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The Bhaduri/Marglin post-Kaleckian model in the history of distribution and growth theories – an assessment by means of model closures

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The Bhaduri/Marglin post-Kaleckian model in the history of distribution and growth theories – an assessment by means of model closures*

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Abstract
Starting from a review of the main strands of orthodox and heterodox distribution and growth models and their distinguishing features, with the post-Kaleckian Bhaduri/Marglin (1990) (and Kurz 1990) model as a specific, but highly flexible variant of heterodox distribution and growth theories, we develop a simple modelling framework in which we can treat these different theories as different variants of model closure. In a simple closed private one-good economy model, each theory is presented drawing on the relationship between the rate of profit and the rate of growth, as well as on the consideration of one major adjusting variable allowing for the convergence of the endogenous variables of the model to their equilibrium values. This allows for a systematic comparison of exogenous and endogenous variables, of the 'logic' or the chain of causalities in each of the approaches, and of the generation of the long-run equilibrium positions of the system. It is finally shown that the post-Kaleckian model is able to cover many, but not all of the results generated by the old neoclassical growth model, new neoclassical growth theories, classical/Marxian distribution and growth approaches, and post-Keynesian Kaldor-Robinson and Kalecki-Steindl distribution and growth theories.

Key words: Distribution, growth, model comparison, Bhaduri/Marglin model

JEL classification: E21, E22, E25, O41

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1. Introduction

> "Particular *models* such as that of 'cooperative capitalism' enunciated by the left Keynesian social democrats, the Marxian model of 'profit squeeze' or even the conservative model relying on 'supply-side' stimulus through high profitability and a low real wage, fit into the more general Keynesian theoretical scheme. They become particular *variants* of the theoretical framework presented here." (Bhaduri/Marglin 1990, p. 388, emphasis in the original)

This is how Bhaduri and Marglin summarise what they have achieved and contributed in their seminal 1990 *Cambridge Journal of Economics* paper. Similar conclusions could have been drawn by Kurz (1990) providing a similar model framework as Bhaduri/Marglin (1990), deriving different regimes – and furthermore discussing different forms of technical progress within this framework. We have termed this modelling approach, generating the potential of different regimes of demand and growth, the 'post-Kaleckian model' (Hein 2014, Chapter 6). It is distinguished from the 'neo-Kaleckian model' based on the works of Rowthorn (1981) and Dutt (1984, 1987), 'only' generating 'stagnationist', 'underconsumptionist' or 'wage-led' regimes in its basic version, i.e. a depressing effect of re-distribution at the expense of the wage share on demand, capacity utilisation and growth.

Since the 1980s/1990s, the basic versions of both variants of the Kaleckian model have been extended to include all sorts of real world features: saving out of wages, international trade, endogenous productivity growth, interest and credit, as well as issues of 'financialisation', among others, as has been reviewed by Blecker (2002), Hein (2014, Chapters 7-10) and Lavoie (2014, Chapter 6), for example. And the 'post-Kaleckian' model variant has provided the theoretical foundations for extensive empirical and econometric work, in order to identify the specific regime for specific countries in specific time periods, starting with the work by Bowles/Boyer (1995) up to the latest contributions by Onaran/Galanis (2014) and Hartwig (2014), among several others (see Hein 2014, Chapter 7 for a review).

Here we will neither add further features to the post-Kaleckian model nor contribute to the empirical work based on this model.[1] Our concern is more modest and rather didactic and pedagogical. The interested reader should thus not expect anything new in terms of contents. We attempt to contextualise and situate the Bhaduri/Marglin (1990) and Kurz (1990) model in the history of distribution and growth theories and to compare it in a systematic way to other approaches using the method of model closures, in this way elaborating on the summary claim by Bhaduri/Marglin (1990) mentioned above.

Of course, using model closures in order to compare different approaches in the area of distribution and growth has been around for a while. Marglin (1984a, 1984b) has used this method in order to compare neoclassical, neo-Marxian and, what he calls, neo-Keynesian approaches – the latter are today rather termed post-Keynesian models in the tradition of Kaldor and Robinson (Hein 2014, Chapter 4). Amadeo (1986) has compared a Marxian, a post-Keynesian Kaldor-Robinson and a Kaleckian case in a unified framework. Similarly and much more elaborate and extensively, Dutt (1990a) has provided a comparison of neoclassical, neo-Marxian, post-Keynesian Kaldor-Robinson (what he calls neo-Keynesian) and Kalecki-Steindl approaches. The latter is in essence what we have termed the neo-

[1] For most recent assessments of the empirical literature and some of the controversies see Blecker (2015).

Kaleckian model. The post-Kaleckian approach based on Bhaduri/Marglin (1990) and Kurz (1990) has not been included in this kind of literature so far, and we will thus try to fill this gap here. Furthermore, in all these approaches, the basic models to be 'closed' are quite restrictive, assuming given production conditions and fixed coefficient technologies. Here, we will not make such an assumption, but rather start from an accounting definition for the profit rate and add a simplifying assumption regarding saving. This will provide the grounds for different closures, neoclassical, Marxian, post-Keynesian, neo-Kaleckian and post-Kaleckian, and thus a didactic/pedagogical contextualization of the post-Kaleckian model. But before doing so in Section 3 of the paper, we will briefly but systematically review the major distinguishing features of the main approaches towards (functional) income distribution and growth in Section 2. As usual, the final Section 4 will summarise and conclude.

2. The distinguishing features of orthodox and heterodox theories of distribution and growth

From the current perspective, the theories of distribution and growth can be broadly separated into orthodox approaches and heterodox approaches (Table 1). The orthodox approaches contain the neoclassical microeconomic theory of distribution, as included in the general equilibrium theory going back to Walras (1954), the neoclassical macroeconomic theory of distribution, based on Wicksell (1893) and Clark (1899), and then in particular the old neoclassical growth models proposed by Solow (1956) and Swan (1956), and finally the new neoclassical growth theories starting with works of Romer (1986) and Lucas (1988), and nowadays mainly included in mainstream textbook and being taught in mainstream academic programmes.[2]

In principle, the neoclassical approach explains both income distribution and growth in a unified and integrated framework taken from its foundations in allocation theory based on 'first principles'. These are given production technologies, i.e. production functions, given preferences, i.e. utility functions, given initial endowments of economic agents, and the assumption of strictly utility and profit maximizing behaviour of economic agents in perfectly competitive markets. Assuming marginal productivity remuneration of the factors of production, the technology of production determines the income shares of the factors of production. And adding initial endowments to the story also the personal or household distribution of income is fully determined. In this context, factor price relations, established by supply and demand processes in factor markets, are taken to represent relative scarcities.

When it comes to growth, in the ***old neoclassical growth models*** à la Solow (1956), flexible factor prices and smooth substitution between capital and labour guarantee the adjustment towards an exogenously given full employment equilibrium growth rate, the 'natural rate of growth', determined by non-explained rates of labour force growth and technical progress. Capital stock growth is given by saving, Say's law is thus assumed to hold at any rate. Due to falling marginal productivity, capital stock growth has no effect on the long-run natural rate of growth, but only on the long-run equilibrium growth path. Saving is beneficial in the sense that it increases the capital intensity of production and the level of productivity, but not the growth rate of productivity or output.

[2] See, for example, Aghion/Howitt (2009) and Barro/Xala-i-Martin (2004), and for a simplified overview Hein (2014, Chapter 3).

In the modern version of neoclassical growth theory, that is in the ***new neoclassical or endogenous growth theory***, productivity growth and hence the natural rate of growth are determined endogenously in a way, which is consistent with neoclassical first principles. In this approach it is technical progress which is determined by technology, either by externalities of the production process, or by the technologies applied in the purposeful generation of growth enhancing human capital or R&D, and by preferences, in particular the time preference of households regarding present and future consumption. Different from old neoclassical growth theory, saving and broad investment, including human capital investments, have a permanent effect on the equilibrium growth rate and thus on the natural rate of growth. Saving, determining investment, is thus beneficial for the steady growth rate, and not only for the growth path.

New growth models have been criticized by the proponents of old neoclassical growth theory, in particular by Solow (2000, 2007), because only specific parameter constellations are able to generate stable growth with constant growth rates: In the standard AK model, positive externalities for the economy as a whole have to exactly compensate for the falling marginal productivity of the capital stock at the firm level. In the human capital and R&D models, the elasticity of production of human capital or technological knowledge has to be exactly equal to one. If these conditions are not met, the model results will either converge towards those of the old neoclassical model, or they will generate ever rising growth rates, which is inconsistent with realities in modern capitalism.

Furthermore, orthodox distribution and growth models ignore the Keynesian problem of the non-neutrality of money and the importance of effective demand for long-run growth, and consider it to be irrelevant by means of assuming that, when it comes to questions of long-run growth, investment of firms is always equal to and determined by saving of households. And finally, of course, there is the critique of the 'Cambridge controversies in the theory of capital', questioning the very existence of uniquely downward sloping factor demand curves in price-quantity space and the smooth substitution of factors of production guided by relative factor prices in a more than one good economy (Harcourt 1969, 1972, Lazzarini 2011, Hein 2014, Chapter 3.6). As is well known, the latter two areas of critique have given rise to post-Keynesian models of distribution and growth starting in the 1950s, which will be addressed next as part of the heterodox approaches.

Table 1: Distribution and growth theories

Orthodox		***Heterodox***			
Old neoclassical (Solow, Swan)	New neoclassical (Romer, Lucas)	Classical/ Marxian	Post-Keynesian		
			Kaldor-Robinson	Kalecki-Steindl	
				Neo-Kaleckian (Dutt, Rowthorn)	Post-Kaleckian (Bhaduri/Marglin, Kurz)

Heterodox contributions to distribution and growth include post-Keynesian distribution and growth models, on the one hand, as well as the theories based on classical authors' and Marx's contributions, on the other hand (Table 1). Heterodox approaches contain a degree of

freedom in the determination of relative prices and thus in functional income distribution, which can be closed by different distribution hypotheses. Therefore, income distribution cannot be explained by generally valid assumptions about production technologies, preferences and strictly utility and profit maximising behaviours of economic agents in perfectly competitive markets. Instead, independent theories of distribution are required in order to determine equilibrium relative prices, which are prices of production and reproduction in these approaches. Since these approaches cannot be based on first principles they are open to and indeed require the integration of specific historical, institutional and societal considerations. Furthermore, income distribution, capital accumulation and growth are interrelated, albeit in different ways.

