The limits to profit-wage redistribution: Endogenous regime shifts in Kaleckian models of growth and distribution

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Abstract

A feature of Kaleckian models of distribution and growth that is often overlooked is that they describe a nonlinear relation between functional income distribution and demand and growth, because the size of the multiplier is affected by redistribution from wages to profits and vice versa. This paper addresses the nonlinearity of the standard post-Kaleckian model by examining its so-called IS-curves. It is found that changes in functional income distribution affect the 'distribution-ledness' of an economy: redistribution towards wages reinforces the wage-led or profit-led character of an economy, while redistribution towards profits does the opposite. In addition, redistribution towards wages can turn an intermediate regime wage-led. A standard post-Kaleckian model with nonlinear investment behaviour is then presented. This model yields substantially different IS curves, such that an optimal functional income distribution can be derived. However, it is found that unlike in the standard model, this optimum is not the same for the different classes, such that true opposing interests appear in the model.

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1. Introduction

The well-known 'post-Kaleckian' growth model, developed independently by Bhaduri and Marglin (1990) and Kurz (1991), and based on earlier models by Rowthorn (1981), Dutt (1984) and Taylor (1985), is now commonly used for questions about growth and distribution in post-Keynesian analysis (Hein 2017; Lavoie 2014: Chapter 6). The merit of this model and its extensions is that they address long-run growth and capacity utilisation, while incorporating functional income distribution. As a result, a large branch of heterodox economic literature is concerned with the distinction between 'wage-led' and 'profit-led' demand and growth regimes, the former referring to a situation in which an increasing profit share in national income leads to a slowdown in capital accumulation and declining capacity utilisation, while the opposite holds for the latter. This distinction has in particular been the basis of a substantial amount of empirical research, often centred around the question of whether demand and growth are profit-led or wage-led[1]. However, the interpretation of demand and growth regimes as static constellations is problematic, since there is no reason to assume that regimes do not change over time. Moreover, most of the literature on the post-Kaleckian model has so far ignored the question of the sustainability of demand and growth regimes: does a profit-led regime remain profit-led after pursuing a profit-led growth strategy, i.e. after persistent income redistribution from wages towards profits? The same question can be asked for the wage-led regime. In other words: does the profit share have an upper (or lower) threshold at which an economy switches from a profit-led growth regime to a wage-led regime and vice versa, and if so, what factors determine this threshold? This is the central question that will be addressed in this paper.

The opacity surrounding what exactly determines the demand and growth regime an economy is in and when such regimes change has fuelled a number of critiques. Some among these[2] are dedicated to the possibility of nonlinear relations within the post-Kaleckian model. Nonlinearities have the potential of making demand and growth regimes 'endogenous', in the sense that the regime depends on functional income distribution. A threshold as described above then appears, so that redistribution towards wages or profits can cause a regime to shift when that threshold is reached. This poses a limit to the 'virtuous process' described by Stockhammer (2011), in which redistribution towards profits in a

[1] See for example Onaran and Galanis (2013), Stockhammer and Ederer (2008) and Stockhammer et al. (2008).
[2] Most notably Nikiforos (2016) and Palley (2013).

profit-led regime or towards wages in a wage-led regime induces high growth. Indeed, it is clear that the profit share cannot rise to 100 per cent, nor fall to zero per cent: these scenarios are simply irrelevant for a model that seeks to capture the dynamics of growth and distribution in a capitalist economy, of which both profits and wages are an inherent component. However, they do raise the question of what the limits to profit-wage redistribution in a capitalist economy are, and of what factors determine these limits.

The aim of this paper is therefore twofold: on the one hand, it is to assess the theoretical potential for regime shifts in the post-Kaleckian model. On the other, it is to analyse the effect of functional income distribution on 'distribution-ledness', i.e. the degree to which an economy is wage-led or profit-led (Nikiforos 2016). As a result, a considerable amount of attention will be devoted to nonlinearities in the post-Kaleckian model, both systemic and behavioural.

The remainder of this paper is structured as follows. The next section outlines a simple version of the post-Kaleckian model, and discusses the degree to which 'distribution-ledness' varies in this model. Section 3 presents a critique of the post-Kaleckian model, aimed at the sustainability of persistent wage-led and profit-led strategies, with a focus on nonlinear behavioural equations. In Section 4, a simple post-Kaleckian model with a nonlinear accumulation function (based on suggestions by Nikiforos 2016) will be presented and analysed. Section 5 discusses the conflicting interests that appear in the model. Section 6 provides a brief summary and some concluding comments.

2. Distribution-ledness and regime shifts in the standard model

The main result of the post-Kaleckian model is that growth and demand can be either 'wage-led' or 'profit-led'. The factors determining what regime applies to an economy have been discussed extensively in the Kaleckian literature. However, while the model is designed for dynamic analysis, its results are usually interpreted as being static by nature; an economy is characterised by either profit-led or wage-led growth, and either profit-led or wage-led capacity utilisation. The way the IS curve in the profit share – capacity utilisation space was originally depicted by Bhaduri and Marglin (1990) can be seen as a symptom of this. The IS curve shows all dynamic equilibria for a given set of values for the exogenous parameters, while relating the profit share to capacity utilisation. In other words, it shows the effect of a change in the profit share on the equilibrium rate of capacity utilisation, keeping everything

else constant. For simplicity, Bhaduri and Marglin produce a linear IS curve, which is upward sloping for the profit-led regime, and downward sloping in the wage-led case. This curve thus suggests that a change in functional income distribution has no effect on the *extent* to which an economy is profit-led or wage-led.

Few researchers seem to be interested in this: although several authors (e.g. Blecker, 1989) present a nonlinear IS curve, the exact shape of the curve is seldom explicitly discussed. This is odd because, as will be demonstrated below, the IS curve is only linear in a very specific case. Furthermore, the fact that the curve is nonlinear in all other cases proves the relevance of the concept of 'distribution-ledness'[3]. Nikiforos (2016) presents a Kaleckian model in which the 'degree of distribution-ledness' changes endogenously; however, the simple versions of the Kaleckian distribution and growth models already contain the possibility of changing distribution-ledness, and even – albeit to a very limited extent – the possibility of regime shifts, as a result of functional income redistribution.

The model used for the analysis in this section is a simple post-Kaleckian growth model, based on Hein (2014, Chapters 6 & 7). It is set in a world of oligopolistic competition, such that firms have the power to freely set prices within certain limits. They do so by marking up unit labour costs:

$$p = (1 + m)\frac{W}{Y}, \tag{1}$$

where p is the price level, m the mark-up, W the total wage bill and Y total output. The mark-up is determined by the institutional characteristics of the economy, such as market concentration and trade union power (Hein 2014: Chapter 5). Functional income distribution is therefore regarded as a variable exogenous to the models, determined by the mark-up of firms:

$$h = \frac{\pi}{pY} = \frac{pY - W}{pY} = \frac{(1 + m)W - W}{(1 + m)W} = \frac{m}{1 + m}, \tag{2}$$

where h is the profit share in total income and π aggregate profits. Furthermore, it is assumed that firms operate below full capacity output, so that they can produce more when

[3] Nikiforos (2016) proposes a mathematical definition of 'distribution-ledness', but that definition is somewhat less applicable to the explicit model presented here. Instead, the term will be used here to refer to the degree to which capacity utilisation and/or growth are wage-led or profit-led. In mathematical terms, it thus simply refers to the slope of the IS curve.

