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Income distribution and the multiplier – an exploration of non-linear distribution effects in linear Kaleckian distribution and growth models

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Abstract

In this paper, I show that the income-autonomous demand multiplier of Keynesian-Kaleckian models is endogenous to changes in income distribution. This effect gives rise to non-linearity of distributional effects, even in basic models. Under certain conditions, an important consequence from the distribution-sensitive multiplier is that a higher wage share can have increasingly expansionary effects, which might even shift a profit-led investment regime to a wage-led one in the basic post-Kaleckian model. Surprisingly, the respective literature on distribution and growth largely ignored these features of Keynesian-Kaleckian macroeconomic models. After a theoretical discussion on the implications of the distribution-sensitive multiplier in basic closed- and open-economy models, I present a counterfactual illustration based on empirical parameter estimations from the literature and the development of functional income distribution for selected EU countries. My analysis indicates that a rising profit share has put partial downward pressure on the wage-ledness of aggregate demand in many EU countries. These results stress the relevance of this particular form of path dependency for empirical research and policy debates on distribution and growth.

Key words: Keynesian models, Kaleckian models, Multiplier, Income distribution, Open economy

JEL codes: D31, D33, E11, E12, F41

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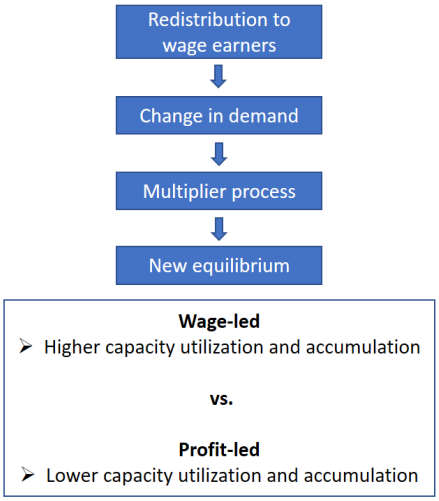
1 Introduction

Issues of income distribution and their impact on macroeconomic development have experienced a strong surge in popularity since the outbreak of the Great Recession. Indeed, it seems that the number of macroeconomists with different theoretical backgrounds who see income inequality as an obstacle to sustainable growth is growing. While the growing interest in the macroeconomic effects of redistribution is a relatively recent development among mainstream scholars, non-mainstream economists particularly with Marxian and post-Keynesian background, have long been researching these issues (Lavoie, 2017). One of the most influential macroeconomic approaches in non-mainstream research on the relationship between distribution and growth is the post-Keynesian-Kaleckian framework, based on the seminal works of Rowthorn (1981), Dutt (1984), Bhaduri and Marglin (1990) and Kurz (1990). This class of macroeconomic models is particularly well suited to examine the macroeconomic implications of changes in functional income distribution, as it provides an intuitive and clear framework for the debate on wage-led and profit-led demand and growth regimes.[1] The core of this debate focuses on the equilibrium effects of a one-off exogenous change in the distribution of income between profits and wages on aggregate demand, capacity utilization and capital accumulation. Modelling wise, the core of the debate centers around the analysis of a particular goods market equilibrium situation, which is affected by a one-off distributional "shock". The central question in this analysis concerns the position in which the model economy finds itself after the shock. According to the basic post-Keynesian/Kaleckian framework underlying these models, a change in the wage share leads to a change in consumption and (potentially) income-autonomous demand (e.g. income-autonomous components of investment and net exports) and this exogenous "demand shock" leads to excess demand or excess supply in the goods market, which then triggers a corresponding quantity adjustment of the goods market equilibrium. If this adjustment process leads to higher capacity utilization and growth, the macroeconomic regime is called wage-led. Instead, if there are negative effects on equilibrium utilization and growth, the economy is in a profit-led regime. It is

[1] See Lavoie (2017) for the history and evolution of the debate, see Hein (2014), chapter 6 for an introduction to this class of models.

also possible, that capacity utilization is in a wage-led demand regime, while capital accumulation is profit-led, resulting in an overall "intermediate regime", in Hein's (2014) terminology. Excluding this intermediate case for brevity, Figure 1 gives a summary of the core of the debate on wage-led and profit-led demand and growth regimes.

Figure 1: The core of the debate on wage-led vs. profit-led demand and growth: what is the new equilibrium succeeding a distribution-induced demand shock?



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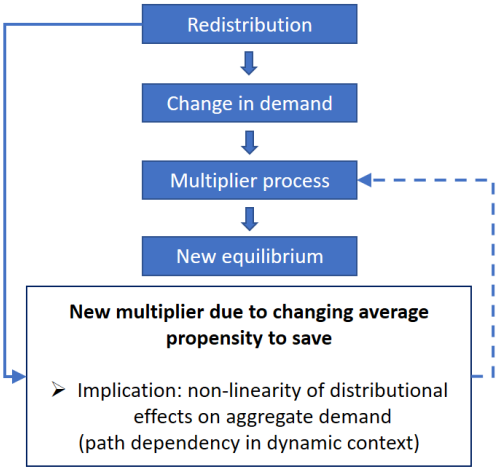
The adoption of the Keynesian-Kaleckian framework by many non-mainstream economists gave rise to a rich literature on theoretical extensions and empirical applications of the models[2]. Much in line with the theoretical core of the debate, many of the empirical applications have equally focused on the question whether an exogenous one-off permanent shock to the wage share triggers a rise or a fall of initial excess demand (the initial distribution-induced demand shock) or equilibrium output (the fully adjusted position after the shock). Yet, I will argue that there is an important aspect of the distributional effects in Kaleckian models that has received very little attention in the theoretical and empirical literature. This gap in the literature concerns the most important element of the macroeconomic adjustment process succeeding an initial distributional change: the income-autonomous demand multiplier. Due to the Kaleckian-Kaldorian features of

[2] Again, see Hein (2014) for extensive surveys.

the model economy any redistribution of income between agents with different propensities to consume and save will lead to a change of the Keynesian multiplier and therefore to an alteration in the adjustment process. This implies that the effects of income distribution on demand and growth are endogenous to the state of income distribution itself and therefore, distributional effects in these models exhibit non-linear behaviour. Transformed to a dynamic context, for example in empirical applications of such models, these nonlinearities would result in a form of path dependency of distributional effects, in which the effects of distributional shocks depend on the initial state of distribution. This endogeneity channel is even present in the most basic Keynesian-Kaleckian models, or more generally, in any macroeconomic model, with different propensities to save. Figure 2 illustrates this ignored part of the story on wage-led and profit-led regimes.

Figure 2: The neglected part of the story: redistribution changes the equilibrium adjustment process. Distributional effects are therefore non-linear and become path dependent in a dynamic context.



Source: Author's illustration.