The ***classical authors,*** such as Adam Smith (1776) and David Ricardo (1817), as well as Karl Marx (1867, 1885, 1894) assume that functional income distribution is determined by socio-institutional factors, in particular by a subsistence real wage rate. For a given production technology the rate of profit then becomes a residual variable. The subsistence real wage rate is given by the necessary means of reproduction of workers and their families, which themselves are affected by the prevailing historical and institutional circumstances, and by the power relations between the social classes, in particular for Marx. Some neo-Ricardian authors, like Panico (1985) and Pivetti (1991), have proposed an alternative approach. Based on Sraffa's (1960, p. 33) ideas, they have suggested to take the rate of profit as being determined by the monetary interest rates, making the real wage rate the residual variable.

With functional income distribution determined in either way, the rate of profit, together with capitalists' propensity to save and to accumulate, determines the rate of capital accumulation and growth.[3] In this approach the validity of Say's law in Ricardo's version is assumed:[4] Profits saved are completely used for investment and accumulation, so that no problems of effective demand for the economy as a whole arise in long-run growth. However, for the classical authors and Marx this does not mean that the growth path is characterised by full employment. On the contrary, unemployment is considered to be a persistent feature of capitalism constraining distribution claims of workers and thus providing the conditions for positive profits, capital accumulation and growth. Furthermore in this perspective, capital accumulation feeds back on the rate of profit in the long run, and causes a tendency of the rate of profit to fall. This is either due to the specific nature of technical progress causing a falling productivity of capital (Marx's notion of a rising 'organic composition of capital'), or it is caused by the falling marginal productivity of land which may not be compensated for by

[3] For an introduction to the classical approach to distribution and growth, see Harris (1987), Kurz/Salvadori (2003) and Pasinetti (1974, Chapter 1). On Marx's and Marxian theories of distribution and capital accumulation see, for example, Catephores (1989), Levine (1988) and Shaikh (1978a, 1978b).

[4] The validity of Say's law however is not accepted by all classical economists. During the 'general glut'-controversy, in which the possibility of a general crisis of over-production was discussed, Ricardo, Say and James Mill advocated that demand is only limited by production and that a general over-production crisis is therefore impossible. Malthus and Sismondi, however, stressed the possibility of over-production and a general stagnation due to a lack of effective demand (Sowell 1972). Marx's theory also allows for another interpretation, in which the assumption of Say's law does not follow conclusively, and in which aggregate demand, finance, credit and interest rates matter for the determination of accumulation and growth, as for example Argitis (2001, 2008) and Hein (2004, 2006a, 2008, Chapter 5) have discussed, focussing on Marx's (1867) monetary theory of value in *Capital, Volume I*, Marx's (1885) analysis of aggregate demand and monetary flows in *Capital, Volume II*, and Marx's (1894) views on the role of interest and credit in *Capital, Volume III*.

productivity enhancing technical progress (Ricardo). Finally, a deep crisis of capitalism (Marx) or a stationary state of the economy (Ricardo) is supposed to emerge.

From a (post-)Keynesian perspective, this classical and orthodox Marxian approach, of course, suffers from the assumption of the long-run neutrality of money, the acceptance of the classical version of Say's law, and thus from the lack of any role for effective demand in long-run growth theory. Therefore, the ***first generation of post-Keynesian distribution and growth theories*** put forward by Nicholas Kaldor (1955/56, 1957, 1961) and Joan Robinson (1956, 1962) have relied on John Maynard Keynes's (1936) and Michal Kalecki's (1939, 1969) 'principle of effective demand' and have attempted to extend it to the long period, and hence to growth and distribution issues (Hein 2014, Chapter 4). From this perspective, in a monetary production economy, investment by firms is independent of prior saving and is the driving force of the growth process. As Robinson (1962, pp. 82-83) famously put it:

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

For the macro-economy, saving will have to adjust to investment, and since the post-Keynesian approach by Kaldor and Robinson assumes the long-run full or normal utilisation of productive capacities given by the capital stock (Kaldor also assumed full employment), this adjustment has to take place through changes in income distribution, assuming a higher propensity to save out of profits than out of wages. And this will only happen, if prices in the goods markets are more flexible than nominal wages in the labour market, such that a change in investment and aggregate demand triggers a change in the real wage rate and the wage share, and thus in the profit share and the rate of profit. If these conditions are given, investment and consumption expenditures will determine functional income distribution. The causality known from the classicals and Marx is thus reversed: The rate of profit is determined by the rate of accumulation and growth, as well as by the propensities to save out of profits and out of wages. In the model, income distribution is hence an endogenous result of capital accumulation and not a precondition. However, the inverse relationship between the wage share and the rate of accumulation and growth known from the classical and Marxian approach is maintained.

Obviously, the assumption of long-run growth with a normal or full rate of capacity utilisation and the related requirements of goods market prices to be more flexible than nominal wages in the long run, in order to generate the required redistribution and adjustment of saving to investment whenever there is a change in capital accumulation, poses some problems. First, it is not clear why in organised oligopolistic goods markets price reactions should be speedier than quantity responses towards changes in demand, in particular in periods of shrinking demand. Second, even if prices were highly flexible, it is not clear why nominal wages should be more rigid in the long run, and, in particular, why workers should accept a lower real wage rate or wage share whenever capital accumulation accelerates. Of course, Robinson (1962, pp. 58-59) discussed the exceptional case of the 'inflation barrier', when there is a tendency of the real wage rate to be forced below some conventional or target level, and workers start to resist, generating a price-wage-price spiral. However, why should workers accept a lower real wage rate at any level of the wage rate? Generally, the role of

distribution conflict seems to be seriously underrated in the post-Keynesian Kaldor-Robinson approach.

Alternatively, in the ***second generation of post-Keynesian models*** based on Michal Kalecki's (1954, 1971) and Josef Steindl's (1952) works**,** the independence of capital accumulation of firms from saving at the macroeconomic level is connected with a determination of income distribution by relative economic powers of capital and labour, mainly through firms' mark-up pricing – on constant unit labour costs up to full capacity output – in incompletely competitive goods markets. At first sight, the system now seems to be over determined, i.e. having more (linearly independent) equations than variables to be determined. However, the long-run endogeneity of the rate of capacity utilization allows for a reconciliation: Functional income distribution and hence the profit share are explained by relative economic powers of capital and labour affecting the mark-up in firms' pricing, and the rate of capacity utilization is determined by aggregate demand growth and hence by capital accumulation and consumption. In the Kalecki-Steindl approach, the rate of capital accumulation still determines the rate of profit, but now through variations in capacity utilisation, not in income distribution. In a dynamic framework, saving adjust to investment through variations in income growth and in the rate of utilisation of productive capacities.

The effects of distributional changes on equilibrium capacity utilisation and growth mainly depend on the relative weights of demand/utilisation and profitability determinants in the investment functions. The neo-Kaleckian model based on the works of Rowthorn (1981) and Dutt (1984, 1987) contains a strong accelerator effect of demand and no direct effect of profitability in the investment function. In its closed economy version without saving out of wages it generates uniquely depressing effects of re-distribution at the expense of the wage share on the rates of capacity utilisation, capital accumulation, growth and profit. The post-Kaleckian model, based on the works of Bhaduri/Marglin (1990) and Kurz (1990), however, also contains a direct profitability effect in the investment function. Therefore, its closed economy version without saving out of wages is already able to generate different regimes of demand and growth, hence positive or negative effects of a lower wage share on capacity utilisation, capital accumulation, growth and the rate of profit, depending on the relative weights of accelerator and profitability terms in the investment function and on the differential in the propensity to save from profits and from wages.

Both modern variants of the Kalecki/Steindl approach towards distribution and growth have been challenged because of their treatment of capacity utilisation as endogenous variable and the potential deviation of the equilibrium rate of capacity utilisation from the normal rate or firms' target rate of utilisation when making investment decisions. Marxian and Harrodian authors, like Dumenil/Levy (1999), Shaikh (2009) and Skott (2010, 2012) have argued that such a position should not be considered to be a long-run equilibrium, but would rather trigger further responses by firms. Thus 'Harrodian instability' would arise, in which equilibrium utilisation moves ever farther away from target or normal utilisation. This would then have to be contained by other mechanisms in the model (changes in distribution or animal spirits, or government and central bank interventions). As has been reviewed and discussed by Hein/Lavoie/van Treeck (2011, 2012), Kaleckian and Steindlian authors have put forward different justifications for taking the rate of capacity utilisation as an adjusting and

endogenous variable, probably within bounds, nonetheless:[5] Normal or target rates of utilisation cannot be precisely determined in a world of fundamental uncertainty about future events and should thus rather be considered as a range (Dutt 1990b, 2005, 2010). Firms may have multiple goals and accept variations in capacity utilisation and hence deviations from the target or normal rate in the long-run equilibrium to come closer to meeting other targets, for instance dividend payments demanded by shareholders (Dallery/van Treeck 2010). Firms' assessment of trend growth and the normal rate of utilisation may endogenously adjust to actual experience (Lavoie 1995, 1996). And finally, the target or normal rate as a stable inflation rate of utilisation may itself be endogenous to inflation targeting monetary policies when the interest cost and distribution channels of interest rate policies are considered (Hein 2006b, 2008, Chapter 17).

3. A systematic comparison by means of model closures

Let us now compare the basic features of each of the approaches outlined above making use of a very basic and simple model and then apply different closures, according to the different theories, to that model. In essence we will start with two equations for the basic model, and will then add four equations for each approach, in order to close the model. Each approach can then be described graphically in a two quadrant system by the relationship between the rate of growth and the rate of profit, on the one hand, and by an endogenous variable adjusting the rate of profit to its long-run equilibrium value, on the other hand.