demand increases; an increase in demand has a quantity effect rather than a price effect. Output is completely homogeneous, as are capital and labour. The rate of profit r in this economy can be decomposed as follows:

$$r = \frac{\pi}{pK} = \frac{\pi}{pY}\frac{Y}{Y^*}\frac{Y^*}{K} = h\frac{u}{v}, \tag{3}$$

where K stands for the (real) capital stock, Y^* for potential output (i.e. full capacity output), u for the rate of capacity utilisation and v for the capital-potential output ratio. Finally, there are two behavioural equations, which describe aggregate saving and aggregate investment; both are normalised by the capital stock for convenience. The saving rate σ is often presented as a linear function of the profit share and the rate of utilisation:

$$\sigma = \frac{S_\pi + S_w}{pK} = \frac{s_\pi \pi + s_w(Y - \pi)}{pK} = [s_w + (s_\pi - s_w)h]\frac{u}{v}, \tag{4}$$

where S_π is saving out of profits and S_w is saving out of wages, while s_π and s_w refer to the respective propensities. Although Bhaduri and Marglin (1990) present an implicit investment function, simply noting that investment depends on the profit share and the rate of capacity utilisation, I will use the explicit investment function proposed by Kurz (1991), since this enables a more elaborate analysis of the demand and growth regimes. This explicit function also includes a constant α:

$$g = \frac{I}{K} = \alpha + \beta u + \gamma h. \tag{5}$$

In equilibrium, saving and investment must be equal:

$$g^* = \sigma^*, \tag{6}$$

so that the equilibrium values for growth and capacity utilisation are:

$$u^* = \frac{\alpha + \gamma h}{[s_w + (s_\pi - s_w)h]\frac{1}{v} - \beta}, \tag{7}$$

$$g^* = \frac{(\alpha + \gamma h)[s_w + (s_\pi - s_w)h]\frac{1}{v}}{[s_w + (s_\pi - s_w)h]\frac{1}{v} - \beta}. \tag{8}$$

Under a classical saving assumption (i.e. $s_w = 0$)[4], this simplifies to:

$$u^* = \frac{\alpha + \gamma h}{s_\pi \frac{h}{v} - \beta}, \tag{7a}$$

$$g^* = \frac{(\alpha + \gamma h) s_\pi \frac{h}{v}}{s_\pi \frac{h}{v} - \beta}. \tag{8a}$$

For these equilibria to be stable, a Keynesian stability condition must hold:

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \rightarrow s_\pi \frac{h}{v} - \beta > 0. \tag{9}$$

The first order derivatives with respect to the profit share of the equilibrium values can be both positive and negative, so that demand and growth can be both wage-led and profit-led:

$$\frac{\partial u^*}{\partial h} = -\frac{\alpha \frac{s_\pi}{v} + \beta\gamma}{\left(s_\pi \frac{h}{v} - \beta\right)^2}, \tag{7b}$$

$$\frac{\partial g^*}{\partial h} = \frac{\frac{s_\pi}{v}\left(\gamma h^2 \frac{s_\pi}{v} - 2\beta\gamma h - \alpha\beta\right)}{\left(s_\pi \frac{h}{v} - \beta\right)^2}. \tag{8b}$$

As noted by Bhaduri and Marglin (1990), the IS curve in the profit share and capacity utilisation space – hereinafter referred to as the *utilisation curve* – can have two basic shapes: it can appear both as a rising (Figure 1a) and as a declining (Figure 1b) line. The former corresponds to a wage-led (or stagnationist) and the latter to a profit-led (or exhilarationist) regime. The condition for the wage-led regime to appear is:

$$\frac{\partial u}{\partial h} < 0 \rightarrow -\alpha \frac{s_\pi}{v} < \beta\gamma \tag{7c}$$

[4] Letting go of this assumption complicates the mathematics, but does not alter the qualitative outcomes of the analysis in this paper.

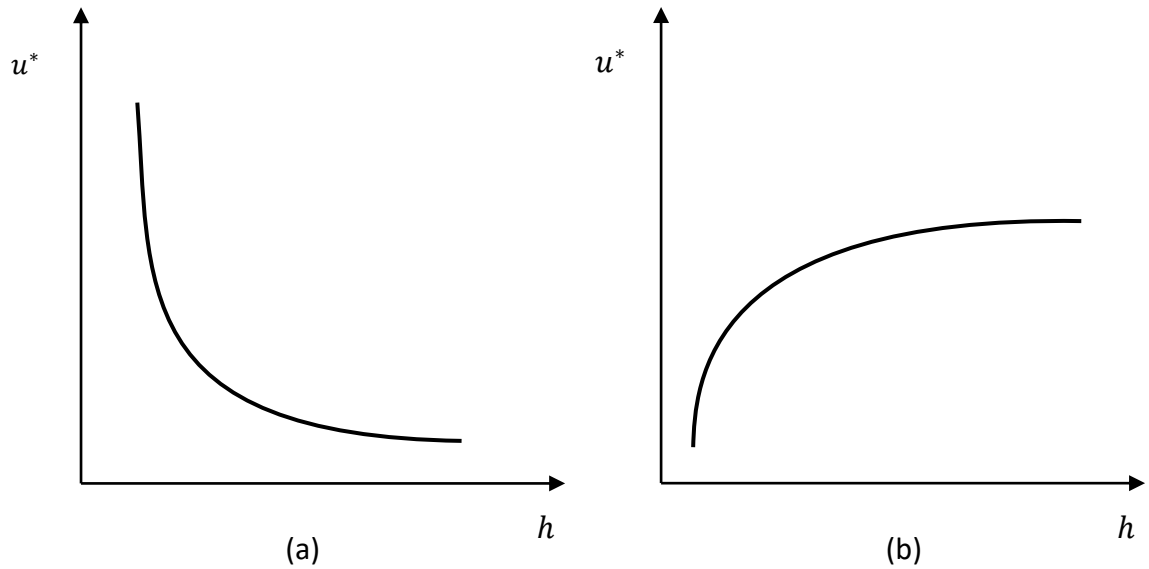

Figure 1: Utilisation curves of the post-Kaleckian model, wage-led (a) and profit-led (b)

Neither of these shapes are linear: the slope of both lines is decreasing. In other words, the stagnationist regime becomes less wage-led when the profit share increases, while the exhilarationist regime becomes less profit-led. Mathematically, this result is unsurprising: the profit share only appears in the denominator of the first order derivative, so that the denominator increases when the profit share increases and the slope therefore declines. Economically, the reason behind these shapes is somewhat less obvious, but logical upon closer inspection. A profit-led regime can arise when a higher profit share leads to a higher rate of capital accumulation by firms. This can have a strong positive effect on overall capacity utilisation in the economy, because the increased investment leads to increased employment, and the increased wages that are paid lead to increased consumption expenditure. This is the process that lies behind the Keynesian multiplier. However, a higher profit share means a lower wage share: every increase in employment (and therefore in investment) will therefore lead to lower consumption expenditure when the profit share is higher. This is shown by the simple Keynesian investment multiplier: as a higher profit share by assumption leads to a higher average propensity to save, the multiplier $dY = dI/s$ decreases, also in a dynamic context. Redistribution towards profits in the profit-led regime is therefore less effective when the profit share is higher, while redistribution towards wages in the wage-led regime is also less effective; the Bhaduri-Marglin model thus suggests that

wage-led demand exhibits increasing marginal returns, whereas profit-led demand suffers from the opposite[5].

