages, as for example Dutt (2006a, 2010c) and several of the other papers mentioned above have proposed. This adjustment channel is, of course, closely related to our introduction of endogenous technical progress and productivity growth into Kaleckian models in Chapter 8, where we argued that technological progress is, at least partly, a response towards pressures on the profit share. Therefore, this model opens one way of dealing with labour supply constraints, if we assume that the profit share is affected by unemployment and the bargaining power of workers, as argued above.

Alternatively, we could think about an adjustment of the demand determined equilibrium growth rate towards the natural rate of growth determined by labour force growth through the (un)employment, bargaining power and distribution channel without introducing technological progress. Decreasing (rising) unemployment and rising (falling) bargaining power of workers and their trade unions would have to cause falling (rising) profit shares, which then would have to dampen aggregate demand and capital stock growth. Obviously, this adjustment process will only operate if demand and growth are profit-led, as Stockhammer (2004b, 2004c, chap. 2), among others, has demonstrated.

Another important supply constraint has hardly received any attention in post-Keynesian and Kaleckian distribution and growth theories and has therefore not been discussed at all in our book. That is a potential ecological constraint to growth, as recently outlined by Foley (2012) in a differentiated and comprehensive way. Gowdy (1991) and Kronenberg (2010), as well as the contributions in Holt et al. (2009), provide some broad background on the relationship and the compatibility between post-Keynesian and ecological economics. And recently Fontana and Sawyer (2013) and Rezai et al. (2013) have provided some initial conceptual thoughts on dealing with ecological constraints on economic growth in a post-Keynesian–Kaleckian framework. For example, Fontana and Sawyer (2013) introduce a sustainable growth rate of 'ecological footprint' and an 'ecological footprint constrained growth rate of output', and they discuss the lack of market mechanisms which will adjust the economy towards this rate. But these are only preliminary considerations. The explicit integration of ecological constraints into post-Keynesian and Kaleckian distribution and growth models is therefore definitely a task for future research.

Finally, in our book we have not dealt explicitly and extensively with macroeconomic policies in our Kaleckian models of distribution and growth. Since in our models the long-run equilibrium growth rates of real GPD and productivity are endogenous to aggregate demand growth and income distribution, macroeconomic policies, that is monetary policies, fiscal policies and wage or incomes policies, will have not only short-run effects on aggregate demand, output and employment, but also long-run effects on growth. With respect to the 'real' interest rate and hence to the monetary policies of the central bank, having a major impact on this interest rate, this has been made clear in Chapter 9 of this book, where we have discussed extensively the effects of changes in the interest rate. But much more work in this area has been done. Kaleckian models of distribution and growth have been used extensively over the last couple of years – amongst other post-Keynesian modelling frameworks – in order to analyse the role of monetary, fiscal and wage/incomes policies and to present alternatives to the economic policy suggestions provided by the new consensus macroeconomics (NCM). The interested reader should take a look at the recent contributions by Laramie and Mair (2003), Hein (2006c, 2006d, 2008, chaps 16–17), Setterfield (2009a, 2009b), Hein and Stockhammer (2010, 2011b), Rochon and Setterfield (2012), Sawyer (2012), Dutt (2013), Palley (2013b, 2014b) and Michl (2014), for example.

Appendix

A.1 RULES FOR CALCULATIONS WITH GROWTH RATES[1]

The growth rate of variable x is given by:

$$\hat{x} = \frac{dx}{x} = \frac{\partial x}{\partial t}\frac{1}{x} = \frac{\partial \log x}{\partial t}. \tag{A.1.1}$$