It should be noted that Bhaduri and Marglin (1990) in their original model are not explicit about the functional form of their equations, which might be non-linear. However, in their graphical illustrations they focus on linear equilibrium paths of the endogenous variables. While they acknowledge that this is a simplification, I argue below that the non-linearity arising from basic

models deserves a more prominent role because it can have important empirical and policy implications. It should also be acknowledged here that several authors have already attempted to show that the nature of the macroeconomic regime with respect to functional income distribution (the wage- or profit-*ledness*) can depend on the state of distributional variables. However, except for Köhler (2018, section 2) these authors do not derive this insight from a standard framework, but rather introduce such a model behaviour through various extensions of basic models.[3] For example, Nikiforos (2016) models the propensities to save and to invest out of profits as functions of the profit share. In his extended Kaleckian model, it follows that continuous changes of functional income distribution lead to continuous shifts between wage-led and profit-led regimes over time. By providing other extensions than Nikiforos (2016), Carvalho and Rezai (2016), Palley (2015;2017) and Hein/Prante (2018) show that personal income distribution can have an effect on the regime character in Kaleckian models, which can in some cases lead to endogenous regime shifts. These "endogeneity issues" of wage-led and profit-led regimes either with respect to the profit share or with respect to personal income and wealth distribution are interesting and important on their own. However, first, in contrast to non-linear effects in the most basic linear models, the nonlinearities introduced through such extensions are not easy to relate to the existing empirical research on Kaleckian models. Second, even these authors have not discussed the very basic channel of changes in the strength as well as in the direction of distributional effects that passes through the multiplier.[4] The point I want to make is that even in the very basic models, the state of income distribution will alter the adjustment to a change in income distribution.

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[3] My theoretical analysis in section 2.2 is similar to Köhler's (2018, section 2) analysis of the canonical post-Kaleckian closed-economy model. However, in contrast to Köhler, who then extends the theoretical closed-economy model with non-linear behavioural equations, I provide an analysis in the open-economy context and show the empirical relevance of the theoretical effects in the standard framework (see section 2.3 and 3 below).

[4] Already Bhaduri and Marglin (1990) suggest in their Appendix B to extend the basic model with non-linear behavioral coefficients similar to the above-mentioned authors, but even Bhaduri and Marglin (1990) do not discuss the non-linearity arising from the distribution-sensitive multiplier in the basic closed- and open-economy models.

The common neglect of this issue is quite surprising, because it has important implications in the theoretical models and they should be accounted for in any empirical analyses of distributional effects as well as in the related policy discussions. Therefore, the aim of the paper is to analyse the non-linearity resulting from the distribution-sensitive multiplier, which gives rise to a form of path dependency when applied to an empirical context. For theoretical clarity, I first show how it affects the distribution-ledness in simple closed- and open-economy versions of Keynesian-Kaleckian models. In a second step, I illustrate the empirical relevance of the underlying mechanism for selected EU countries by calculating the distribution-sensitive multiplier from macroeconomic data and the estimation results of Onaran and Obst (2016). The paper is structured as follows: Section 2 discusses the endogeneity of distributional effects and its policy implications in basic closed- and open-economy models. Section 3 illustrates the distribution-sensitivity of the income-autonomous demand multiplier for selected countries. Section 4 concludes.

2 A theoretical clarification: on the neglected endogeneity of distribution-ledness in basic Keynesian-Kaleckian models

The models to be discussed in this paper are Keynesian models in the sense that aggregate production adjusts to aggregate demand through a multiplier process. The goods market equilibrium in these models is given by the product of income-autonomous demand and the Keynesian multiplier. The Kaleckian features of such models come from three main assumptions. First, the economy is usually in a situation of excess capacity. This means that the demand-determined level of equilibrium real output, Y^*, falls short of potential output, Y^p, which is the maximum real output that can be produced given technological factors, such as labour and capital productivity and the capital stock. In such an economy, capacity utilization, $u = Y^*/Y^p$, is therefore usually below one. Second, and related to the first assumption, the economy is characterised by monopolistic competition, with the main implications that firms respond to demand fluctuations by adjusting the quantity produced and prices determined by a mark-up on production costs. For the sake of simplicity, we do not discuss the formation of inflation and the role of an inflation-targeting policymaker here, but it should be noted that the models discussed in this paper could be easily extended to such issues (see for example Hein and Stockhammer

(2011)). The most important Kaleckian feature with respect to the aim of the paper is that, third, aggregate demand is partially determined by the distribution of income between profits and wages, i.e. the functional income distribution.

The particular channels of the distributional effects on aggregate demand (through consumption, investment and net exports) have been object of intense debates in the wage-led/profit-led literature (Lavoie, 2017), and, as we will see, the non-linearity that arises in the models due to the distribution-sensitive multiplier varies with the specific channels considered. Therefore, in what follows, I will systematically analyse this relationship by introducing the different channels into a basic Keynesian-Kaleckian model one at a time. First, I will discuss the non-linearity of domestic demand and growth regimes by distinguishing between effects in a closed economy of neo-Kaleckian kind, in which distribution affects only consumption demand directly, and compare this to a simple post-Kaleckian closed economy, in which income distribution may also directly affect investment through firms' unit profits. This will be followed by an analysis of how the distribution-sensitive multiplier may also alter the consequences of a changing profit share for the equilibrium net export rate in an open-economy post-Kaleckian model.

2.1 Non-linearity of distributional effects in the basic neo-Kaleckian model

Consider a simple neo-Kaleckian model of a private closed economy producing only one good that is available for consumption purposes or investment into a non-depreciating capital stock without technological improvements.[5] In this basic model, assuming linear investment and saving functions without saving out of wage income, the saving rate – i.e. saving, (S), normalized by the capital stock, K – depends positively on the profit share, h, and capacity utilization, u. Investment demand, I, also normalized by the capital stock, depends positively on capacity utilization and on autonomous investment, α, which is determined by "animal spirits" in the sense of Keynes (1936, ch. 12). The autonomous investment parameter can be seen as a proxy for "the complex historical, political and psychological factors affecting investment, for example the general

[5] For early versions of the neo-Kaleckian model see Dutt (1984); Rowthorn (1981). For an introduction to Kaleckian models of distribution and growth see Hein (2014), ch. 6 and 7).

business climate, the pressure of competition, long- run expectations, and so on" Hein (2014), p. 248. It can also be interpreted as the expected long-run growth rate of sales and, as we will see below, assumptions about this parameter are quite important in the context of basic Keynesian-Kaleckian models. The saving rate, $\sigma = S/K$, and the investment rate, $g = I/K$, of this basic neo-Kaleckian model are given by

(1) $\sigma = \sigma(h,u) = s_\pi r = s_\pi h \frac{u}{v}, 0 < s_\pi < 1$

and

(2) $g = g(\alpha,u) = \alpha + \beta u, \alpha, \beta > 0$

where σ, s_π, r, h, u, v, g, α, β denote the saving rate, the propensity to save out of profits, the profit rate, the profit share, the rate of capacity utilization, the capital-potential output ratio (assumed to be equal to one), the investment rate, autonomous investment and the effect of capacity utilization on investment, respectively.[6] In this Keynesian modelling framework, firms adjust capacity utilization in order to meet aggregate demand in the goods market. The economy therefore is demand-led. Given the goods market equilibrium condition ($g = \sigma$) and assuming the Keynesian stability condition ($SC = \frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} = s_\pi \frac{h}{v} - \beta > 0$) to hold, the following equilibrium values of capacity utilisation, u^*, and the investment rate, g^*, result from the adjustment to equilibrium on the basis of the income-autonomous demand multiplier:

(3) $u^* = \frac{\alpha}{s_\pi \frac{h}{v} - \beta} = \frac{1}{SC} AD$

(4) $g^* = \alpha + \beta u^*$

[6] I assume here that the propensity to save out of wage income equals zero. Note, that assuming a positive propensity to save out of wages would not change any of the qualitative results on the distribution-sensitive multiplier presented in this section as long as the propensity to save out of profits exceeds the propensity to save out of wages. It would only dampen the response of the multiplier to a change in profit share. In the empirical part in section 3, I introduce saving out of wages.