The story becomes somewhat more complicated, however, when one looks at growth and capital accumulation as well. As is well-known, the wage-led regime can be either 'cooperative' or 'conflictual'; the former means a higher wage share leads to higher growth and profit rates, while the latter refers to the opposite (Bhaduri/Marglin 1990). The conflictual version of the wage-led regime, which Bhaduri and Marglin connect to the Marxian 'profit squeeze' theory, has been recognised as a separate third regime by others (e.g. Hein 2014). This intermediate regime is characterised by wage-led capacity utilisation, but profit-led growth. The condition for a positive first order derivative of output growth with respect to the profit share is the same as that of the profit rate:

$$\frac{\partial g^*}{\partial h} > 0 \rightarrow \gamma h^2 \frac{s_\pi}{v} - 2\beta\gamma h - \alpha\beta > 0, \tag{8d}$$

$$\frac{\partial r^*}{\partial h} > 0 \rightarrow \gamma h^2 \frac{s_\pi}{v} - 2\beta\gamma h - \alpha\beta > 0. \tag{3a}$$

Since this condition contains the profit share itself, the level of the profit share affects not only the degree of distribution-ledness, but also which regime applies to an economy. In other words, the character of the regime can change when functional income distribution changes, which can be seen clearly from the IS curve in the profit share – accumulation space (Figure 2). In the remainder of this paper, this curve will be referred to as the *growth curve*.

[5] A similar analysis is presented by Prante (2018).

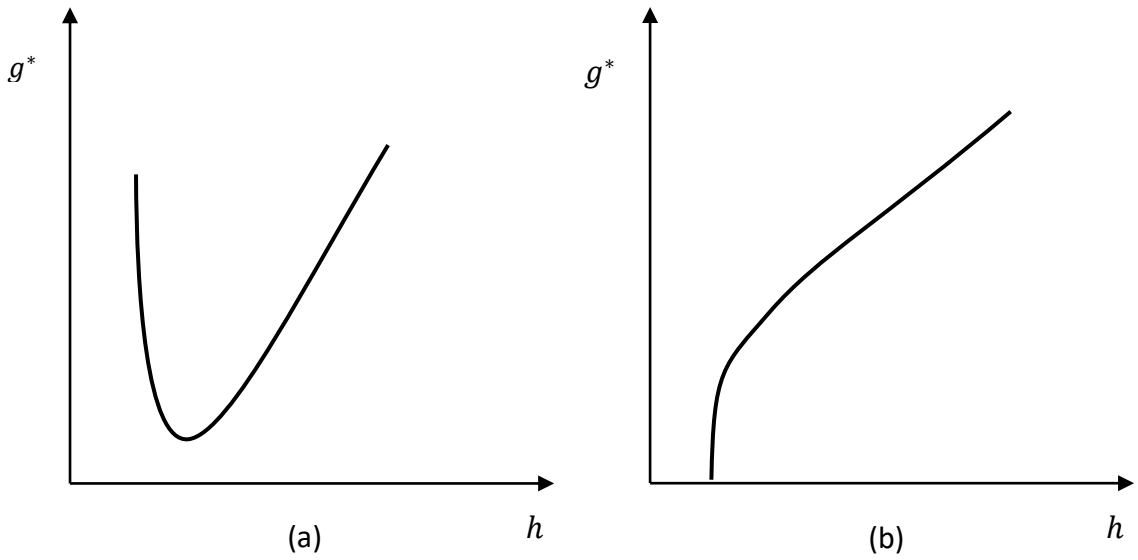

Figure 2: Growth curves of the post-Kaleckian model, 'wage-led' (a) and profit-led (b)

Again, two different shapes are possible. Clearly, the shape of the curve does not depend on the sign of the first order derivative. Instead, the sign of the second order derivative determines the shape of the curve; a positive second order derivative means that the slope of the curve is increasing, as in Figure 2a, while the opposite means that the growth curve of Figure 2b appears. The condition for shape (a) is thus:

$$\frac{\partial^2 g^*}{\partial h^2} = \frac{2\beta \frac{s_\pi}{v}\left(\beta\gamma + \alpha\frac{s_\pi}{v}\right)}{\left(s_\pi \frac{h}{v} - \beta\right)^3} > 0. \tag{8e}$$

Since the stability condition requires that the denominator is positive, this can be simplified to:

$$\frac{\partial^2 g^*}{\partial h^2} > 0 \rightarrow \beta\gamma > -\alpha\frac{s_\pi}{v}. \tag{8e*}$$

This is the exact same condition as for the wage-led demand regime, which is why shape (a) in Figure 2 is labelled the 'wage-led' shape, even though it has both an upwards sloping and a downwards sloping part. In contrast, shape (b), which coincides with the profit-led demand regime, is unambiguously profit-led. Thus, while growth becomes more profit-led (or less wage-led) as the profit share increases in the first case (Figure 2a), it stays more or less consistently profit-led in the second case (Figure 2b). We can thus say that while

redistribution towards profits becomes progressively less effective when it comes to capacity utilisation, this is not true for the growth and profit rates.

How can these shapes be explained? The equilibrium growth rate is affected positively by the profit share in a direct way by assumption, while the profit share also has an indirect effect through the rate of capacity utilisation. It is therefore not surprising that profit-led capacity utilisation (Figure 1b) coincides with a profit-led growth rate (Figure 2b), since in that case both the direct and the indirect effect are positive. Nevertheless, the exact shape of the profit-led growth curve in Figure 2b is not that obvious; it seems to be almost vertical at first, to become a straight upwards sloping line after bending somewhat. As explained above, the profit-led utilisation curve flattens because of the lower average propensity to save that results from an increasing profit share. Since the rate of capacity utilisation is a relatively unimportant motivator for accumulation in the profit-led regime (β is small), the effect of a lower investment multiplier is not very strong in the profit-led growth curve in Figure 2b, so that the slope is not declining as quickly as that of the profit-led utilisation curve.

The first shape, in Figure 2a, can be traced back directly to the shape of the utilisation curve. Since the effect of functional income redistribution on equilibrium capacity utilisation diminishes as the profit share increases, through the already discussed declining multiplier effect, this in turn affects the equilibrium growth rate. As the indirect effect of the profit share on the accumulation rate declines, the direct effect becomes more prominent, meaning that after a certain threshold, the direct effect overtakes the indirect effect. The value of this threshold is determined by the propensity to save, the capital-potential output ratio and the investment coefficients.

This sheds some new light on the discussion by Bhaduri and Marglin (1990) on ‘cooperative capitalism’. Bhaduri and Marglin argue that the ‘critical analytical condition for the successful working of this model of cooperative capitalism is that the normalised value of total profit […] must decrease as the real wage rate decreases and the profit share correspondingly increases’ (id.: 382, emphasis in the original). When this condition is not fulfilled, they argue, a situation of ‘profit squeeze’ arises, that is, what is usually called the intermediate or conflictual regime. However, the analysis above clearly shows that a wage-led strategy in a wage-led regime will always succeed, as long as it is maintained for long enough. Even when growth and the profit rate respond in an adverse way at first, the

intermediate (or conflictual) regime shifts to a full wage-led regime as soon as the profit share falls below the threshold defined above (that is, when there is no change in the behavioural parameters). The success of a wage-led strategy thus depends on the perseverance of policymakers.

3. Nonlinear behaviour

The analysis in the previous section shows that the standard post-Kaleckian model is rather versatile. However, some questions about the shapes of the IS curves do remain. First of all, there is no possible 'endogenous' shift from wage-led to profit-led capacity utilisation and vice versa; that is, changes in the profit share alone cannot cause such a shift. Secondly, it is unclear what the limits to functional income distribution are: according to the model, wage-led regimes remain wage-led, even when the wage share approaches 100%, while profit-led regimes remain profit-led, even when the wage share is almost non-existent.

Several authors have suggested that the utilisation curve may be nonlinear[6]. Marglin and Bhaduri (1991: 145) extensively discuss the shape of this curve, noting that 'all discussion of the shape of the IS schedule is necessarily hypothetical. The truth is that we know relatively little about its shape even in the neighbourhood in which the economy has actually been operating and even less about its global shape'. However, they argue that recent trends can indicate the approximate shape. Moreover, Marglin and Bhaduri offer some speculative ideas themselves, and provide two potential utilisation curve shapes, shown below in Figure 3.