3.1 The basic model

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. 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. We do neither 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. Capitalists control the capital stock, hire labour, organise the production process, and decide about investment and thus the expansion of the capital stock. For the latter they draw on their own means of finance, issue stocks or corporate bonds or draw on credit endogenously generated and granted by the financial sector. By assumption all these transactions take place within the capitalist class and they are not modelled here.

In our model economy, a homogenous 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 refrain from the consideration of overhead labour, depreciation of the capital stock, and raw materials and intermediate products. The rate of profit (r) relating the flow of profits (Π) to the nominal capital stock (pK) can be decomposed into the following components: the profit share (h) relating profits to nominal income (pY), the rate of capacity utilisation (u) relating actual

[5] See also Hein (2014, Chapter 11) and Lavoie (2014, Chapter 6.5).

output to potential output given by the capital stock (Y^p), and the inverse of the capital-potential output ratio (v) relating the capital stock to potential output:

(1) $$r = \frac{\Pi}{pK} = \frac{\Pi}{pY}\frac{Y}{Y^p}\frac{Y^p}{K} = hu\frac{1}{v}.$$

Our assumption regarding saving translates into the following saving rate (σ), which relates the flow of total saving (S) to the value of the capital stock:

(2) $$\sigma = \frac{S}{pK} = \frac{s_\Pi \Pi}{pK} = s_\Pi r = s_\Pi hu\frac{1}{v}, \qquad 0 < s_\Pi \leq 1.$$

With zero saving out of wages, the saving rate is determined by the propensity to save out of profits (s_Π) and by the profit rate, respectively the components of the profit rate from equation (1).

Discussing the different model closures of our approaches in what follows, we are interested in the long-run equilibrium relationship between the rate of capital accumulation, the rate of growth and the determination of income distribution, the profit share, and finally the profit rate.

3.2 The old neoclassical closure

Starting with the old neoclassical growth model in the tradition of Solow (1956) and Swan (1956), we obtain the following closure. In long-run equilibrium, capacity utilisation is at its normal or target rate (u_n). Profit maximising firms use the capital stock at the optimal rate – and labour is fully employed through a flexible real wage rate in the labour market:

(3n) $$u = u_n.$$

Functional income distribution, and thus the profit share in the neoclassical model are determined by the production technology, assuming marginal productivity remuneration. With a Cobb/Douglas production function, the profit share is given by the output elasticity of capital:

(4n) $$h = \bar{h}.$$

From equations (1), (3n) and (4n), the capital-potential output ratio remains as a variable which may adjust the profit rate to its value required by the growth equilibrium. The latter is given by the natural rate of growth (g_n), composed of the sum of labour force growth and the rate of technical progress, each of them assumed to be exogenous.

(5n) $$g = g_n.$$

Finally, in the neoclassical model, investment is identically equal to saving. It is thus the saving decisions of the households which determine investment of the firms, and the saving rate thus determines the rate of capital accumulation (g):

(6n) $$\sigma = \frac{S}{pK} \equiv g = \frac{pI}{pK}.$$

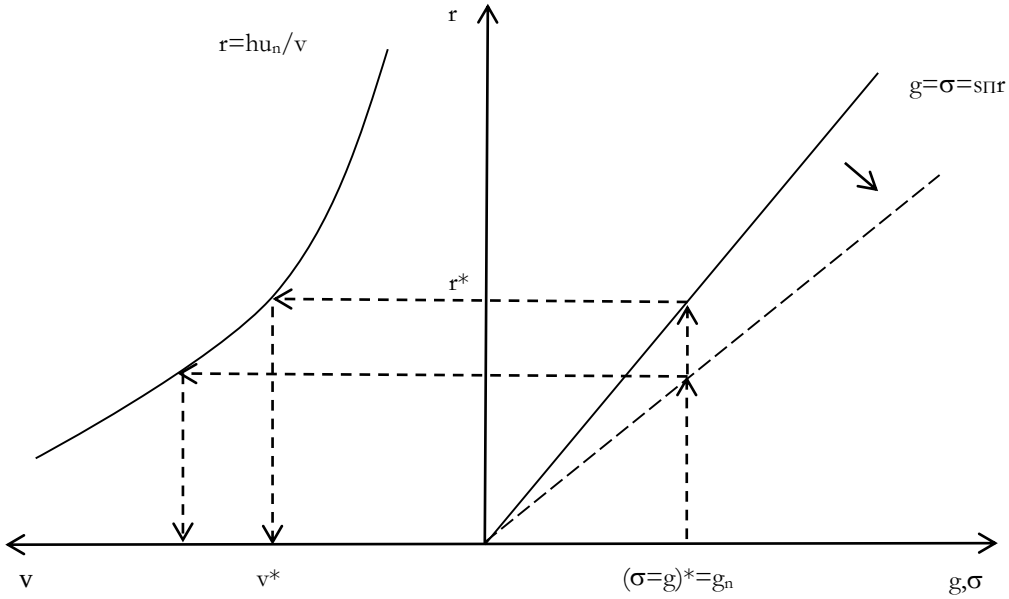
Equation (6n) is what Harrod (1939) used to call the ‘warranted rate of growth’. This is the rate of growth of output, investment and the capital stock, at which firms can sell the output produced at the target or normal rate of utilisation in the goods market, and they will thus continue with this rate of expansion. In the neoclassical model, the warranted rate of growth will now adjust towards the natural rate of growth through a variation in the capital-potential output ratio.

Graphically, the old neoclassical growth model is presented in Figure 1. On the right hand side, we have the relationship between the rate of profit and the saving rate (equation 2), the latter being identical with the rate of capital accumulation (equation 6n). On the left hand side, we have the relationship between the rate of profit and the capital-potential output ratio (equation 1), assuming the profit share to be given technologically and capacity utilisation at its normal rate.

In long-run growth equilibrium, the natural rate of growth determines the equilibrium growth rate of capital accumulation (the warranted rate), and with a given propensity to save thus the equilibrium rate of profit. The latter will adjust to its equilibrium rate through changes in the capital-potential output ratio, that is through substitution between capital and labour guided by flexible real wages and real interest rates in the labour and capital markets, responding to changes in factor supply and demand.

With the natural rate of growth as exogenous variable, together with propensity to save out of profits (determined by time preference in more elaborated models), the profit share (given by production technology) and the normal rate of utilisation (determined by technology), the warranted rate of growth, the rate of profit and the capital-potential output ratio become the endogenous variables in the old neoclassical growth model. A higher (lower) natural rate of growth will cause a higher (lower) warranted rate of growth, a higher (lower) rate of profit and a lower (higher) capital-potential output ratio. A higher (lower) propensity to save out of profits, and thus a clockwise (counter-clockwise) rotation of the g-σ-curve, as shown in Figure 1, will have no effect on the equilibrium rates of growth and capital accumulation, but will cause a lower (higher) rate of profit and a higher (lower) capital-potential output ratio. Finally, a higher (lower) profit share or a higher (lower) normal rate of utilisation – through a change in production technology –, and thus an upwards (downwards) shift of the r-curve in Figure 1, will have no effect on the equilibrium rates of growth and capital accumulation, but will cause a higher (lower) capital-potential output ratio. Table 2 summarises the effects of changes in exogenous variables on endogenous variables in the old neoclassical growth model.

Figure 1: The neoclassical distribution and growth model



Note: The rotation of the g-σ-curve shows the effect of a rise in the propensity to save out of profits.

Table 2: Effects of changes in exogenous variables on endogenous variables in the old neoclassical growth model			
Exogenous variables	***Endogenous variables***		
	$(\sigma \equiv g)^*$	r*	v*
g_n	+	+	–
s_Π	0	–	+
h	0	0	+
u_n	0	0	+

3.3 The new neoclassical closure

Turning to the new neoclassical growth models inspired by Romer (1986) and Lucas (1988) and codified in modern textbooks, like Aghion/Howitt (2009) or Barro/Xala-i-Martin (2004), we obtain the following closure. As in the old neoclassical growth model, utilisation of the capital stock in long-equilibrium is at its optimal, target or normal level – and labour is fully employed, too:

(3ng) $u = u_n$.

Factor income shares and thus the profit share are again given by production technology, assuming marginal productivity remuneration:

(4ng) $h = \bar{h}$.

But different from the old neoclassical growth model, the capital-potential output ratio is no longer a passively adjusting variable (dominated by capital-labour substitution and falling marginal productivities). It is now a constant, either determined by macroeconomic externalities exactly compensating for falling marginal productivities at the microeconomic

levels, as in the AK model, or by productivity growth generated by human capital or R&D expenditures in the respective models compensating for falling marginal productivities. Taking the AK model as the most simple and workhorse model of new neoclassical growth theory, with a production function Y = AK, and A as constant (broad) capital productivity (Hein 2014, Chapter 3.5), we obtain:

(5ng) $$v = \frac{1}{A}.$$

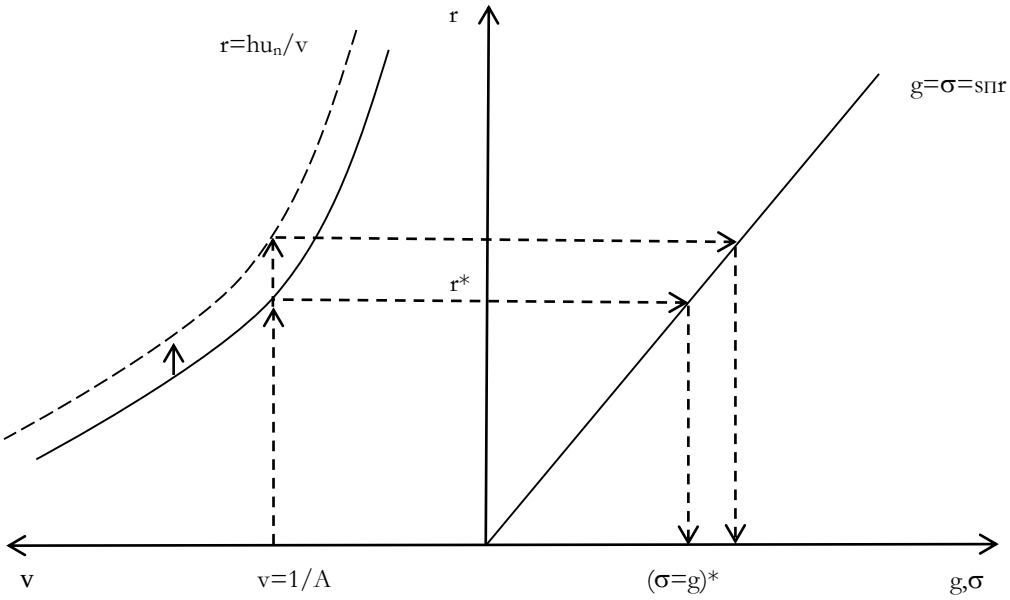
Finally, as in the old neoclassical growth model, investment is identically equal to saving:

(6ng) $$\sigma = \frac{S}{pK} \equiv g = \frac{pI}{pK}$$

Figure 2 presents the new neoclassical growth theory, using the same equations as for the old neoclassical model, i.e. the relationship between the saving and accumulation rate with the rate of profit on the right hand side, and the relationship between the rate of profit and the capital-potential output ratio on the left hand side. But now the causality has turned around. It is the given and constant capital-potential output ratio, which determines the equilibrium rate of profit, and the latter, together with the propensity to save out of profits, then determines long-run equilibrium capital accumulation and (productivity) growth, and thus full employment natural growth.