In equation 3, AD denotes income-autonomous demand, which here comprises only autonomous investment demand, $AD = \alpha$. Note that the assumption of positive autonomous investment, a, in this model is crucial to ensure a positive value of equilibrium capacity utilization. The income-autonomous demand multiplier is defined as $\mu = 1/(s_\pi \mathrm{h/v} - \beta) = 1/SC$. As is well known, the response of this neo-Kaleckian model without saving out of wages to a change in income distribution is unambiguously wage-led: an increase of the profit share will lead to a fall of equilibrium capacity utilization and accumulation. The first order partial derivatives of the equilibrium values with respect to the profit share are strictly negative:

(5) $$\frac{\partial u^*}{\partial h} = \frac{\frac{\partial AD}{\partial h} SC - AD \frac{\partial SC}{\partial h}}{SC^2} = \frac{-\alpha \frac{s_\pi}{v}}{SC^2} < 0$$

(6) $$\frac{\partial g^*}{\partial h} = \beta \frac{\partial u^*}{\partial h} < 0$$

Equation 5 highlights that the assumption of a positive autonomous investment parameter, $\alpha > 0$, and no additional distribution-dependent influences on income-autonomous demand, $\frac{\partial AD}{\partial h} = 0$, is central for this result.

Graphically speaking, the term $\frac{-AD \frac{\partial SC}{\partial h}}{SC^2}$ in equations 5 and 6 essentially represents the partial movement of the equilibrium values of the system that is due to the counter-clockwise rotation of the saving rate function when the profit share rises (see Figure 4 below). These first order partial effects determine the sign and the absolute size of the response to a one-off exogenous "shock" to income distribution. Conceptually, the above analysis is what has been done in most of the analytical literature on basic Kaleckian models; that is, examining the effects of such a one-off exogenous change in distribution on equilibrium demand and capital accumulation. Surprisingly, this is where the analysis of basic Kaleckian models usually stops even though the debate on wage-led and profit-led growth is only to a very limited extend motivated by one-off movements ("shocks") to the profit share, in which case one-off equilibrium effects of

redistribution would be of main interest.[7]. Instead, much of the motivation in the literature comes from consequences of longer-term and structural distributional changes, which, for example, can be understood by applying Kalecki's institutional concept of the "degree of monopoly" (representing the degree of market concentration, the importance of price competition, trade union's bargaining power and the role of overhead costs) and mark-up pricing (see Hein (2014) ch. 5). Therefore, what I have in mind here is examining the effects of continuous or successive unidirectional changes in distribution, for example as a result of politically induced long-term strategies to either increase or diminish the profit share based on opposing political ideologies (i.e. profit-led vs. wage-led policy strategies).

In the model above, longer-term distributional change would imply successive unidirectional "shocks" to the profit share, instead of a marginal one-off shock that has been the focus of the literature. However, in simple Keynesian-Kaleckian models, as well as in more advanced models of this kind, the Keynesian-Kaleckian multiplier, μ, is an important determinant of the economic equilibrium, and therefore of the size of the effect of redistribution. What is usually ignored in the discussion of these models is that the state of income distribution has an effect on the multiplier itself, implying that the level of the profit share is a determinant of its own effects on the economic equilibrium. Presumably, the focus on one-off marginal distributional shocks in the literature has facilitated the neglect of this issue. In the simple model above, the distribution-sensitive multiplier is given by

[7] To some extent, this focus on one-off shocks in the theoretical literature also seems to be at odds with the empirical evidence, because short-run fluctuations of the profit-share and capacity utilization are more likely to move in the same direction. However, this is not necessarily due to the irrelevance of the Kaleckian notions of wage-led demand and growth, but can be explained by other mechanisms, for example, the related behavior of overhead costs, which are not often accounted for in Kaleckian models. See Blecker (2016) for a discussion of these empirical issues and Lavoie (2009) for a Kaleckian model with overhead costs. See Hein (2017) for a brief account of both issues. Yet, simple distribution and growth models are often presented as a motivation for essentially short-run estimations of distributional effects on aggregate demand (see for example Hein and Vogel (2008), Stockhammer et al. (2008), Onaran and Galanis (2014), Onaran and Obst (2016)).

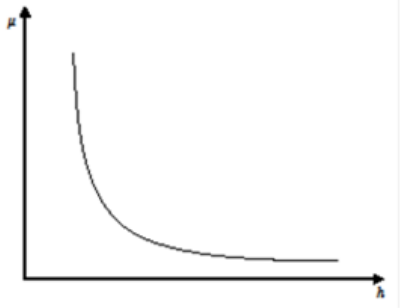
(7) $\mu = \mu(h) = \frac{1}{SC} = \frac{1}{s_\pi \frac{h}{v} - \beta}$

implying a strictly negative partial effect on the multiplier if the profit share increases marginally:

(8) $\frac{\partial \mu}{\partial h} = \frac{-\frac{s_\pi}{v}}{SC^2} = -\frac{\frac{\partial SC}{\partial h}}{SC^2} < 0$

This negative effect on the multiplier is present in equations 5 and 6 and therefore, the response of the equilibrium values of the model to changes in income distribution is non-linear.[8] Crucially, the multiplier in these models is a function of the average propensity to save, which is given by a weighted average of the different propensities to save from wages (assumed here to be zero) and profits, where the weights are determined by functional income distribution. Since it is commonly and reasonably assumed that the propensity to save out of profits is larger than the propensity to save out of wages, the multiplier will fall when the profit share rises and it will rise when the profit share falls. Figure 3 illustrates the negative and non-linear dependence of the multiplier on the profit share.

Figure 3: The distribution sensitive multiplier.



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Consequently, the effects of a changing profit share on the equilibrium values of the system are not constant. Instead, given the uniquely wage-led nature of the basic neo-Kaleckian model, any

[8] In a dynamic context, distributional effects would therefore clearly depend on the initial distributional conditions and, in this sense, exhibit a form of path dependency. This is relevant for the empirical application of Kaleckian models and from a policy perspective. I will come back to these points below.