[6] Authors in the social structure of accumulation (SSA) tradition have also proposed nonlinear relations between profits, demand and growth (see for example Bowles & Boyer 1988; Gordon 1995). These authors are, like many Kaleckians, concerned with the distinction between wage-led and profit-led growth, but take a more institutionalist/Marxist, power-oriented approach.

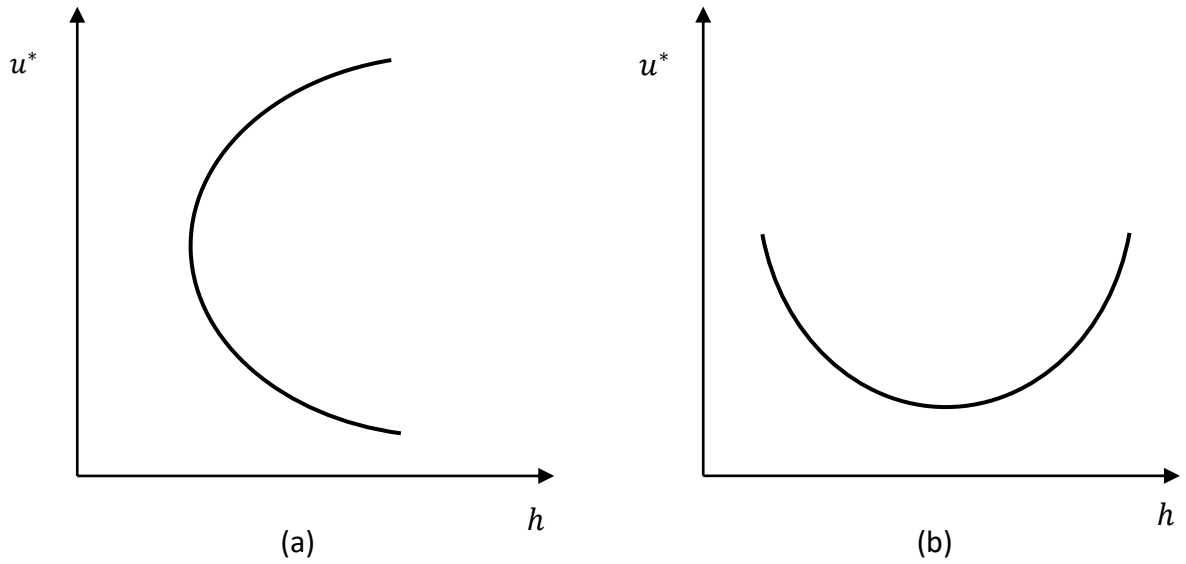

Figure 3: Utilisation curve shapes, as suggested by Marglin and Bhaduri (1991)

They also discuss the implications of these shapes: in the case of shape (a), the economy is wage-led when capacity utilisation is low, and profit-led when it is high. Shape (b) indicates that the economy is wage-led for low levels of the profit share, and profit-led for high levels. Unfortunately, Marglin and Bhaduri provide no explanation as to why this would be the case; it is unclear what the reason for the existence of such dynamics would be, or in what kind of situation they would arise.

Taylor (1990), You (1994) and Palley (2013) all present what is essentially the opposite of the curve in Figure 3b. This curve is shown below in Figure 4.

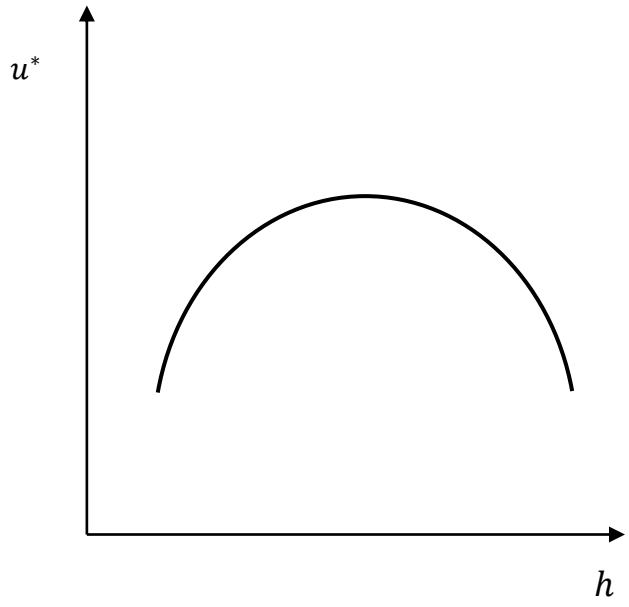

Figure 4: The utilisation curve, according to Taylor (1990), You (1994) and Palley (2013b)

In this situation, the economy is wage-led for high levels of the profit share, and profit-led for low levels. Increasing the profit share thus makes the economy less profit-led, while increasing the wage share does the opposite; both wage-led and profit-led strategies have decreasing marginal returns. This makes some intuitive sense, but that does not necessarily make it a more appropriate representation of reality. The authors all provide a limited explanation of their reasoning. You (1994: 217) simply refers to Marglin and Bhaduri (1991), noting that the actual shape of the IS curve is unknown, and that the displayed shape is 'chosen for illustrative purposes only'. Taylor (1990: 333) refers to 'stronger profit effects on investment as the real wage rises', but does not substantiate this assumption. Palley (2013: 7) argues that 'rising marginal costs of capital stock adjustment limit the rate at which new capital can be added and absorbed into organizations' and that a change in functional income distribution causes the saving rate to change. The latter argument is of course already included in the standard post-Kaleckian model, which does not lead to the reversed U-shape in Figure 4, unless Palley is referring to nonlinear saving behaviour.

Although the assumption of linear behavioural equations is standard in the Kaleckian growth literature, some authors have suggested that nonlinear functions resemble reality more closely (see for example Nikiforos 2016). The idea of nonlinear behavioural equations is far from new; Robinson (1962) assumes that accumulation is a nonlinear function of the rate of profit, although she provides no arguments for the nonlinearity. In an even earlier paper, Kaldor (1940) argues that both saving and investment are nonlinear functions of output. He notes that firms are not likely to invest more when capacity utilisation is low, even when profits increase. Furthermore, when capacity utilisation is at a very high rate, firms attempting to accumulate at a higher speed will face increasing costs. This notion strongly resembles Palley's (2013) argument mentioned above.

However, contrary to Kaldor's (1940) investment function, the Kaleckian versions do explicitly include capacity utilisation and profits, so that Kaldor's first argument is already included in the model[7]. Moreover, it is doubtful whether firms will really slow down accumulation as a result of increasing costs when capacity utilisation is very high; the underlying mechanism leading to rising costs (i.e. scarcity driving prices up) should also work for the output of the firms attempting to invest more, so that investment still constitutes a

[7] It could be argued that there should also be an interaction variable, as Kaldor asserts that the effect of profits on investment is not independent of the effect of capacity utilisation.

profitable business opportunity. And, if this not the case, then this means that the profit share is declining, which has its own separate effect in the post-Kaleckian investment function. There is also no clear reason why the financing of investment would become more difficult with a higher rate of capacity utilisation; if anything, banks are more optimistic and likely to provide loans in the boom phase of the business cycle, as Minsky (1977) famously argued.