In the new neoclassical growth model, the capital-potential output ratio turns out to be the exogenous variable in our model setup, itself determined by externalities or by technology and preferences with respect to the generation of technological progress through human capital accumulation or R&D expenditures. The other exogenous variables are again the propensity to save out of profits (determined by time preference), the profit share and the normal rate of utilisation (each determined by technology). The endogenous variables are the rate of profit and the rates of accumulation and growth. A higher (lower) broad capital productivity and thus a lower (higher) capital-potential output ratio cause a higher (lower) rate of profit and higher (lower) equilibrium rates of accumulation and growth. A higher (lower) profit share or a higher (lower) normal rate of utilisation, and thus an upwards (downwards) shift of the r-curve, as shown in Figure 2, has the same effects. A higher (lower) propensity to save, hence a clockwise (counter-clockwise) rotation of the g-σ-curve, causes a higher (lower) equilibrium rate of capital accumulation and growth, but has no effect on the equilibrium profit rate. Table 3 summarises these effects.

Figure 2: The new growth theory



Note: The upwards shift of the r-curve shows the effect of a rise in the profit share.

Table 3: Effects of changes in exogenous variables on endogenous variables in the new neoclassical growth theory		
Exogenous variables	***Endogenous variables***	
	$(\sigma \equiv g)^*$	r*
v	–	–
h	+	+
u_n	+	+
s_Π	+	0

3.4 The classical/Marxian closure

Discussing the classical and orthodox Marxian closure in our model, we have again that productive capacities given by the capital stock are used at their normal or target rate in the long-run growth equilibrium:

(3cm) $u = u_n$.

Usually, in the classical/Marxian approach we have unemployment in the long-run growth equilibrium. Functional income distribution is determined by socio-institutional factors and distribution conflict – either over the real wage rate or over the rate of interest, as explained above. Let us here focus on the subsistence or conventional real wage rate (w^r_s), which for a given production technology and thus a given labour-output ratio (a) determines the profit share:

(4cm) $h = \frac{pY - wL}{pY} = 1 - w^r_s a$,

with w representing the nominal wage rate and L the labour input. If the technical conditions of production are taken as given, i.e. not responding in a systematic way towards changes in distribution or economic activity, we also have:

(5cm) $v = \bar{v}$.

And finally, we have the classical version of Say's law, with saving determining investment in the capital stock:

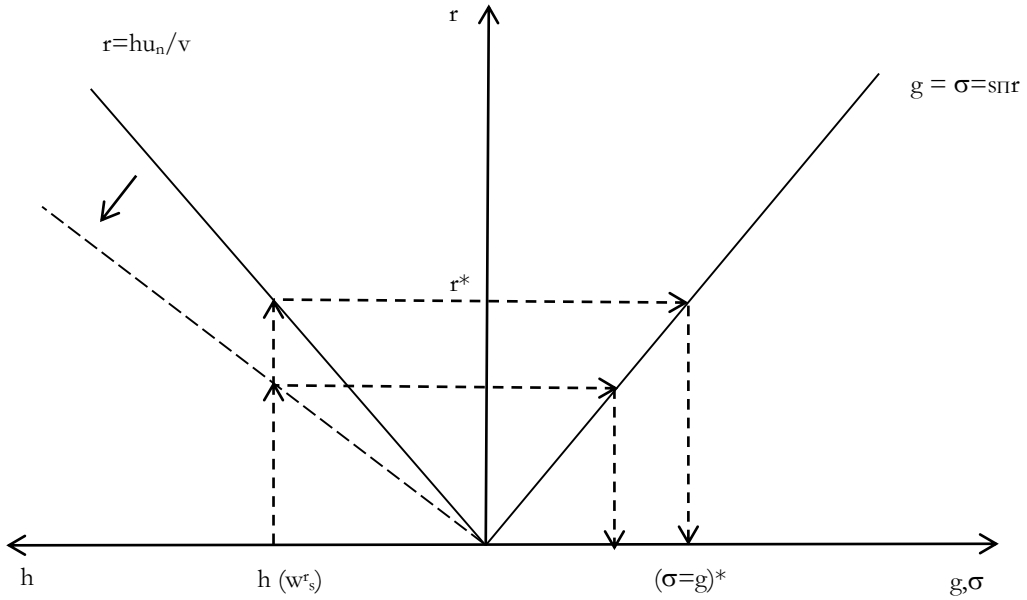
(6cm) $\sigma = \frac{S}{pK} \equiv g = \frac{pI}{pK}$.

Figure 3 presents the classical/Marxian distribution and growth model. On the right hand side, we have the relationship between the rate of profit and the saving and accumulation rate from equations (2) and (6cm). And on the left hand side, we have the rate of profit from equation (1), for a given capital-potential output ratio and the normal rate of capacity utilisation depending on the profit share. Distribution conflict determines the profit share, thus the profit rate, and the latter, together with the propensity to save out of profits, determines equilibrium capital accumulation and growth. Higher growth will thus either require a higher propensity to save out of profits, i.e. lower capitalist consumption, or a weaker working class with lower bargaining power and hence a lower wage share, and thus less consumption of workers.

The exogenous variables in the classical/Marxian model are thus the profit share, the capital-potential output ratio, the normal rate of capacity utilisation and the propensity to save out of profits. A higher (lower) profit share, as well as a higher (lower) normal rate of utilisation, the latter through a clockwise (counter-clockwise) rotation of the r-curve will cause a higher (lower) profit rate and a higher (lower) equilibrium rate of capital accumulation and growth. Technical change triggering a higher (lower) capital-potential output ratio, hence a counter-clockwise (clockwise) rotation of the r-curve, as shown in Figure 3, will lead to a lower (higher) rate of profit and thus also to lower (higher) equilibrium capital accumulation and growth, as in Marx's (1894) falling rate of profit and overaccumulation crisis theory. Finally, a higher (lower) propensity to save, hence a clockwise (counter-clockwise) rotation of the g-σ-curve, will cause a higher (lower) equilibrium rate of accumulation and growth, but will have no effect on the equilibrium profit rate. Table 4 summarises again the results, and shows that they are structurally similar to the ones in the new neoclassical growth theory – although based on a very different type of model.[6]

[6] This observation induced Kurz/Salvadori's (2003, 21) assessment of new neoclassical growth theory: 'A brief look into the history of economic thought shows that from Adam Smith via David Ricardo, Robert Torrens, Thomas Robert Malthus, Karl Marx up to John von Neumann both the equilibrium and the actual rate of capital accumulation and thus both the equilibrium and the actual rate of growth of output as a whole were seen to depend on agents' behaviour, that is, endogenously determined. In this regard there is indeed nothing new under the sun.'

Figure 3: The classical/Marxian distribution and growth model



Note: The rotation of r-curve shows the effect of a rise in the capital-potential output ratio.

Table 4: Effects of changes in exogenous variables on endogenous variables in the classical/Marxian distribution and growth theory		
Exogenous variables	***Endogenous variables***	
	$(\sigma \equiv g)^*$	r*
h	+	+
u_n	+	+
v	–	–
s_Π	+	0

3.5 The post-Keynesian Kaldor-Robinson closure

The textbook version of the first generation post-Keynesian distribution and growth model in the tradition of Kaldor and Robinson (Hein 2014, Chapter 4.4, Lavoie 2014, Chapter 6.1), provides the following closure. In the long-run growth equilibrium the utilisation rate of productive capacities given by the capital stock is at its normal or target rate:

(3kr) $u = u_n$.

Labour, however, is usually not fully employed. The capital-potential output ratio is an exogenous variable, which is itself affected by the nature of technical progress. It is not systematically related to the rate of profit or economic activity, as in the neoclassical theory:

(4kr) $v = \overline{v}$.