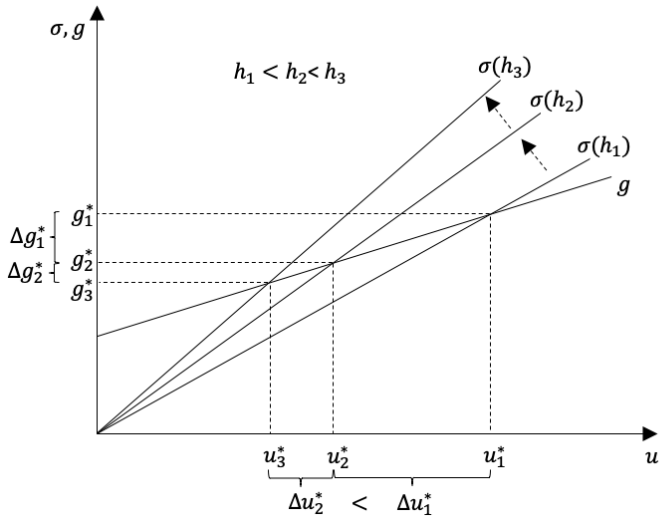
rise in the profit share will reduce the "wage-ledness" of the model, because of a lower multiplier, whereas a fall of the profit share will lead to a more strongly wage-led regime. This can easily be checked with the second order partial derivatives of equilibrium utilisation and investment with respect to the profit share. They reveal that the wage-ledness of the system is weakening as the profit share rises:

(9) $$\frac{\partial^2 u^*}{\partial h^2} = \frac{2\alpha\left(\frac{s_\pi}{v}\right)^2}{\left(s_\pi\frac{h}{v}-\beta\right)^3} = \frac{2AD\left(\frac{\partial SC}{\partial h}\right)^2}{SC^3} > 0$$

(10) $$\frac{\partial^2 g^*}{\partial h^2} = \beta\frac{\partial^2 u^*}{\partial h^2} > 0$$

Graphically speaking, the rotation of the saving rate function becomes weaker as the profit share rises continuously by one percentage point and the multiplier falls. Figure 4 illustrates this form of endogeneity of the wage-ledness in a basic neo-Kaleckian model without saving out of wages. The initial counter-clockwise rotation of the saving rate function due to an increase of the profit share from h_1 to h_2 leads to a reduction of the equilibrium values of capacity utilization and investment from u_1^* to u_2^* and from g_1^* to g_2^*, respectively. Starting from this new situation, a further increase of the profit share from h_2 to h_3 leads again to a fall of equilibrium capacity utilization and investment, however, the fall in both variables is lower in absolute terms than in the previous situation ($\Delta u_2^* < \Delta u_1^*$ and $\Delta g_2^* < \Delta g_1^*$) due to a lower multiplier.

Figure 4: Endogeneity of the wage-ledness in a basic neo-Kaleckian model



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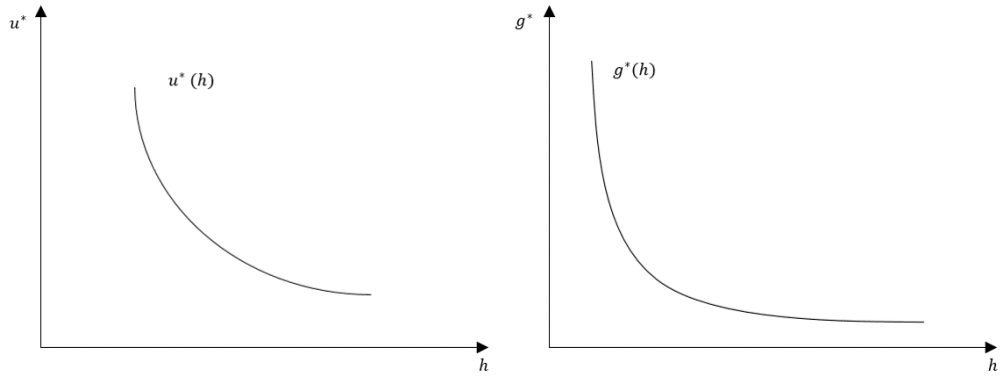
In addition, Figure 5 shows the equilibrium paths of utilization and investment for a changing profit share. The relationship in both parts of the figure is negative, since both endogenous variables are wage-led and a higher profit share has a depressing effect on the economy. However, the slope of both curves becomes flatter with a rising profit share, meaning that the marginal demand and growth effects of a rising profit share are falling for both variables as shown formally in equation 9 and 10. Of course, this equally implies that the positive marginal demand and growth effects of a rising wage share are rising. Therefore, an important conclusion from this endogeneity channel is that an increase of the profit share is making the economy less wage-led, while a decrease of the profit share (i.e. increase of the wage share) is making the economy more wage-led. Pursuing a macroeconomic strategy of wage-led demand and growth via redistribution to wages is therefore not only expansionary for this simple model economy; it will even become more expansionary as the profit share falls (wage share rises). In the simple model above, a wage-led economy becomes even more wage-led if a higher share of income goes to wages. This channel is therefore an important qualifier in terms of the potential concern of policy makers that a rising wage share will eventually undermine economic performance. The simple neo-Kaleckian model shows that the direct effects of a rising wage share on the income-autonomous demand multiplier imply the opposite of this concern.

Figure 5: Uniquely wage-led equilibrium paths of utilization and investment in a basic neo-Kaleckian model



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The two equilibrium situations in Figure 4 and the continuous equilibrium paths of the neo-Kaleckian model in Figure 5 illustrate the principal idea of non-linearity of distributional effects that results from the distribution-sensitive multiplier even in a most-basic model. As mentioned above, the basic mechanism through which this non-linearity arises is the difference in propensities to save out of different income categories. In the basic model without saving out of wages this difference is equal to s_π. This allows for an alteration of the multiplier with income distribution.

As is well known, in addition to consumption, also investment and net exports have been identified as important channels through which income distribution might affect aggregate demand and capital accumulation. Accounting for these can lead to an alteration of the non-linearity observed for the basic model. The next subsection therefore introduces the direct distributional effect on investment in the context of a simple *post*-Kaleckian model.

2.2 Non-linearity of distributional effects in the basic post-Kaleckian model

The idea that profitability plays a role for firms' investment demand has been put forward to challenge the uniquely wage-led nature of the basic neo-Kaleckian model. By integrating an effect of unit profits represented by the profit share into the investment function of the above model, we turn to a simple closed-economy version of the post-Kaleckian model based on the seminal

works of Bhaduri and Marglin (1990) and Kurz (1990). While retaining all the other assumptions and the saving function of the previous model, we now replace equation (2) with the post-Kaleckian investment function in equation (11):

(11) $g = \alpha + \beta u + \tau h, \quad \beta, \tau > 0$

Equation 11 states that in addition to the positive investment effect of capacity utilization, also the profit share is assumed to have a positive linear impact on investment, where τ denotes the profitability-sensitivity of investment. Crucially, we can now let go of the assumption that autonomous investment must be positive. This assumption is now no longer needed to maintain positive capacity utilization, because income-autonomous demand (normalized by the capital stock) is now given by the sum of autonomous and profitability-induced investment demand, $\alpha + \tau h$.[9] This slight change of the determinants in the investment function transforms the previously neo-Kaleckian model into the basic post-Kaleckian version. In contrast to the neo-Kaleckian model, the effect of the profit share on the equilibrium values of capacity utilization and capital accumulation in the post-Kaleckian model is now ambiguous. The equilibrium values in the simple post-Kaleckian model are the following:

(12) $u^* = \frac{\alpha + \tau h}{s_\pi \frac{h}{v} - \beta} = \frac{1}{SC} AD$

(13) $g^* = \alpha + \beta u^* + \tau h$

Due to the fact that rising unit profitability does now have a positive effect on income-autonomous demand, $\frac{\partial AD}{\partial h} > 0$, the new equilibrium values now imply ambiguity in the first order partial effects of the profit share:

(14) $\frac{\partial u^*}{\partial h} = \frac{\frac{\partial AD}{\partial h} SC - AD \frac{\partial SC}{\partial h}}{SC^2}$

(15) $\frac{\partial g^*}{\partial h} = \beta \frac{\partial u^*}{\partial h} + \tau$

[9] Obviously, in order to have a reasonable model outcome, $AD = \alpha + \tau h > 0$ must be assumed.