Nikiforos (2016) provides a more elaborate explanation as to why the behavioural equations would be nonlinear. He argues that profits matter for investment decisions for two reasons: because current and recent profits are the best indication firms have for future profitability and therefore for the success of their investments, and because profits can be retained, which is crucial for the financing of investment. According to Nikiforos, current profitability may become (relatively) less relevant as a predictor of future profitability when the profit share increases, so that the sensitivity of investment to the profit share declines. Unfortunately, it is unclear why this would be the case; Nikiforos refers to Kalecki (1943 [1971]) and asserts that the limited size of a market may become more important for investment decisions, relative to the profit share. But Kalecki specifically mentions that his argument applies to the short period; he does not refer to the medium or long period that the Kaleckian growth models represent. In the long run, the market size depends on equilibrium aggregate demand, which itself depends on investment; it is thus strange to model profitability expectations as less sensitive to current profitability when the latter increases, because of a limited market size.

However, that does not mean that market size does not play any role in investment decisions in the long run. Nikiforos's (2016) second argument is more compelling: he points out that finance may no longer be constrained by retained earnings when a certain profit margin is reached. When the profit share becomes very high, firms will have such an abundance of retained earnings that a further increase does not incentivise firms to invest more. This is because the market size and thus demand for firms' output becomes a binding constraint. Looking at modern day tech firms, this argument makes a lot of sense: companies such as Apple, which is known for its enormous stock of retained earnings, will not be able to invest more when their already huge profit margin increases, since they can already invest as much as they deem fit. The market size thus does not influence the relation between current

and future profitability, but becomes more important relative to retained earnings, as the latter gradually ceases to constrain investment.

Another reason for a declining effect of profits on investment can be found in the behavioural response of economic agents to structural change. In the post-Kaleckian model, functional income distribution affects aggregate demand through the investment and saving function. However, a change in the overall propensity to save also has an effect on the structure of the economy: since an equilibrium position implies that saving and investment are equal, a higher propensity to save must be accompanied by a higher investment share in total output. In a long run equilibrium, this means that the production of investment goods relative to consumption goods increases.

The question then arises whether this affects economic behaviour. Investment decisions are made before any of the potential cash flows that result from them appear; consumption, on the other hand, is usually done out of wages (or other types of income) that are already earned[8]. Investment therefore entails a higher degree of uncertainty; investors make decisions based on expectations of the future, which is fundamentally uncertain, whereas consumers (mostly) make decisions based on things that have already happened[9]. Investment behaviour is therefore at least partly based on Keynes's (1936) famous 'animal spirits', and thus somewhat less predictable than consumption behaviour. This explains the fact that investment is the most volatile component of aggregate demand (Blecker 2016). A higher share of investment in total output – or more firms producing machines to make machines with – thus results in the fact that more firms are basing their investment decisions on the investment decisions of other firms, and are hence facing high uncertainty. It seems reasonable to assume that this high level of uncertainty will have a dampening effect on firms' animal spirits[10]. The sensitivity of investment to profits may then be affected negatively by an increase in the profit share, since the latter causes the economy to shift from being consumption-based towards being investment-based. Combined with

[8] This is of course not true for credit-based consumption expenditures. However, taking into account consumption credit does not change the fact that for most consumption, income is earned before the actual expenditure takes place, which is not necessarily the case for investment.

[9] This is not to say that consumers do not have to deal with uncertainty, or that their consumption decisions are not affected by any form of uncertainty. The point here is not that consumers suffer less from uncertainty than investors; rather, those *observing* the behaviour of both groups of economic agents, are faced with higher uncertainty regarding the investment decisions of firms.

[10] Riddick and Whited (2009: 1764) note that 'the effect of uncertainty on the propensity to save out of cash flow is empirically at least as strong as the effect of finance constraints'.

Nikiforos's (2016) argument on the smaller role for profits in investment financing when margins are high, this leads to the assumption of an investment function that is nonlinear with respect to the profit share, such that its first order derivative is declining when the profit share increases (i.e. a negative second order derivative).

Besides the investment function, Kaldor (1940) argues that the saving function is nonlinear as well. According to Kaldor, households save much less when income is very low; there is some amount of autonomous consumption. On the other hand, those with very high incomes save much more because some degree of saturation appears at high consumption levels. Nikiforos (2016) reasons in a similar way regarding the relation between saving and the profit share. He argues that as the profit share increases, the propensity to save out of profits increases as well, because 'no matter how extravagant rich households are, with respect to their consumption, there is only so much that they consume' (id.: 398). This argument closely resembles Keynes's (1936) absolute income hypothesis. The elaborate debate about this hypothesis will not be reviewed further here, but some notes on Nikiforos's interpretation are in order. As noted before, the propensity to save out of profits is in the post-Keynesian and Kaleckian literature usually assumed to be higher than the propensity to save out of wages. There are two reasons for this: part of profit income is retained by firms, and therefore per definition saved, while the remaining part is distributed to households. These households are usually richer than those that receive (only) wage income, and richer households usually save a higher proportion of their income, even if only because a smaller part of their income is required for basic necessities of life (Hein 2014: 273).

Nikiforos extends this static assumption to a dynamic one: he assumes that the propensity to save out of profits increases when the profit share increases. The rising profit share most likely leads to higher personal income inequality. If one assumes that higher income inequality leads to a larger gap between the propensities to save, then Nikiforos's argument makes sense. However, this argument by no means necessarily follows from the assumption that richer households save a larger part of their income than poorer households do at a specific point in time. Nikiforos essentially claims that the propensity to save out of profits is a linear function of the profit share, which is a much more far-reaching assumption than the standard Kaleckian presupposition. In fact, it is very well possible that the latter holds, while at the same time the relation between the propensity to save out of

profits and functional income distribution is completely different from what Nikiforos supposes; this depends on social and cultural norms (Prante 2017).

Furthermore, Nikiforos's (2016) theory of the propensity to save seems to disregard his own theory about the sensitivity of investment to profits. If firms are indeed no longer constrained by the availability of retained earnings when their profit margin is sufficiently high, then one would expect these firms to distribute a larger part of their profits. This would cause the propensity to save out of profits to decrease, which could partly or completely offset the positive effect described above. As a result, the effect of a change in functional income distribution on the propensity to save out of profits is uncertain.

4. Endogenous regime shifts in a simple Kaleckian model

Nikiforos (2016) proposes a method of incorporating his arguments on nonlinear behaviour in the saving and investment functions of the post-Kaleckian model. In this section, his suggestions will be applied partly: the model that will be presented below includes an altered (nonlinear) investment function, but a standard post-Kaleckian saving function. The reason for this is that the arguments for a nonlinear investment function are simply stronger than those for a nonlinear saving function, as was explained in the previous section. Another difference between the model presented here and the one by Nikiforos (2016), is that functional income distribution is treated here as being completely exogenous. This assumption most likely does not hold in reality, but enables a clearer analysis of the effect of functional income distribution on growth and effective demand.