With a constant and given normal rate of utilisation and a given capital-potential output ratio, the profit share becomes the variable adjusting the profit rate (equation 1) to its equilibrium value. The distinguishing feature of the post-Keynesian approach, as mentioned above, is the independence of firms' investment decisions from households' saving decisions. In a

monetary production economy, firms have access to means of investment finance through the endogenous generation and supply of credit and finance by the banking and financial sector, without the need of any prior saving of the household sector.[7] This means that we now have an investment function separately from the saving function in equation (2):

(5kr) $g = g(\alpha, r), \qquad \frac{\partial g}{\partial \alpha} > 0, \frac{\partial g}{\partial r} > 0.$

Following Kaldor (1955/56, 1957, 1961) and Robinson (1956, 1962), investment decisions are determined by firms' 'animal spirits' (α), describing the 'spontaneous urge to action rather than inaction' (Keynes 1936, p. 161), and by the (expected) rate of profit. Profits and thus the profit rate are considered to have a positive influence on investment decisions, as retained profits provide internal funds for investment, furthermore, they alleviate the access of firms to external funds, because the firm's own means of finance (and thus profits) determine its creditworthiness in incompletely competitive financial markets. Equation (6kr) is the goods market equilibrium, in which the accumulation rate and the saving rate have to be equal:

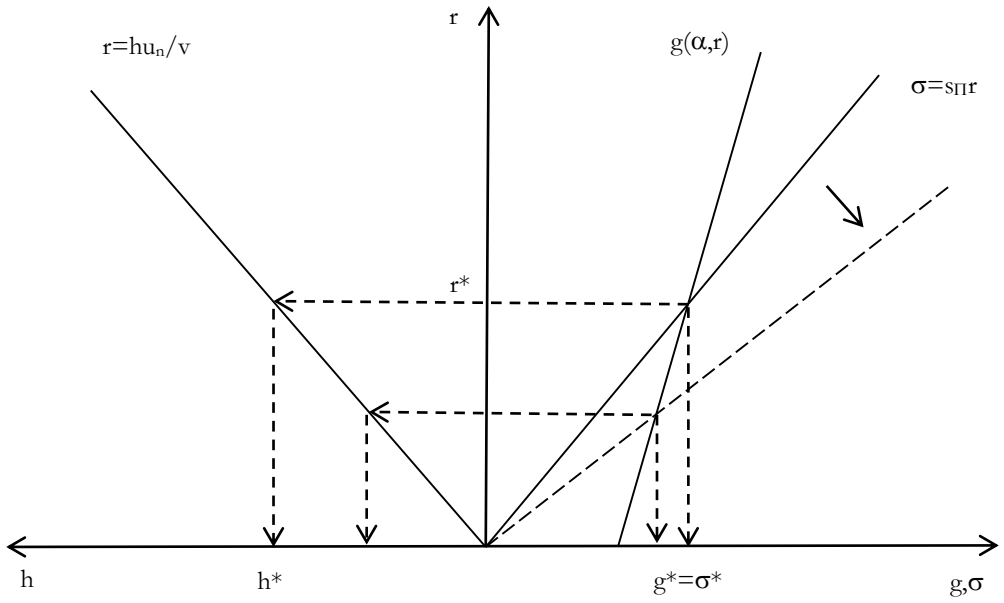
(6kr) $g^* = \frac{pI}{pK} = \sigma^* = \frac{S}{pK}.$

The full Kaldor-Robinson distribution and growth model is presented in Figure 4. On the right hand side, we have the accumulation rate and the saving rate, each as a function of the rate of profit. And on the left hand side, we have the relationship of the profit rate and the profit share for a given normal rate of capacity utilisation and a given capital-potential output ratio. The point of intersection of investment and saving functions determines the long-run equilibrium accumulation and growth rate, as well as the associated equilibrium profit rate, with the profit share as the adjusting variable. Higher equilibrium growth will trigger a higher profit rate, a higher profit share and thus a lower wage share. Higher growth thus requires a lower workers' share in national income.

In the post-Keynesian Kaldor-Robinson model, we have as exogenous variables and parameters those determining the investment and saving function, i.e. animal spirits, the responsiveness of investment with respect to the profit rate ($\partial g/\partial r$), and the propensity to save out of profits, as well as the exogenous and given normal rate of utilisation and capital-potential output ratio. Any rise (fall) in animal spirits, hence a rightwards (leftwards) shift in the g-curve, or in the responsiveness of investment to the profit rate, hence a clockwise (counter-clockwise) rotation in the g-curve, will cause higher (lower) equilibrium rates of accumulation, growth and profit, and a higher (lower) profit share. A higher (lower) propensity to save, thus a clockwise (counter-clockwise) rotation in the σ-curve, as shown in Figure 4, has a negative (positive) effect on the equilibrium values of accumulation, growth, the profit rate and the profit share. The paradox of thrift is thus valid for long-run growth, too. Finally, any change in the capital-potential output ratio or in the normal rate of utilisation will have no effects on the equilibrium accumulation, growth and profit rates, but will only affect the equilibrium profit share. A change in the capital-potential output ratio (rotation in the r-curve) will be positively related with the profit share, whereas a change in the normal rate of utilisation (rotation in the r-curve, too) will have an inverse effect on the profit share. Table 5 summarises these results.

[7] See Lavoie (2014, Chapter 4) for an elaborated textbook presentation of the endogeneity of money, credit and finance in the post-Keynesian monetary theory.

Figure 4: The post-Keynesian Kaldor-Robinson distribution and growth model



Note: The rotation of the σ-curve shows the effect of a rise in the propensity to save out of profits.

Table 5: Effects of changes in exogenous variables on endogenous variables in the post-Keynesian Kaldor-Robinson distribution and growth model			
Exogenous variables	***Endogenous variables***		
	$\sigma^* = g^*$	r*	h*
α	+	+	+
$\partial g/\partial r$	+	+	+
s_Π	–	–	–
v	0	0	+
u_n	0	0	–

3.6. The post-Keynesian Kalecki-Steindl closure

The final closure to be discussed is the one based on the contributions by Kalecki (1954, 1971) and Steindl (1952), and included in the textbook version of the neo-Kaleckian and post-Kaleckian models (Blecker 2002, Hein 2014, Chapter 6, Lavoie, Chapter 6.2). As explained above, the rate of capacity utilisation becomes an endogenous variable in the Kalecki-Steindl approach. The profit share, and thus functional income distribution, is mainly determined by the mark-up in firms' pricing in incompletely competitive markets. In a multi-sectoral model with intermediate inputs, the sectoral composition of the economy and the relationship between unit material costs and unit wage costs matter as well for functional income distribution (Hein 2014, Chapter 5.2). In our simple closed private one-good economy model, it is only the mark-up (m) on constant unit labour costs which determines the profit share:

(3ks) $h = h(\overline{m}), \qquad \frac{\partial h}{\partial m} > 0.$

The mark-up itself is affected by several factors, as the degree of competition in the goods market, the bargaining power of workers and unit overhead costs, which we all treat as constant and given. The capital-potential output ratio is also treated as an exogenous variable determined by technology, which does not systematically respond to distribution and activity variables in the model:

(4ks) $v = \overline{v}$.

With the profit share and the capital-potential output ratio treated as exogenously given, the rate of capacity utilisation becomes the variable, adjusting the profit rate (equation 1) to its equilibrium value. The determinants in the Kalecki-Steindl investment function are basically similar to the ones in the Kaldor-Robinson model. We have again firms' or managements' animal spirits (α), sometimes taken to represent the firms' assessment of the long-run growth trend of the economy. Furthermore, the (expected) rate of profit is of relevance, because it indicates internal means of finance required for attracting external investment finance, according to Kalecki's (1937) 'principle of increasing risk'. Also the dynamics of demand are reflected in the rate of profit through changes in capacity utilisation (equation 1). Different from the Kaldor-Robinson model, however, Kaleckians and Steindlians prefer to include the constituting elements of the profit rate into the investment function, because, as in particular Bhaduri/Marglin (1990) have argued, the source of a change in the profit rate may be important when it comes to the discussion of the effects on firms' investment decisions. Therefore, on top of animal spirits as a shift parameter, we have included the three determinants of the profit rate from equation (1) into the Kalecki-Steindl accumulation function:

(5ks) $g = g(\alpha, r) = g(\alpha, h, u, v), \qquad \frac{\partial g}{\partial \alpha} > 0, \frac{\partial g}{\partial r} > 0, \frac{\partial g}{\partial h} > 0, \frac{\partial g}{\partial u} > 0, \frac{\partial g}{\partial v} = ?.$

Investment decisions will thus positively depend on the profit share and the rate of capacity utilisation, because each will increase the (expected) rate of profit, ceteris paribus. Here, it is important to understand that we are talking about partial effects on investment decisions, applying the ceteris paribus clause, and are not yet considering the further feedback effects through the model. Regarding changes in the capital-potential output ratio through technical change, the partial effects on investment decisions are not clear. On the one hand, a higher capital-potential output ratio means a lower rate of profit which should dampen investment. On the other hand, however, a higher capital-potential output ratio means that a certain increase in demand requires a higher increase in the capital stock than before which should boost investment. The sign of the sum of these two opposing effects is not clear ex ante, so that we will disregard any direct effect of changes in the capital-potential output ratio on investment in what follows. Finally, equation (6ks) is again the familiar goods market equilibrium condition:

(6ks) $g^* = \frac{pI}{pK} = \sigma^* = \frac{S}{pK}.$

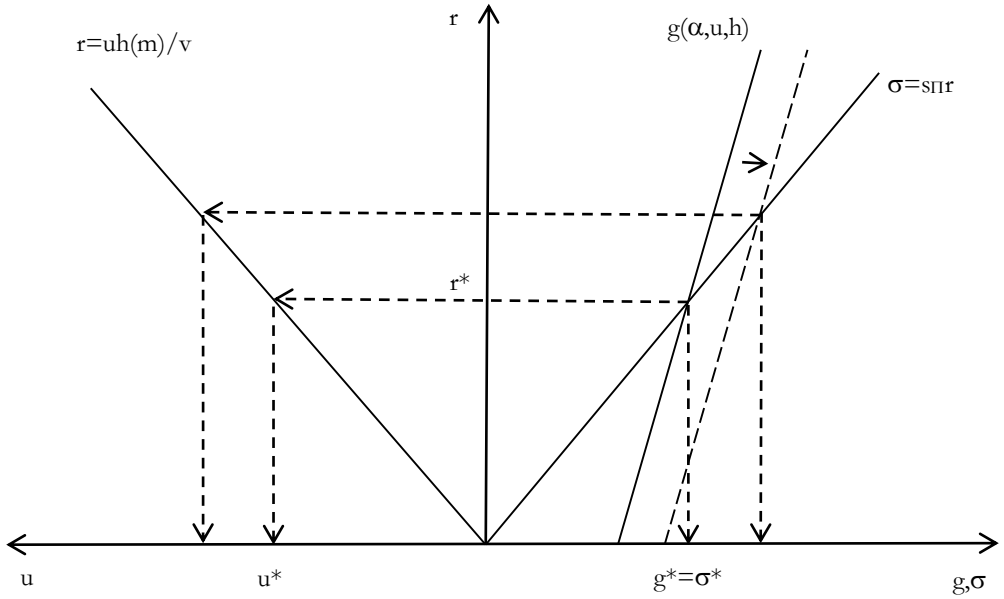
Figure 5 presents the general Kalecki-Steindl distribution and growth model. On the right hand side, we have the accumulation rate and the saving rate, each as a function of the rate of profit – bearing in mind that we have to take into account potentially different effects of the

components of the profit rate on investment. And on the left hand side we have the relationship of the profit rate with the rate of capacity utilisation, for a given profit share and a given capital-potential output ratio. The point of intersection of investment and saving functions determines the long-run equilibrium accumulation and growth rate, as well as the associated equilibrium profit rate, with capacity utilisation as the adjusting variable. Higher equilibrium growth will trigger a higher profit rate and a higher equilibrium rate of utilisation. Higher growth will thus not come at the expense of the workers' share in national income, which will remain constant, as long as the determinants of the mark-up do not change.[8]