Graphically speaking, in equations 14 and 15, the expression $\frac{-AD\frac{\partial SC}{\partial h}}{SC^2} < 0$ again represents the partial movement of the equilibrium that results from a rotation of the saving rate function. In addition – and in contrast to the neo-Kaleckian model –, the term $\frac{\frac{\partial AD}{\partial h}SC}{SC^2} > 0$ represents the converse partial movement of the equilibrium, which results from a shift of income-autonomous demand, triggered by a change in unit profitability. These opposing effects render the sign of the expression $\left(\frac{\partial AD}{\partial h}SC - AD\frac{\partial SC}{\partial h}\right)$ in the partial effects ambiguous, and therefore, the post-Kaleckian model now allows not only for wage-led, but also for profit-led demand and growth. However, equation 14 also shows that profit-led demand can only appear under rather special circumstances in the closed economy version of this model. If we rewrite the numerator of the partial effect of the profit share on equilibrium utilization to: $-\left(\tau\beta + \alpha\frac{s_\pi}{v}\right)$, we can see that the rate of capacity utilization may only be in a profit-led regime if firms expect the long-run growth rate of sales to be negative $(\alpha < 0)$ and this is not overcompensated by high effects of profitability and/or utilization on investment. Therefore, in a closed-economy post-Kaleckian model, negative long-run business expectations of firms are a necessary condition of profit-led aggregate demand. Formally, profit-led utilization can only arise when: $\alpha < -\frac{\tau\beta v}{s_\pi} < 0$. This very peculiar condition for profit-led utilisation in this model is not a necessity for a profit-led capital accumulation rate to occur. As can be seen in equation 15, if utilization is wage-led, for a profit-led accumulation regime, it is "only" necessary that the positive effect of profitability on investment overcompensates for the potentially negative effects of falling consumption demand and the related multiplier-accelerator effects.

The possibility that capacity utilization and capital accumulation in the model economy can now also become profit-led gives rise to different constellations for the overall regime regarding changes in income distribution (Hein, 2014, ch. 6). If the partial effects of the profit share are negative for both, utilization and the investment rate, an overall wage-led regime emerges, which resembles the one of the basic neo-Kaleckian model. Instead, if equilibrium utilization is wage-led and the equilibrium investment rate is profit-led, an intermediate overall regime is the result. Finally, if both utilization and the investment rate are profit-led, the economy is in an overall

profit-led regime. For this last case, the above-mentioned peculiar assumption needs to hold. The well-known variety of regimes is one of the reasons why the post-Kaleckian model is attractive for many heterodox scholars with different believes about the drivers of demand and growth in capitalist economies (Lavoie, 2017, p 208-210). One the one hand, it allows for the classical underconsumptionist idea that without a high enough share of wages in income, the economy will be faced by a lack of demand. On the other hand, it allows for the profit-squeeze idea, which maintains that falling unit profitability will eventually undermine investment and therefore, aggregate demand and growth, even though this latter narrative requires quite strong assumptions about the importance of profitability for investment demand of extremely pessimistic firms.[10]

However, the inclusion of a profit share-dependent term in the investment function does not only allow for profit-led demand in an otherwise Keynesian-Kaleckian model, it can also be of critical relevance for the non-linearity of such distributional effects, which is usually ignored in the literature on these models. As was the case for the previously discussed neo-Kaleckian model, the multiplier of the post-Kaleckian model is also distribution-sensitive.[11] Indeed, since the saving rate function has not changed, the multiplier is exactly the same as before (equation 7) and shows exactly the same negative non-linear relationship with the profit share that was already illustrated above for the neo-Kaleckian model in Figure 3. Again, the consequence for the effects of the profit share is a dependence on initial distributional conditions and, therefore, non-linearity.

Interestingly, the way in which redistribution will change the wage- or profit-ledness of the system depends only on the regime of capacity utilization. This can be seen with the second order partial effects of the profit share on the equilibrium utilization rate and the investment rate:

[10] It should be noted that this requirement for profit-led growth to occur is relaxed in the open economy version of the model. However, in that case it is not really the profit-squeeze mechanism which can lead to profit-ledness, but rather a mechanism of export-led demand and growth.

[11] Köhler (2018), p.3-11) provides a similar analysis of the post-Kaleckian closed-economy model.

(16) $\frac{\partial^2 u^*}{\partial h^2} = \frac{-2\left(\frac{\partial AD}{\partial h}SC - AD\frac{\partial SC}{\partial h}\right)\frac{\partial SC}{\partial h}}{SC^3}$

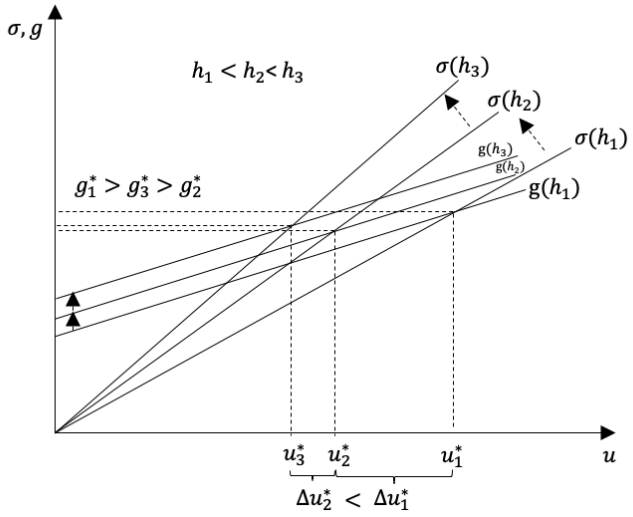
(17) $\frac{\partial^2 g^*}{\partial h^2} = \beta \frac{\partial^2 u^*}{\partial h^2}$

If capacity utilization is wage-led $\left(\frac{\partial u^*}{\partial h} < 0\right)$, the expression $\left(\frac{\partial AD}{\partial h}SC - AD\frac{\partial SC}{\partial h}\right)$ is negative since – graphically speaking – the effect of the rotation of the saving rate function on the economic equilibrium exceeds the effect of the shift in the investment function. This renders the second order partial derivatives of capacity utilization and capital accumulation positive $\left(\frac{\partial^2 u^*}{\partial h^2}, \frac{\partial^2 g^*}{\partial h^2} > 0\right)$. Consequently, redistribution towards wages will make the utilization and accumulation regime more wage-led in an overall wage-led regime, very much like in the neo-Kaleckian model. Again, in such a regime, a policy strategy aiming for a higher share of wages in aggregate income is not only expansionary; it will even become more expansionary each time the wage share rises (profits share falls).