The model has the same basic characteristics as the simple post-Kaleckian model; the usual assumptions apply. At its core, the model consists of the same equations as the standard post-Kaleckian model presented in Section 2:

$$r = h\frac{u}{v}, \tag{3a}$$

$$h = 1 - \frac{1}{1+m}, \tag{2a}$$

$$\sigma = \frac{S_\pi}{pK} = s_\pi r = s_\pi h\frac{u}{v}, \tag{4a}$$

$$g = \frac{I}{K} = \alpha + \beta u + \gamma h, \tag{5}$$

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \rightarrow s_\pi \frac{h}{v} - \beta > 0. \tag{9}$$

The only change made here is that the coefficient γ, which represents the sensitivity of investment to the profit share, is, following Nikiforos's (2016) suggestions, now defined as:

$$\gamma = \gamma_1 - \gamma_2 h;\ \gamma_1 > \gamma_2, \tag{10}$$

so that the accumulation function can be written as:

$$g = \frac{I}{K} = \alpha + \beta u + (\gamma_1 - \gamma_2 h)h = \alpha + \beta u + \gamma_1 h - \gamma_2 h^2. \tag{5a}$$

The equilibrium rates of capacity utilisation and growth follow from the goods market equilibrium condition:

$$g = \sigma, \tag{6}$$

$$\alpha + \beta u + \gamma_1 h - \gamma_2 h^2 = s_\pi h \frac{u}{v}, \tag{11}$$

$$u^* = \frac{\alpha + \gamma_1 h - \gamma_2 h^2}{s_\pi \frac{h}{v} - \beta}, \tag{12}$$

$$g^* = \sigma^* = \frac{(\alpha + \gamma_1 h - \gamma_2 h^2)\frac{s_\pi h}{v}}{s_\pi \frac{h}{v} - \beta} \tag{13}$$

Capacity utilisation is profit-led when:

$$\frac{\partial u^*}{\partial h} > 0 \rightarrow 2\beta\gamma_2 h - \gamma_2 h^2 \frac{s_\pi}{v} - \alpha \frac{s_\pi}{v} - \beta\gamma_1 > 0. \tag{12a}$$

Capital accumulation, growth and the rate of profit are profit-led when:

$$\frac{\partial g^*}{\partial h} > 0 \rightarrow 3\beta\gamma_2 h^2 + \frac{s_\pi}{v}(\gamma_1 h^2 - 2\gamma_2 h^3) > \alpha\beta + 2\beta\gamma_1 h. \tag{13a}$$

As becomes clear from these equations, the level of the profit share now partly determines the regime. Whereas in the standard post-Kaleckian model, a change in functional income distribution could only turn a conflictual regime in a cooperative regime and vice versa (see

Section 2), such a change can now also turn a wage-led regime profit-led and the other way around.

The IS curves tell a somewhat more complicated story. As with the standard post-Kaleckian model, two main constellations can be distinguished. The first constellation, which I will call the 'wage-led case', is shown in Figure 5.

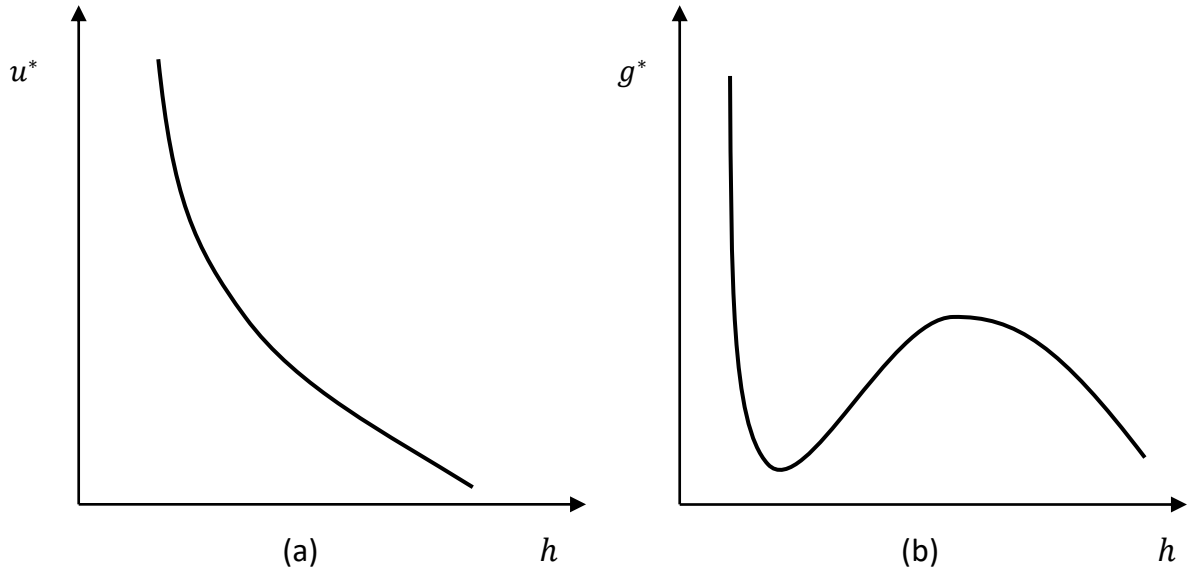

Figure 5: Utilisation (a) and growth (b) curves in the wage-led case

In this case, the utilisation curve is strictly downwards sloping, as shown in Figure 5a, with a decreasing absolute value of the slope. The wage-led case therefore obtains when the second order derivative of the equilibrium rate of capacity utilisation with respect to the profit share is positive:

$$\frac{\partial^2 u^*}{\partial h^2} > 0 \rightarrow \alpha \frac{{s_\pi}^2}{v^2} + \beta\gamma_1 \frac{s_\pi}{v} - \beta^2\gamma_2 > 0. \tag{12b}$$

Figure 5b presents the growth curve in the wage-led case. This curve is linked to the capacity curve in Figure 5a, and also appears when condition (4.8b) holds. The shape of this curve is determined by the same condition as that of the utilisation curve in Figure 5a. The reason for this is that the rate of capacity utilisation appears in the investment function, such that the shape of the curve in Figure 5a directly determines that of the curve in Figure 5b. Therefore, there are no different combinations of growth and capacity utilisation curves; there are only constellations of curves that always go together.

The second constellation, which will hereinafter be called the 'dynamic case', is shown in Figure 6. This constellation arises when the second order derivative of the equilibrium rate of capacity utilisation with respect to the profit share is negative, i.e.:

$$\frac{\partial^2 u^*}{\partial h^2} < 0 \rightarrow \alpha \frac{{s_\pi}^2}{v^2} + \beta\gamma_1 \frac{s_\pi}{v} - \beta^2\gamma_2 < 0 \tag{12c}$$

These curves have similar, inverted U-type shapes.

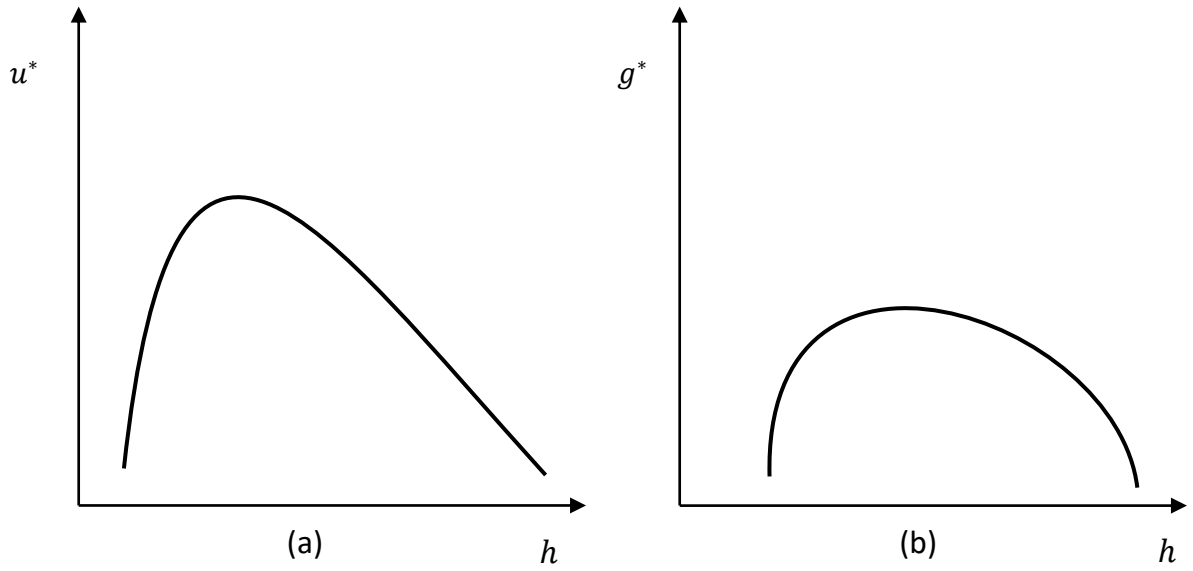

Figure 6: Utilisation (a) and growth (b) curves in the dynamic case

The equilibrium outcomes of the model provide some interesting insights. First of all, the utilisation curve in the dynamic case (Figure 6a) strongly resembles the one suggested by Taylor (1990), You (1994) and Palley (2013). However, as with other versions of the post-Kaleckian model, this outcome is not unique, and without any knowledge of the real values of the exogenous parameters, there is no reason to assume that the utilisation curve actually has this shape, and is not strictly downwards sloping. Therefore, in the remainder of this subsection, the two different constellations will be analysed separately.