In the Kalecki-Steindl approach, we have again the parameters and coefficients of the saving and investment functions as exogenous variables: animal spirits, the responsiveness of investment with respect to capacity utilisation ($\partial g/\partial u$) and with respect to the profit share ($\partial g/\partial h$), and the propensity to save out of profits. Furthermore, we have the capital-potential output ratio, a change of which will only affect the relationship between the equilibrium profit rate and the utilisation rate, because we have disregarded any direct effect on investment. And finally, we have the profit share, which will affect the left hand side of Figure 5, but also the right hand side through the effects on capital accumulation. Any rise (fall) in animal spirits, hence a rightwards (leftwards) shift in the g-curve, as shown in Figure 5, or in the responsiveness of investment with respect to capacity utilisation or the profit share, thus a clockwise (counter-clockwise) rotation in the g-curve, will cause higher (lower) equilibrium rates of accumulation, growth, profit and capacity utilisation. A higher (lower) propensity to save out of profits, thus a clockwise (counter-clockwise) rotation in the σ-curve, will cause lower (higher) equilibrium rates of accumulation, growth, profit and capacity utilisation – the paradox of thrift again. A change in the capital-potential output ratio will only have positive effects on equilibrium capacity utilisation, through a rotation in the r-curve, but will have no effects on the equilibrium rates of accumulation and profit. Finally, changes in the profit share will either have positive or negative effects on the equilibrium rates of capital accumulation, growth and profit, as we will analyse graphically in more detail below. Again Table 6 summarises all these results.

[8] Obviously, here we could now discuss feedback effects of economic activity on income distribution through changes in the degree of competition, workers' bargaining power or unit overhead costs. However, this would go beyond our simple overview. See Dutt for a detailed review and discussion, as well as Stockhammer (2004), Hein/Stockhammer (2011), Lavoie (2010), and Assous/Dutt (2013), among several others, for modeling attempts.

Figure 5: The post-Keynesian Kalecki-Steindl distribution and growth theory



Note: The shift of the g-curve shows the effect of a rise in animal spirits.

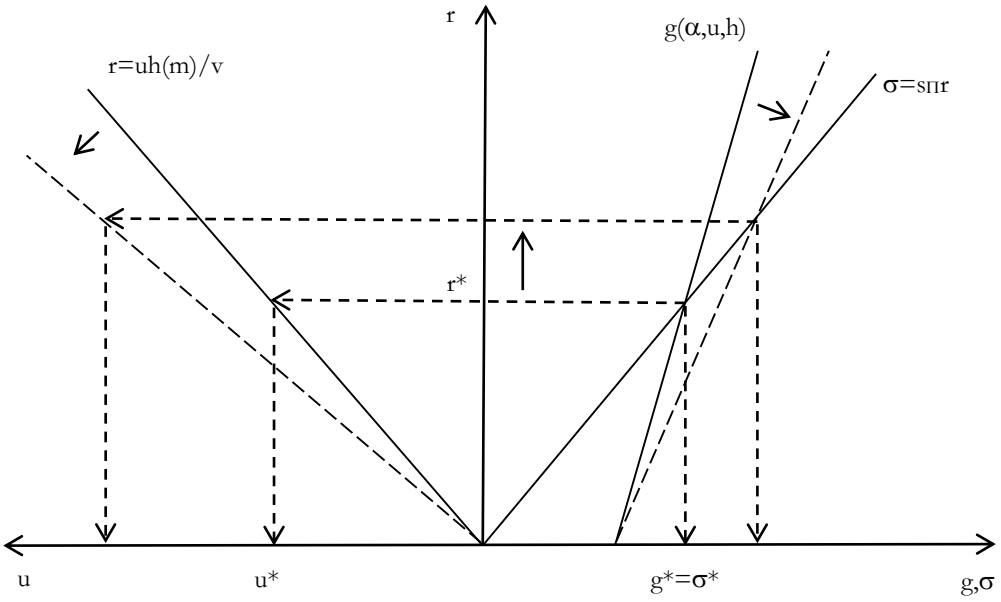
Table 6: Effects of changes in exogenous variables on endogenous variables in the Kalecki-Steindl growth theory			
Exogenous variables	***Endogenous variables***		
	$\sigma^* = g^*$	r*	u*
α	+	+	+
$\partial g/\partial u$	+	+	+
$\partial g/\partial h$	+	+	+
s_Π	–	–	–
v	0	0	+
h	–/+	–/+	–/+

Any change in the profit share will affect both the r-curve and the g-curve in our Kalecki-Steindl model. On the one hand, a higher (lower) profit share will cause a clockwise (counter-clockwise) rotation of the r-curve in Figure 5. On the other hand, a higher (lower) profit share will cause a rotation of the g-curve. Here the direction will depend on the relative importance of the profit share and the rate of utilisation in the investment function. Let us focus on a reduction of the profit share in what follows – caused by a reduction in the mark-up; for an increase in the mark-up and the profit share, the arguments below apply in reverse.

With a strong responsiveness of investment towards utilisation ($\partial g/\partial u$) and a very weak or even zero reaction towards the profit share ($\partial g/\partial h$), as assumed in the neo-Kaleckian model by Dutt (1984, 1987) and Rowthorn (1981), a fall in the profit share and thus a lower profit share and a higher rate of utilisation for every rate of profit, hence a counter-clockwise rotation of the r-curve, will also trigger a clockwise rotation of the g-curve in g-r space, as

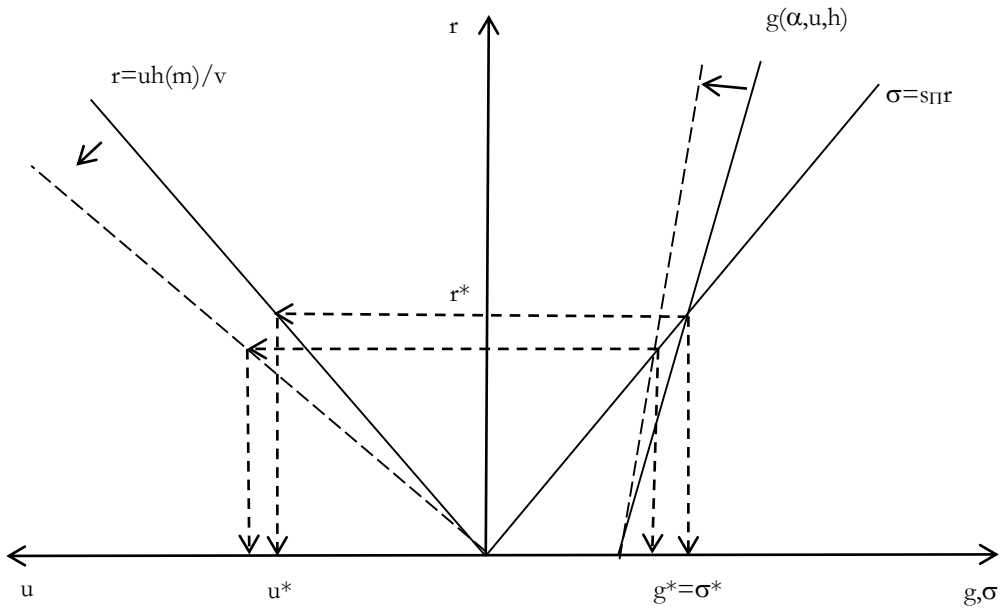
shown in Figure 6. Every rate of profit will be associated with a higher rate of utilisation, and firms' investment will respond accordingly. This will then cause higher equilibrium rates of accumulation, growth, profit and capacity utilisation. The economy will be in a wage-led demand and a wage-led growth regime, or, as Bhaduri/Marglin (1990) term it, in a stagnationist demand and wage-led growth regime: a higher wage share causes higher utilisation, accumulation and growth rates. Furthermore, the paradox of costs (Rowthorn 1981) applies: A higher wage share triggers a higher profit rate.