This result does not hold in an intermediate regime with a wage-led utilisation rate and a profit-led investment regime ($\frac{\partial u^*}{\partial h} < 0$ and $\frac{\partial g^*}{\partial h} > 0$). Here, a lower profit share will increase the wage-ledness of the utilization regime and simultaneously decrease the profit-ledness of the investment regime. This is a quite interesting finding, because it implies that even if a profit-led accumulation regime prevails, the negative effect of a falling profit share on the equilibrium investment rate will become smaller and smaller as the profit share falls. Graphically speaking again, the downwards shift of the investment function triggered by a marginal fall of the profit share remains constant, while the clockwise rotation of the saving rate function becomes more pronounced each time the profit share falls. Indeed, if the fall of the profit share continues for long enough (or if a one-off fall is large enough), the accumulation regime can even switch from profit-led to wage-led. From this point on, the wage-ledness will improve steadily as the wage share rises and the model then behaves like the neo-Kaleckian model from above (i.e.: $\frac{\partial u^*}{\partial h} < 0, \frac{\partial g^*}{\partial h} < 0, \frac{\partial^2 u^*}{\partial h^2}, \frac{\partial^2 g^*}{\partial h^2} > 0$). Therefore, in a post-Kaleckian model it is not only the case that the wage- or profit-ledness depends on distribution itself, the type of accumulation regime can also endogenously switch from profit-led to wage-led, if – crucially – utilisation is in a wage-led regime.

This point has been largely ignored in the relevant literature, the only exception being Köhler (2018). Of course, this also implies that in the opposite case of a wage-led accumulation regime with a rising profit share, the investment regime could at some point switch to profit-led and the effect of a higher profit-share on investment would become stronger as the profit share rises ($\frac{\partial u^*}{\partial h} < 0, \frac{\partial g^*}{\partial h} > 0, \frac{\partial^2 u^*}{\partial h^2}, \frac{\partial^2 g^*}{\partial h^2} > 0$). However, a profit-led strategy in such a system cannot be consistently pursued from a policy perspective because it would lead to depressed utilisation. Figure 6 illustrates the situation in which a rise of the profit share shifts the growth regime from wage-led to profit-led. Again, the profit share initially rises from h_1 to h_2, which leads to a reduction of equilibrium capacity utilization and investment, from u_1^* to u_2^* and from g_1^* to g_2^*, respectively. However, another rise from h_2 to h_3 leads to rising equilibrium investment (from g_2^* to g_3^*), indicating a switching growth regime from wage-led to profit-led, while the demand regime remains wage-led as equilibrium utilization falls (from u_2^* to u_3^*).

Figure 6: Endogenous regime switching from wage-led to profit-led investment in a post-Kaleckian model

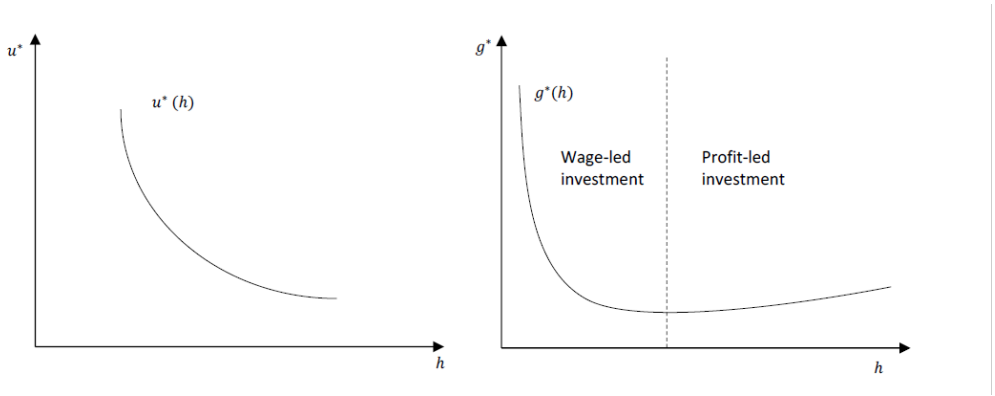


Source: Author's illustration

In addition, Figure 7 shows the equilibrium paths of utilization and the accumulation rate with respect to the profit share. It can be seen how a continuous fall of the profit share can transform an intermediate regime with wage-led utilisation and profit-led growth into an overall wage-led regime in which a falling profit share has expansionary effects on demand and growth.

Analogously, an overall wage-led constellation can be transformed into an intermediate one, if the profit share rises. While utilization in Figure 6 and 7 remains wage-led, the investment regime can switch between profit-led and wage-led.[12]

Figure 7: Equilibrium paths of utilization and investment in a basic post-Kaleckian model – the overall wage-led and the intermediate case



Source: Author's illustration

In contrast, if the rate of capacity utilization is in a profit-led regime (i.e. $\frac{\partial u^*}{\partial h} > 0$), the effect of the profitability-induced shift in the investment rate function overcompensates for the effect of the rotation of the saving rate function $\left(\frac{\partial AD}{\partial h} SC - AD \frac{\partial SC}{\partial h} > 0\right)$. However, the constant increase in autonomous investment demand is having a smaller and smaller positive impact on the equilibrium because of the falling multiplier. Therefore, the second order partial effects with respect to the profit share become negative $\left(\frac{\partial^2 u^*}{\partial h^2}, \frac{\partial^2 g^*}{\partial h^2} < 0\right)$.[13] This means that in an overall

[12] Obiously, the equilibrium path of investment under a wage-led utilization regime depends on the specific parameter constellation. Given a specific constellation, it might be that a realistic parameter space will rule out the possibility of a regime switch, because the minimum of the investment-equilibrium growth path, the regime-switching point, is located at an unrealistically high or low value of the profit share. The profit share at which the investment regime switches between wage-led and profit-led is: $\mathrm{h_{switch}} = \frac{\mathrm{v}}{\mathrm{s_\pi}} \sqrt{\frac{\beta\left(\tau\beta + \alpha\frac{\mathrm{s_\pi}}{\mathrm{v}}\right)}{\tau}} + \beta$.

[13] Note, again, that for this to happen requires autonomous investment to be negative in our simple model without saving out of wages. Moreover, it implies that in a profit-led utilization regime the lowest profit share for which the model generates a positive value for capacity utilization is higher than the lowest value satisfying the stability condition (see Figure 6).

profit-led regime, an increase of the profit share will make the utilization and investment regime less profit-led. Of course, in this case the regimes cannot endogenously switch towards a wage-led regime, since the utilization regime is constrained to be profit-led by assumption.[14]

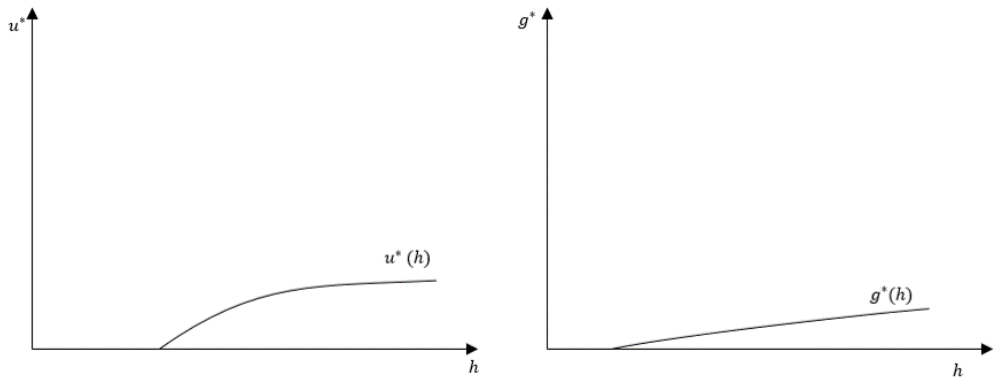
Again, Figure 8 shows the equilibrium paths of utilization and investment for the overall profit-led regime, in which they are both uniquely profit-led. Both curves show a positive but decreasing slope.[15]

Generally, the range of profit shares for which the model makes sense is quite sensible to the absolute value of a negative autonomous investment term, it will become smaller with a higher absolute value of a negative autonomous investment term. Moreover, the scope for profit-led strategies in this simple model is quite limited because the highest level of utilization is approximated very quickly, at least for "realistic" values of the profit share (see Figure 6). Numerical parameter constellations can be explored using my interactive simulator for basic Kaleckian models at https://fprnt.shinyapps.io/Kalecki/.