In the wage-led case (Figure 5), the utilisation curve is not that different from the standard post-Kaleckian wage-led curve; the introduction of a nonlinear accumulation function seems to have a limited effect, and the system is still more strongly wage-led for low levels of the profit share, owing to the higher investment multiplier. However, the concomitant, somewhat odd shape of the growth curve in Figure 5b shows that growth is

first strongly wage-led, then profit-led, and then wage-led again. Starting from a low profit share, and redistributing income towards profits thus shifts the regime from wage-led to intermediate/conflictive and back to wage-led. These strange dynamics can be explained by the combination of the multiplier effect and the diminishing sensitivity of investment to profits. A low profit share means a low average propensity to save, and thus a high investment multiplier, so that the economy is strongly wage-led; as this effect weakens when the profit share increases, the direct positive effect of profits on investment takes over. This effect also weakens, but exponentially (by assumption), so that the regime becomes wage-led again at a higher level of the profit share, albeit less strongly wage-led than before because of the lower investment multiplier.

5. 'Optimal' distribution and conflicting interests

As is well known, Bhaduri and Marglin (1990) sought to provide a general theory of capitalist economic dynamics, which could explain different political views regarding income distribution. The resulting post-Kaleckian model does exactly that: it presents the possibility of both wage-led and profit-led outcomes, so that it can potentially be used as an argument for more than one ideology. However, while different analysts can hold different (mutually exclusive) assumptions about the functioning of an economy, only one set of assumptions can be true at a certain point in time. With a given set of fundamental values, that is, the exogenous parameters in the model, one side of the argument is correct: aggregate demand and growth are either wage-led or profit-led. In other words, the potential for true conflicting interests is very limited in the model. A true conflict only arises in the conflictual regime, when growth and the rate of profit are both profit-led and capacity utilisation wage-led; however, increasing the wage share in that case will make capacity utilisation only more wage-led, while turning growth and the rate of profit-led wage-led as well, so that the conflict disappears. It could also be argued that some can have an interest in turning the regime from wage-led to profit-led or vice versa, which is how Marglin and Bhaduri (1990) interpret Margaret Thatcher's reform programme.

Opposing interests appear in a different way in the adjusted model presented in this section. They do not really exist in the wage-led case; there is a set of values for the profit share in which growth is profit-led, so that the overall regime is conflictual, but a higher

profit rate can be achieved by pursuing a wage-led growth strategy[11]. Therefore, in a situation in which all economic agents are aware of this, there are no conflicting interests. This is not true for the second constellation. Both IS curves in this case are inverted U-shaped, so that they have a maximum, which suggests that there is an 'optimal' functional income distribution. However, the curves do no completely overlap, such that their maximums are obtained at different levels of the profit share. Since the maximum of the growth curve lies to the right of the utilisation curve maximum, firms will prefer a higher profit share than workers. Three 'zones' can therefore be distinguished: the area to the left of the utilisation curve maximum is profit-led (1), the area between the two maxima is conflictual (2) and everything to the right of the growth maximum is wage-led (3)[12]. This is illustrated in Figure 7.

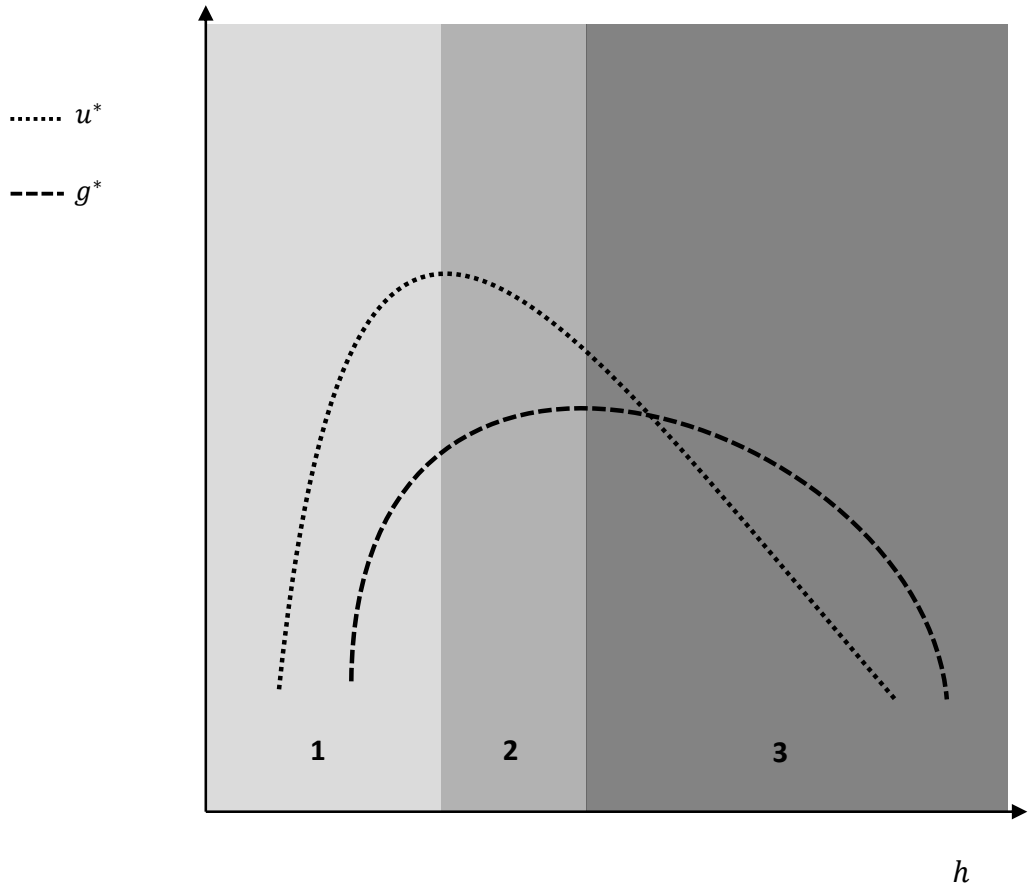

Figure 7: Conflicting interests in the dynamic case, with profit-led (1), intermediate/conflictive (2) and wage-led (3) zones

[11] Unless the steeply downwards sloping part of the growth curve only exists for negative values of the profit share, so that the curve has an inverted U-shape for real values and there is an optimal profit share from the perspective of firms and rentiers.

[12] A similar analysis is performed by Palley (2013).

Letting go of the assumption that workers do not save complicates the story. When there is a positive propensity to save out of wages, the profit rate is no longer equal to the saving rate (and therefore, in equilibrium, the accumulation rate) divided by the propensity to save out profits. As a result, the equilibrium profit rate is no longer necessarily wage-led or profit-led when the equilibrium accumulation rate is. In fact, the IS curve that shows the equilibrium profit rate as a function of the profit share (hereinafter the 'profit curve') now has the shape of the dynamic case growth curve in the wage-led case and vice versa, so that two new constellations appear. The two constellations are illustrated in Figure 8 and Figure 9.