Figure 6: A reduction in the profit share in the neo-Kaleckian model and in the wage-led demand/wage-led growth regime of the post-Kaleckian model



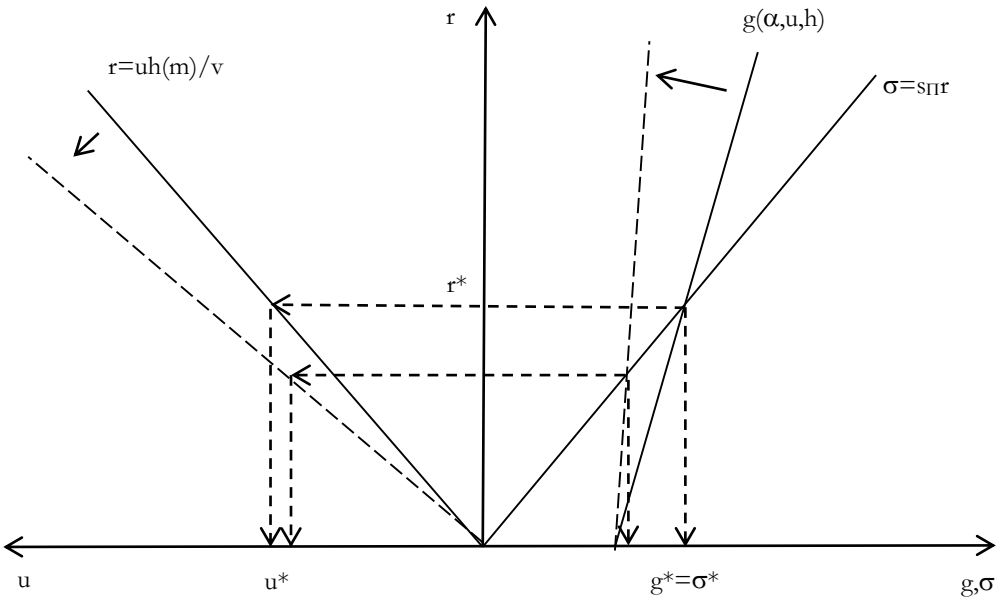
However, the wage-led demand/wage-led growth regime is only one possible regime, if we consider a somewhat stronger effect of the profit share on capital accumulation which may dominate the effect of utilisation, as has been argued by Bhaduri/Marglin (1990). In this case a lower profit share, triggering a higher rate of utilisation for every profit rate, hence the counter-clockwise rotation of the r-curve, will be associated with a counter-clockwise rotation of the g-curve, too. Each rate of profit is associated with a lower profit share, and firms accumulate at a lower rate. If this rotation of the g-curve is not too pronounced, we may still get wage-led demand, hence higher equilibrium utilisation, but profit-led growth, thus lower equilibrium capital accumulation and growth. Furthermore, the equilibrium profit rate comes down, too, and the paradox of costs disappears. Bhaduri/Marglin (1990, p. 383) call this a 'profit squeeze' constellation: Although redistribution in favour of wages is expansionary with respect to aggregate demand and capacity utilisation, it will not be supported by capitalists, because it will mean a lower rate of profit to them and also a lower rate of accumulation and growth. Figure 7 shows this intermediate case.

Figure 7: A reduction in the profit share in the post-Kaleckian distribution and growth model: an intermediate regime with wage-led demand and profit-led growth



Finally, if the effect of the profit share on investment is very pronounced, relative to the effect of utilisation, a lower profit share will cause a more considerable counter-clockwise rotation of the g-curve, as in Figure 8, and we will see profit-led demand and profit-led growth. A lower profit share will thus cause lower equilibrium rates of capacity utilisation, capital accumulation, growth and profit. Bhaduri/Marglin (1990) call this an exhilarationist demand and a profit-led growth regime. The model generates basically the same results as the classical/Marxian and the new neoclassical growth theories, but here in a demand-led growth framework without having to assume Say's law in the classical or neoclassical version.

Figure 8: A reduction in the profit share in the post-Kaleckian distribution and growth model: profit-led demand and profit-led growth



In our graphically derivation of the potential regimes in the post-Kaleckian framework, we have focused on the relative responsiveness of capital accumulation towards the rate of capacity utilisation and the profit share. It should be added that the regimes will also depend on the propensity to save out of profits, which determines the slope of the σ-curve. As can easily be checked graphically, the higher the propensity to save out of profits, the more likely are wage-led regimes in the face of redistribution of income, and vice versa.

With the three potential regimes, we have demonstrated that the post-Kaleckian model closure provides a very flexible instrument. It allows for the derivation of different demand and growth regimes depending on model parameter values, and thus encompasses several of the approaches discussed in this section – from the new growth theory and the classical/Marxian approach generating profit-led growth to the Kalecki-Steindl and neo-Kaleckian wage-led demand and growth models, with an intermediate regime of wage-led demand and profit-led growth in between. Only the old neoclassical approach with an exogenous natural rate of growth is difficult to derive from this post-Kaleckian model closure.

4. Conclusions

Starting from a review of the main strands of orthodox and heterodox distribution and growth models and their distinguishing features, with the post-Kaleckian Bhaduri/Marglin (1990) (and Kurz 1990) model as a specific, but highly flexible variant of heterodox distribution and growth theories, we have developed a simple modelling framework in which we could treat these different theories as different variants of model closure. In this exceedingly simple closed private one-good economy model, each theory could be presented drawing on the relationship between the rate of profit and the rate of growth, as well as on the consideration of one major adjusting variable allowing for the adjustment of the endogenous variables of the model to their equilibrium values. Therefore, each of the approaches, the old neoclassical growth model, the new neoclassical growth theory, the classical/Marxian approach, the post-Keynesian Kaldor-Robinson model, and finally the post-Keynesian Kalecki-Steindl approach,

with the neo-Kaleckian and the post-Kaleckian variants, could each be presented in two-quadrant figures. This allowed for a systematic comparison of exogenous and endogenous variables, of the 'logic' or the chain of causalities in each of the approaches, and of the generation of the long-run equilibrium positions of the system. This method also allowed for discovering close similarities in this respect, based on very different model foundations and assumptions, as for example between the new neoclassical growth theory and the classical/Marxian approach. Of course, with this comparative dynamic method, no out-of-equilibrium dynamics could be discussed. Finally, we have vindicated in this framework, too, Bhaduri/Marglin's (1990) claim that their modelling framework provides a very flexible instrument, based on the notion of distributional struggle and the principle of effective demand, which allows for the derivation of different demand and growth regimes, and thus encompasses several of the approaches discussed in this framework – from the profit-led growth approach of the new growth theory and the classical/Marxian model to the Kalecki-Steindl and neo-Kaleckian wage-led demand and growth model, with an intermediate regime of wage-led demand and profit-led growth in between. Only the old neoclassical approach with an exogenous natural rate of growth is difficult to generate by the Bhaduri/Marglin (1990) post-Kaleckian model. But this should not be considered as a drawback.

References

Aghion, P., Howitt, P. (2009), *The Economics of Growth*, Cambridge, MA: MIT Press.

Amadeo, E.J. (1986), 'Notes on capacity utilisation, distribution and accumulation', *Contributions to Political Economy*, **5**, 83-94.

Argitis, G. (2001), 'Intra-capitalists conflict, monetary policy and income distribution', *Review of Political Economy*, **13**, 453-470.

Argitis, G. (2008), 'Interest, effective demand and capitalist instability: a Marxian perspective', *Bulletin of Political Economy*, **2**, 175-195.

Assous, M., Dutt, A.K. (2013), 'Growth and income distribution with the dynamics of power in labour and goods markets', *Cambridge Journal of Economics*, **37,** 1407–1430.

Barro, R.J., Sala-i-Martin, X. (2004), *Economic Growth*, 2nd edition, Cambridge, MA: MIT Press.

Bhaduri, A., Marglin, S. (1990), 'Unemployment and the real wage: the economic basis for contesting political ideologies', *Cambridge Journal of Economics*, **14**, 375-393.

Blecker, R.A. (2002), 'Distribution, demand and growth in neo-Kaleckian macro-models', in M. Setterfield (ed), *The Economics of Demand-Led Growth*, Cheltenham: Edward Elgar.

Blecker, R.A. (2015), 'Wage-led versus profit-led demand regimes: The long and the short of it', revised February 2015, download: http://nw08.american.edu/~blecker/research/Blecker_LRvsSR_EEA2015.pdf

Bowles, S., Boyer, R. (1995), 'Wages, aggregate demand, and employment in an open economy: an empirical investigation', in G.A. Epstein and H.M. Gintis (eds), *Macroeconomic Policy after the Conservative Era*, Cambridge, UK: Cambridge University Press.

Catephores, G. (1989), *An Introduction to Marxist Economics*, Basingstoke: Macmillan.

Clark, J.B. (1899), *The Distribution of Wealth: A Theory of Wages, Interest and Profits*, New York: Macmillan, reprint, New York: Cosimo, 2005.

Dallery, T., van Treeck, T. (2011), 'Conflicting claims and equilibrium adjustment processes in a stock-flow consistent macro model', *Review of Political Economy*, **23**, 189-211.

Duménil, G., Lévy, D. (1999), 'Being Keynesian in the short term and classical in the long term: the traverse to classical long-term equilibrium', *The Manchester School*, **67**, 684-716.

Dutt, A.K. (1984), 'Stagnation, income distribution and monopoly power', *Cambridge Journal of Economics*, **8**, 25-40.

Dutt, A.K. (1987), 'Alternative closures again: a comment on "Growth, distribution and inflation"', *Cambridge Journal of Economics*, **11**, 75-82.

Dutt, A.K. (1990a), *Growth, Distribution and Uneven Development*, Cambridge, UK: Cambridge University Press.

Dutt, A.K. (1990b), 'Growth, distribution and capital ownership: Kalecki and Pasinetti revisited', in B. Dutta, S. Gangopadhyay, D. Mookherjee and D. Ray (eds), *Economic Theory and Policy. Essays in honour of Dipak Banerjee*, Bombay: Oxford University Press.

Dutt, A.K. (2005), 'Steindl's theory of maturity and stagnation and its relevance today', in T. Mott and N. Shapiro (eds), R*ethinking Capitalism. Essays on the Economics of Josef Steindl*, London, New York: Routledge.

Dutt, A.K. (2010), 'Equilibrium, stability and path dependence in Post Keynesian models of economic growth', in A. Birolo, D. Foley, H.D. Kurz and I. Steedman (eds), *Production, Distribution and Trade: Alternative Perspectives*, London: Routledge.

Dutt, A.K. (2012), 'Distributional dynamics in Post Keynesian growth models', *Journal of Post Keynesian Economics*, **34**, 431-451.

Harcourt, G.C. (1969), 'Some Cambridge controversies in the theory of capital', *Journal of Economic Literature*, **7**, 369-405.

Harcourt, G.C. (1972), *Some Cambridge Controversies in the Theory of Capital*, Cambridge, UK: Cambridge University Press.