Starting from:

$$y = \alpha x, \tag{A.1.2a}$$

with α as a constant, differentiating with respect to time and dividing by y yields:

$$\frac{\partial y}{\partial t}\frac{1}{y} = \frac{\partial x}{\partial t}\frac{\alpha}{\alpha x}, \tag{A.1.2b}$$

which gives:

$$\hat{y} = \hat{x}. \tag{A.1.2c}$$

Starting from:

$$y = x + z, \tag{A.1.3a}$$

differentiating with respect to time and dividing by y yields:

$$\frac{\partial y}{\partial t}\frac{1}{y} = \frac{\partial x}{\partial t}\frac{1}{x}\frac{x}{y} + \frac{\partial z}{\partial t}\frac{1}{z}\frac{z}{y}, \tag{A.1.3b}$$

which gives:

$$\hat{y} = \hat{x}\frac{x}{y} + \hat{z}\frac{z}{y}. \tag{A.1.3c}$$

Starting from:

$$y = xz, \tag{A.1.4a}$$

differentiating with respect to time and dividing by y yields:

$$\frac{\partial y}{\partial t}\frac{1}{y} = \frac{\partial x}{\partial t}\frac{1}{x}\frac{z}{xz} + \frac{\partial z}{\partial t}\frac{1}{z}\frac{x}{xz}, \tag{A.1.4b}$$

which gives:

$$\hat{y} = \hat{x} + \hat{z}. \tag{A.1.4c}$$

Starting from:

$$y = \frac{x}{z}, \tag{A.1.5a}$$

differentiating with respect to time and dividing by y yields:

$$\frac{\partial y}{\partial t}\frac{1}{y} = \frac{z}{x}\left(\frac{\partial x}{\partial t}\frac{z}{z^2} - \frac{\partial z}{\partial t}\frac{x}{z^2}\right), \tag{A.1.5b}$$

which gives:

$$\hat{y} = \hat{x} - \hat{z}. \tag{A.1.5c}$$

Starting from:

$$y = x^{\alpha}z^{\beta}, \tag{A.1.6a}$$

with α and β as constants, taking logs:

$$\log y = \alpha \log x + \beta \log z, \tag{A.1.6b}$$

differentiating with respect to time yields:

$$\frac{\partial \log y}{\partial t} = \alpha\frac{\partial \log x}{\partial t} + \beta\frac{\partial \log z}{\partial t}. \tag{A.1.6c}$$

This is equal to:

$$\frac{\partial y}{\partial t}\frac{1}{y} = \alpha\frac{\partial x}{\partial t}\frac{1}{x} + \beta\frac{\partial z}{\partial t}\frac{1}{z}, \tag{A.1.6d}$$

and therefore we obtain:

$$\hat{y} = \alpha\hat{x} + \beta\hat{z}. \tag{A.1.6e}$$

A.2 RULES OF DIFFERENTIATION[2]

Constant Function Rule

$$y = f(x) = a, \text{ with a constant} \tag{A.2.1a}$$

$$\frac{\partial y}{\partial x} = f'(x) = 0 \tag{A.2.1b}$$

Power Function Rule

$$y = f(x) = ax^n \tag{A.2.2a}$$

$$\frac{\partial y}{\partial x} = f'(x) = nax^{n-1} \tag{A.2.2b}$$

Sum–Difference Rule

$$y = f(x) = g(x) \pm h(x) \tag{A.2.3a}$$

$$\frac{\partial y}{\partial x} = f'(x) = g'(x) \pm h'(x) \tag{A.2.3b}$$

Product Rule

$$y = f(x) = g(x)h(x) \tag{A.2.4a}$$

$$\frac{\partial y}{\partial x} = f'(x) = g'(x)h(x) + g(x)h'(x) \tag{A.2.4b}$$

Quotient Rule

$$y = f(x) = \frac{g(x)}{h(x)} \tag{A.2.5a}$$

$$\frac{\partial y}{\partial x} = f'(x) = \frac{g'(x)h(x) - g(x)h'(x)}{[h(x)]^2} \tag{A.2.5b}$$

The Total Differential

$$y = f(x,z) \tag{A.2.6a}$$

$$dy = \frac{\partial y}{\partial x}dx + \frac{\partial y}{\partial z}dz \tag{A.2.6b}$$

Chain Rule

$$y = f(x,z) \text{ and } x = g(z) \tag{A.2.7a}$$

$$\frac{dy}{dz} = \frac{\partial y}{\partial x}\frac{dx}{dz} + \frac{\partial y}{\partial z} \tag{A.2.7b}$$

NOTES

1. See, for example, Westphal (1994, pp. 551–552) and Carlin and Soskice (2006, pp. 465–468).
2. See, for example, Chiang (1984, chap. 7).

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