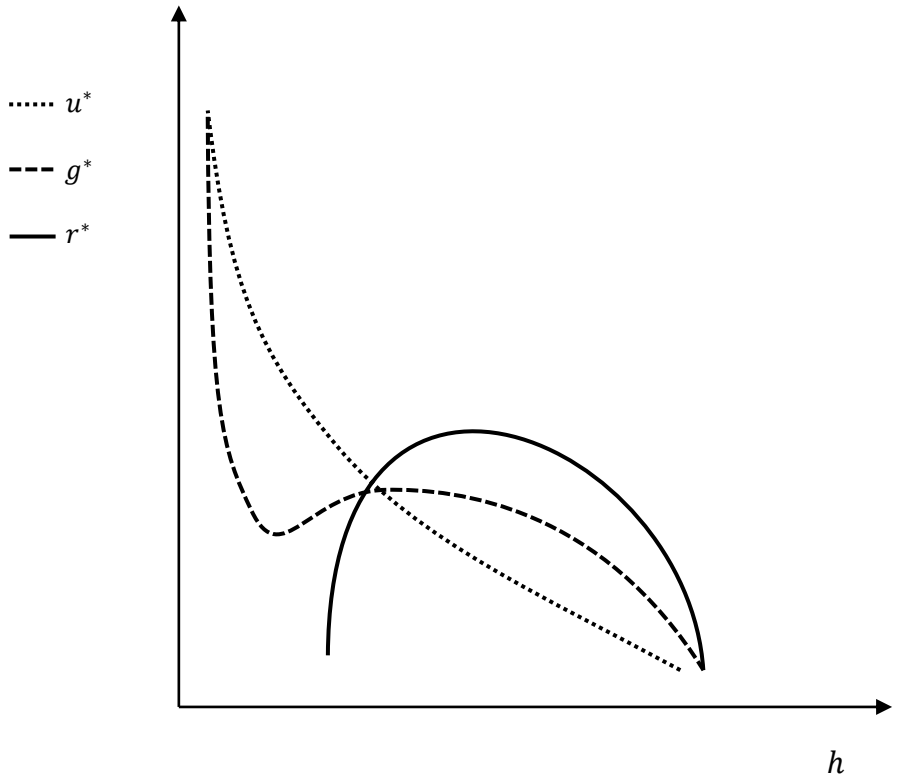

Figure 8: IS curves in the wage-led case when workers save part of their wages

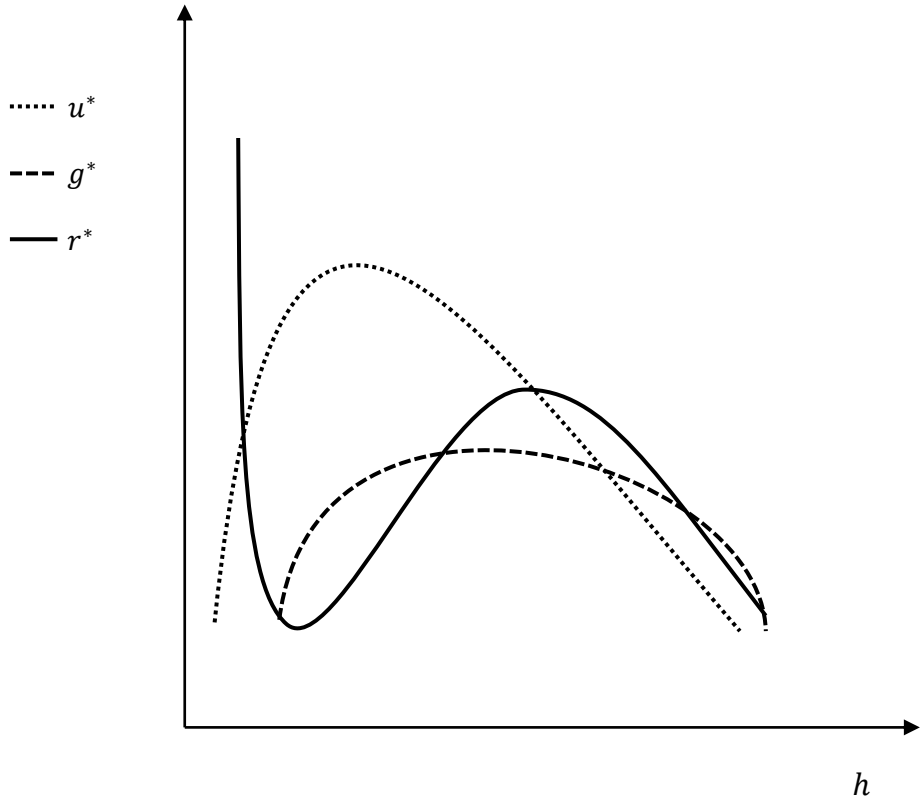

Figure 9: IS curves in the dynamic case when workers save part of their wages

If one assumes that firms are interested in the profit rate and workers in the utilisation rate, then some interesting observations can be made. The wage-led case now exhibits conflicting interests: the optimal profit share for workers is infinitely small, while there is a finite value for the profit share that is optimal for firms (and their shareholders). The dynamic case becomes a puzzling case, in which the paradoxical situation arises wherein the optimal profit share for capitalists is lower than the one for workers – although this is only true when the steeply downwards sloping part of the profit curve exists for positive values of the profit share. If it does not, a similar situation as in the wage-led case materialises, such that capitalists will again prefer a higher profit share than workers.

5. Conclusion

The aim of this paper has been to provide an overview of nonlinearity and regime shifts in Kaleckian models of distribution and growth. This has been done on the one hand by scrutinising the standard post-Kaleckian model, and on the other hand by assessing the relevance of nonlinear behavioural equations in a post-Kaleckian framework.

The standard post-Kaleckian model has been found to yield nonlinear IS curves, such that the 'distribution-ledness' of an economy changes when functional income distribution changes. In practise, this means that capacity utilisation becomes less wage-led or less profit-led, depending on the regime, when the profit share increases. The reason for this is the higher average propensity to save that results from an increase in the profit share, which causes the Keynesian multiplier to decrease and therefore all stimulating and dampening effects on aggregate demand to diminish. As a result, capital accumulation can switch from wage-led to profit-led when the profit share increases, and vice versa, so that a conflictual regime can turn into a cooperative regime. This is the first important result of this paper: the standard post-Kaleckian model suggests that wage-led policies are also successful when the regime is intermediate/conflictual, as long as they are pursued persistently.

Furthermore, it has been argued that while the results of the post-Kaleckian model may be credible at a certain point in time, the global shape of the IS curves is rather unrealistic. The reason for this is that these curves suggest that profit-led economies remain profit-led even when the profit share approaches unity, while wage-led economies continue to be wage-led even when the profit share is close to zero.

The main arguments for a nonlinear investment function identified here are a decreasing importance of retained earnings for the financing of investment and high uncertainty in an investment-based economy. Implementing these ideas in a simple post-Kaleckian model results in appreciably different dynamics than those of the standard model. Firstly, changes in functional income distribution can push the model economy from a wage-led regime to a profit-led regime and vice versa. Secondly, in at least one of the possible constellations, there is a limit to how high the profit share can be in a profit-led regime, and the same holds for the wage share in a wage-led regime; surpassing this limit will flip the regime. Finally, the most important result of this paper is that the inclusion of nonlinear behaviour strengthens the 'economic basis for contesting political ideologies', as the seminal paper by Bhaduri and Marglin (1990) was titled. The model presented in this paper opens up the possibility of conflicting interests, even when economic agents have the same beliefs about reality.

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