[14] Endogenous regime switches between utilization regimes become only possible by extending the model with further mechanisms (see for example Nikiforos (2016), Köhler (2018)).

[15] The representation of the equilibrium paths in Figure 8 might at a first glance appear a bit stunted, however, in order to change the wage-led utilization regime from figure 7 to a profit-led one, it is necessary to change at least one model parameter. For example, the switch from the shapes of the equilibrium paths in figure 7 to the ones in figure 8 would result from a marginal decrease of autonomous investment demand. Inserting the following parameter constellation into the interactive model simulator will produce similar shapes of the equilibrium schedules as in figure 7: $s_\pi = 0.6; v = 1; \alpha = -0.01; \beta = 0.1; \tau = 0.1$. A marginal fall in autonomous investment demand to -0.02 then produces a "stunted" shape as in figure 8.

Figure 8: Equilibrium paths of utilization and investment in a basic post-Kaleckian model – the overall profit-led case



Source: Author's illustration

The above discussion shows that neo- and post-Kaleckian models, even in their most basic form, imply that the effects of income redistribution between profits and wages are not constant. Instead, they are changing in a non-linear manner. More complex Keynesian-Kaleckian linear models will of course also be characterised by a similar non-linearity in the equilibrium paths of utilization and investment with respect to income distribution. More generally, the same will hold for any other heterodox or mainstream macroeconomic model containing a distribution-sensitive multiplier.

The question that naturally arises from the discussion of the basic models is whether these effects are relevant from a policy perspective and empirically. To see the policy-relevance is straightforward: For a wage-led capacity utilization scenario, the policy conclusion from the distribution-sensitive multiplier in terms of the most basic neo- and post-Kaleckian models is that redistribution towards wages can be an economically sustainable strategy in the long-run. The effects of redistribution do not only stay expansionary in a wage-led utilization regime, they will even become larger when a wage-led strategy is pursued by redistribution towards wages. For such a model economy, the potential concern of the policy maker that a wage-led economic strategy will eventually undermine itself is unfounded. In contrast, an ongoing profit-led strategy cannot be economically sustainable, because even in a profit-led utilization regime the expansionary effects of an increasing profit share will fade out. However, in order to discuss the

policy relevance more comprehensively, the model needs to take the effects of international trade into account.

2.3 Distribution-ledness in the open economy

The effect of distributional changes on international trade and therefore net exports can be crucial for the macroeconomic effects of changes in income distribution as was initially argued by Blecker (1989) and Bhaduri and Marglin (1990). It is therefore also relevant to ask which implications can be drawn from the distribution-sensitive multiplier for the effects of redistribution on net exports. The open economy version of the basic closed-economy models can be obtained by adding a linear net-export rate function, b, to the models from the previous section (see Hein (2014), chapter 7). Net-exports normalized by the capital stock are determined by the real exchange rate, e^r, domestic capacity utilization, u, and exogenously given foreign capacity utilization, u^f:

(19) $b = \gamma e^r - \phi u + \zeta u^f, \gamma, \phi, \zeta > 0$

It is assumed here that the Marshall-Lerner condition holds and that the sum of the absolute values of the price-elasticities of exports and imports exceeds unity such that there is a positive effect of a real depreciation (indicated by a rising e^r). I also assume that there will be an effect of the profit share on the real exchange rate ($e^r = e^r(h)$). The sign of this effect can be assumed to depend on the specific channel through which distribution changed (Hein and Vogel, 2008). If redistribution towards profits takes place through a higher mark-up, the effect on the real exchange rate is negative, implying a real appreciation (lower e^r). If it takes place through a fall of the nominal wage rate or through a depreciation of the nominal exchange rate, the effect is positive (see Hein (2014)) chapter 7 for details), implying a real depreciation (higher e^r) when the profit share rises:

$\frac{\partial e^r(h)}{\partial h} < 0$ if redistribution towards profits through higher markup,

$\frac{\partial e^r(h)}{\partial h} > 0$ if redistribution towards profits through lower nominal wages and or lower nominal exchange rate.

In addition, I assume for simplicity that the relationship between the profit share and the real exchange rate is linear, and in what follows, I will restrict the analyses to the post-Kaleckian open economy model. This model can be obtained by combining equations 1, 11 and 19 and the equilibrium condition: $\sigma = g + b$. This leads to the following equilibrium values of the rates of capacity utilization, accumulation and net exports:

(20) $u^* = \frac{\alpha+\tau h+\gamma e^r+\zeta u^f}{SC} = \frac{1}{SC} AD$

(21) $g^* = \alpha + \beta u^*$

(22) $b^* = \gamma e^r - \phi u^* + \zeta u^f$

where $SC = s_\pi \frac{h}{v} - \beta + \phi > 0$.

In the open economy, distribution does not only affect demand and growth, which still might be wage-led or profit-led, but also the net-export rate. The effect of income distribution on net exports depends on the specific parameter constellation of the model. Again, different overall combinations of the regimes of demand, growth and net exports are possible, which have been described in detail in chapter 7 of Hein (2014). The following three equations show the first order partial effects:

(23) $\frac{\partial u^*}{\partial h} = \frac{\frac{\partial AD}{\partial h} SC - AD \frac{\partial SC}{\partial h}}{SC^2}$

(24) $\frac{\partial g^*}{\partial h} = \beta \frac{\partial u^*}{\partial h} + \tau$

(25) $\frac{\partial b^*}{\partial h} = \gamma \frac{\partial e^r}{\partial h} - \phi \frac{\partial u^*}{\partial h}$

As in the closed-economy post-Keynesian model, equation 23 shows that whether a profit- or wage-led regime emerges depends on the relative strength of the overall shift effect on the sum of the investment and the net export function, $g + b$, and the opposing rotation effect on the saving rate function. A profit-led utilization regime can only emerge when the first effect exceeds the latter (in this case, the accumulation regime is also profit-led). Otherwise, a wage-led utilization regime prevails. For the accumulation regime, profit-ledness of growth under a wage-

led utilization regime will arise when the accelerator effect is overcompensated by the profitability effect, as can be seen in equation 24, otherwise the accumulation regime is wage-led, or the effects exactly compensate each other. Compared to the closed-economy post-Kaleckian model, the open-economy effects of income distribution in this model imply that a wage-led utilization regime is becoming less likely if redistribution towards profits takes place through lower nominal wages and/or a lower nominal exchange rate, leaving everything else constant. The reason for this is that falling nominal wages or a nominal depreciation both lead to a real depreciation and a positive effect on income-autonomous demand and the net export rate. However, if redistribution towards profits takes place through a higher markup, a wage-led regime becomes more likely, because of a real appreciation and a negative effect on income-autonomous demand and the net-export rate. (See Hein (2014), chapter 7)

The above-mentioned properties of the post-Kaleckian open-economy model are well known. However, also in the open-economy form, the model shows a non-linearity in the distributional effects. Again, this is due to a distribution-sensitive multiplier, which is now also affecting the equilibrium paths of net exports in the open-economy model. This particular property has not been discussed elsewhere in the context of basic Kaleckian open-economy models.