Harris, D.J. (1987), 'Classical growth models', in J. Eatwell, M. Milgate and P. Newman (eds), *The New Palgrave. A Dictionary of Economics*, Vol. 1, London, New York, Tokyo: Palgrave Macmillan.

Harrod, R.F. (1939): 'An essay in dynamic theory', *The Economic Journal*, **49**, 14-33.

Hartwig, J. (2014), 'Testing the Bhaduri-Marglin model with OECD panel data', *International Review of Applied Economics*, **28,** 419-435.

Hein, E. (2004), 'Money, credit and the interest rate in Marx's economics. On the similarities of Marx's monetary analysis to post-Keynesian economics', *International Papers in Political Economy*, **11** (2), 1-43.

Hein, E. (2006a), 'Money, interest and capital accumulation in Karl Marx's economics: a monetary interpretation and some similarities to post-Keynesian approaches', *European Journal of the History of Economic Thought*, **13**, 113-140.

Hein, E. (2006b), 'On the (in-)stability and the endogeneity of the 'normal' rate of capacity utilisation in a post-Keynesian/Kaleckian 'monetary' distribution and growth model', *Indian Development Review*, **4**, 129-150.

Hein, E. (2008), *Money, Distribution Conflict and Capital Accumulation. Contributions to 'Monetary Analysis'*, Basingstoke: Palgrave Macmillan.

Hein, E. (2014), *Distribution and Growth after Keynes: A Post-Keynesian Guide*, Cheltenham: Edward Elgar.

Hein, E., Lavoie, M., van Treeck, T. (2011), 'Some instability puzzles in Kaleckian models of growth and distribution: a critical survey', *Cambridge Journal of Economics*, **35**, 587-612.

Hein, E., Lavoie, M., van Treeck, T. (2012), 'Harrodian instability and the "normal rate" of capacity utilisation in Kaleckian models of distribution and growth – a survey', *Metroeconomica*, **63**, 139-169.

Hein, E., Stockhammer, E. (2011), 'A post-Keynesian macroeconomic model of inflation, distribution and employment', in E. Hein and E. Stockhammer (eds): *A Modern Guide to Keynesian Macroeconomics and Economic Policies*, Cheltenham: Edward Elgar.

Kaldor, N. (1955/56), 'Alternative theories of distribution', *Review of Economic Studies*, **23**, 83-100, reprinted in N. Kaldor, *Collected Economic Essays, Volume 1, Essays on Value and Distribution*, 2nd edition, London: Duckworth, 1980.

Kaldor, N. (1957), 'A model of economic growth', *The Economic Journal*, **67**, 591-624, reprinted in N. Kaldor, *Collected Economic Essays, Volume 2,Essays on Economic Stability and Growth*, London: Duckworth, 1960.

Kaldor, N. (1961), 'Capital accumulation and economic growth', in F.A. Lutz and D.C. Hague (eds), *The Theory of Capital*, London: Macmillan, reprinted in N. Kaldor, *Collected Economic Essays, Volume 5, Further Essays on Economic Theory*, London: Duckworth, 1978.

Kalecki, M. (1939), *Essays in the Theory of Economic Fluctuations*, London: George Allen and Unwin.

Kalecki, M. (1954), *Theory of Economic Dynamics*, London: George Allen and Unwin.

Kalecki, M. (1969), *Studies in the Theory of the Business Cycle, 1933-1939*, Oxford: Basil Blackwell.

Kalecki, M. (1971), *Selected Essays on the Dynamics of the Capitalist Economy, 1933-70*, Cambridge, UK: Cambridge University Press.

Kurz, H.D. (1990), 'Technical change, growth and distribution: a steady-state approach to 'unsteady' growth', in H.D. Kurz, *Capital, Distribution and Effective Demand*, Cambridge, UK: Polity Press.

Kurz, H.D., Salvadori, N. (2003), 'Theories of economic growth: old and new', in N. Salvadori (ed), *The Theory of Economic Growth: A 'Classical' Perspective*, Cheltenham: Edward Elgar.

Lavoie, M. (1995), 'The Kaleckian model of growth and distribution and its neo-Ricardian and neo-Marxian critiques', *Cambridge Journal of Economics*, **19**, 789-818.

Lavoie, M. (1996), 'Traverse, hysteresis and normal rates of capacity utilization in Kaleckian models of growth and distribution', *Review of Radical Political Economics*, **28** (4), 113-147.

Lavoie, M. (2010), 'Surveying long-run and short-run stability issues with the Kaleckian model of growth', in M. Setterfield (ed), *Handbook of Alternative Theories of Economic Growth*, Cheltenham: Edward Elgar.

Lavoie, M. (2014), *Post-Keynesian Economics: New Foundations*, Cheltenham: Edward Elgar.

Lazzarini, A. (2011), *Revisiting the Cambridge Capital Controversies: A Historical and Analytical Study*, Pavia: Pavia University Press.

Levine, D.P. (1988), 'Marx's theory of income distribution', in A. Asimakopulos (ed), *Theories of Income Distribution*, Boston et al.: Kluwer Academic Publisher.

Lucas, R.E. (1988), 'On the mechanics of economic development', *Journal of Monetary Economics*, **22**, 3-42.

Marglin, S.A. (1984a), *Growth, Distribution and Prices*, Cambridge, MA: Harvard University Press.

Marglin, S.A. (1984b), 'Growth, distribution and inflation: a centennial synthesis', *Cambridge Journal of Economics*, **8**, 115-144.

Marx, K. (1867), *Das Kapital. Kritik der politischen Ökonomie, Erster Band: Der Produktionsprozeß des Kapitals*, 4th edition 1890, editedby F. Engels, reprinted as Marx-Engels-Werke, Volume 23, Berlin: Dietz Verlag 1962, englisch translation: *Capital. A Critique of Political Economy, Volume 1: The Process of Capitalist Production*, New York: International Publisher, 1967.

Marx, K. (1885), *Das Kapital. Kritik der politischen Ökonomie, Zweiter Band: Der Zirkulationsprozeß des Kapitals*, 2nd edition 1893, edited by F. Engels, reprinted as Marx-Engels-Werke, Volume 24, Berlin: Dietz Verlag 1963, englisch translation: *Capital. A Critique of Political Economy, Volume 2: The Process of Circulation of Capital*, New York: International Publisher, 1967

Marx, K. (1894), *Das Kapital. Kritik der politischen Ökonomie, Dritter Band: Der Gesamtprozeß der kapitalistischen Produktion*, edited by F. Engels, reprinted as Marx-Engels-Werke, Volume 25, Berlin: Dietz Verlag 1964, english translation: *Capital. A Critique of Political Economy, Volume 3: The Process of Capitalist Production as A Whole*, New York: International Publisher, 1967.

Onaran, Ö., Galanis, G, (2014), 'Income distribution and growth: a global model', *Environment and Planning A*, **46,** 2489-2513.

Panico, C. (1985), 'Market forces and the relation between the rate of interest and profit', *Contributions to Political Economy*, **4**, 37–60.

Pasinetti, L.L. (1974), *Growth and Income Distribution. Essays in Economic Theory*, Cambridge, UK: Cambridge University Press.

Pivetti, M. (1991), *An Essay on Money and Distribution*, Basingstoke, London: Macmillan.

Ricardo, D. (1817), *On the Principles of Political Economy and Taxation, The Works and Correspondence of David Ricardo, Vol. I.*, edited by Sraffa, P., Cambridge, UK: Cambridge University Press, 1951.

Robinson, J. (1956), *The Accumulation of Capital*, London: Macmillan.

Robinson, J. (1962), *Essays in the Theory of Economic Growth*, London: Macmillan.

Romer, P.M. (1986), 'Increasing returns and long-run growth', *Journal of Political Economy*, **94**, 1002–1037.

Rowthorn, R.E. (1981), 'Demand, real wages and economic growth', *Thames Papers in Political Economy*, Autumn, 1-39.

Shaikh, A. (1978a), 'An introduction to the history of crisis theories', *U.S. Capitalism in Crisis*, New York: URPE.

Shaikh, A. (1978b), 'Political economy and capitalism: notes on Dobb's theory of crisis', *Cambridge Journal of Economics*, **2**, 233-251.

Shaikh, A. (2009), 'Economic policy in a growth context: a classical synthesis of Keynes and Harrod', *Metroeconomica*, **60**, 455–494.

Skott, P. (2010), 'Growth, instability and cycles: Harrodian and Kaleckian models of accumulation and income distribution', in M. Setterfield (ed), *Handbook of Alternative Theories of Economic Growth*, Cheltenham: Edward Elgar.

Skott, P. (2012), 'Theoretical and empirical shortcomings of the Kaleckian investment function', *Metroeconomica*, **63**, 109-138.

Smith, A. (1776), *An Inquiry into the Nature and Causes of the Wealth of Nations*, The Glasgow Edition of the Works and Correspondence of Adam Smith, edited by R.H. Campbell, A.S. Skinner, W.B. Todd, Oxford: Oxford University Press, 1976.

Solow, R.M. (1956), 'A contribution to the theory of economic growth', *Quarterly Journal of Economics*, **70**, 65-94.

Sowell, T. (1972), *Say's Law: An Historical Analysis*, Princeton: Princeton University Press.

Sraffa, P. (1960), *Production of Commodities by Means of Commodities: A Prelude to A Critique of Political Economy*, Cambridge, UK: Cambridge University Press.

Steindl, J. (1952), *Maturity and Stagnation in American Capitalism*, Oxford: Blackwell, 2nd edition, New York, London: Monthly Review Press, 1976.

Stockhammer, E. (2004), 'Is there an equilibrium rate of unemployment in the long run?', *Review of Political Economy*, **16**, 59-77.

Swan, T. (1956), 'Economic growth and capital accumulation', *Economic Record*, **32**, 334-361.

Walras, L. (1954), *Elements of Pure Economics*, London: Allen and Unwin. English translation of the definitive edition of Walras (1874) by W. Jaffe.

Wicksell, K. (1893), *Über Wert, Kapital und Rente nach den neueren nationalökonomischen Theorien*, Jena: Gustav Fischer.

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