The behaviour of the equilibrium utilization and equilibrium growth effects of income distribution is qualitatively the same as in the closed-economy version:

(26) $$\frac{\partial^2 u^*}{\partial h^2} = \frac{2\left(AD\frac{\partial SC}{\partial h} - \frac{\partial AD}{\partial h}SC\right)\frac{\partial SC}{\partial h}}{SC^3}$$

(27) $$\frac{\partial^2 g^*}{\partial h^2} = \beta \frac{\partial^2 u^*}{\partial h^2}$$

If capacity utilization is in a wage-led regime, the second order partial effects of redistribution from wages to profits on capacity utilization and the accumulation rate are unambiguously positive, while under a profit-led utilization regime the second order partial effects are negative. Therefore, under a wage-led regime of capacity utilization, the wage-ledness of utilization and a potential wage-ledness of accumulation would increase when the profit share falls, whereas a potential profit-ledness of accumulation would be reduced until the accumulation regime switches to wage-led. In contrast, under a profit-led regime, a higher profit share would have

positive but falling effects on utilization and accumulation. Overall, this means that the equilibrium paths of utilization and growth are behaving in the same way as was the case in the closed economy model. Formally, we have:

$$\frac{\partial^2 u^*}{\partial h^2}, \frac{\partial^2 g^*}{\partial h^2} > 0, if \frac{\partial u^*}{\partial h} < 0$$

$$\frac{\partial^2 u^*}{\partial h^2}, \frac{\partial^2 g^*}{\partial h^2} < 0, if \frac{\partial u^*}{\partial h} > 0$$

The behaviour of the net-export equilibrium values will depend only on the regime of capacity utilization as well:

(28) $\frac{\partial^2 b^*}{\partial h^2} = -\phi \frac{\partial^2 u^*}{\partial h^2}$

$$\frac{\partial^2 b^*}{\partial h^2} < 0, if \frac{\partial u^*}{\partial h} < 0$$

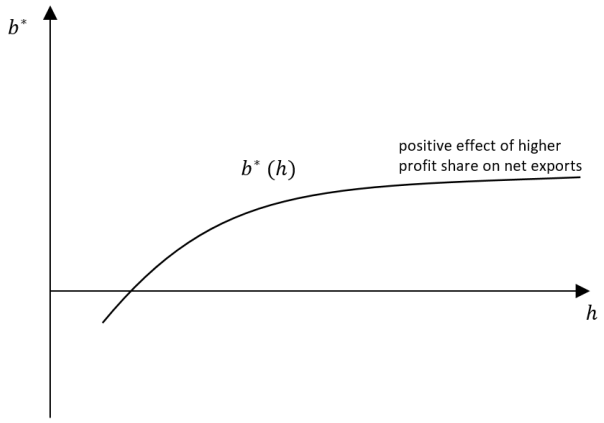
$$\frac{\partial^2 b^*}{\partial h^2} > 0, if \frac{\partial u^*}{\partial h} > 0$$

For net exports, the second order partial effects are negative under a regime of wage-led capacity utilization. What this means for the path-dependent behaviour of the net-export effects of income redistribution depends in part on the regime of capacity utilization and in part on the source of the distributional change, because the source determines whether redistribution towards profits leads to a real depreciation, $\frac{\partial e^r(h)}{\partial h} > 0$, or a real appreciation, $\frac{\partial e^r(h)}{\partial h} > 0$.

If utilization is in a wage-led regime, $\frac{\partial u^*}{\partial h} < 0$, and redistribution towards profits goes along with a real depreciation, $\frac{\partial e^r(h)}{\partial h} > 0$, because it takes place through lower nominal wages and or lower nominal exchange rate, a higher profit share will unambiguously increase the net-export rate: $\frac{\partial b^*}{\partial h} = \gamma \frac{\partial e^r(h)}{\partial h} - \phi \frac{\partial u^*}{\partial h} > 0$. At the same time, this positive impact on net exports will abate with continuous redistribution towards profits, as indicated by the negative sign of the second order partial derivative, $\frac{\partial^2 b^*}{\partial h^2} < 0$. The reason behind this is again the falling multiplier effect, which means that the negative domestic demand effect of redistribution is becoming lower with a rising

profit share and this reduces the domestic demand effect on net exports. The resulting shape of the equilibrium path of the net-exports rate for different values of the profit share is displayed in Figure 9.

Figure 9: Equilibrium path of the net-export rate in a post-Kaleckian model under a wage-led utilization regime when redistribution towards profits goes along with a real depreciation

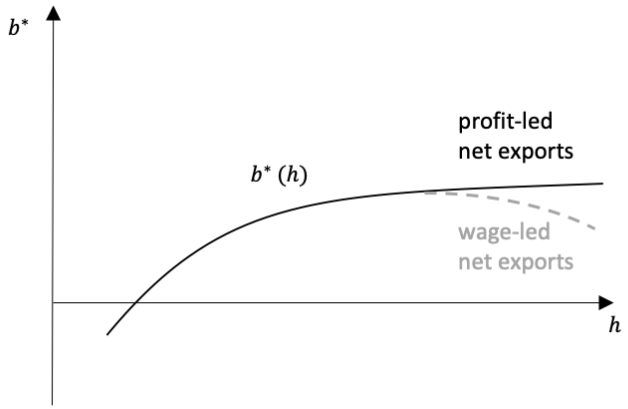


Source: Author's illustration

If instead, redistribution towards profits takes place through a higher markup and leads to a real appreciation, $\frac{\partial e^r(h)}{\partial h} < 0$, the non-linearity of the system under a wage-led utilization regime, $\frac{\partial u^*}{\partial h} < 0$, allows for a regime change for the net-export rate. This follows from the ambiguity in the first order partial effect of a distributional change. The first order effect of a rising profit share on net exports is positive, if the demand effect overcompensates for the appreciation effect: $\frac{\partial b^*}{\partial h} = \gamma \frac{\partial e^r(h)}{\partial h} - \phi \frac{\partial u^*}{\partial h} > 0$. However, since the falling multiplier leads to an abating demand effect and the appreciation effect remains constant, a continuous redistribution to profits in this case has the potential to flip the distributional effect on net exports from positive to negative. This scenario is illustrated with the dashed grey equilibrium path in Figure 10. The open economy channel of redistribution is therefore an important qualifier to the policy conclusions from the closed economy models. A wage-led policy strategy in a wage-led demand regime, even though it might be expansionary, and increasingly so, will lead to falling net exports (at least eventually, see Figure 10), if redistribution continues. This might actually be healthy for economies with

excessive net exports. However, for others it has the potential to harm the macroeconomic performance through a falling net international investment position (not modelled here). Yet, as long as the net international investment position does not lead to dampened demand or financial instability, the general policy conclusion from the closed economy models remains valid: a wage-led strategy can be economically sustainable and its effects will become increasingly expansionary. This will be especially be the case if a global wage-led strategy is pursued, as this will dampen the effect of a lower profit share on net exports as argued, for example, by Onaran and Galanis (2014).

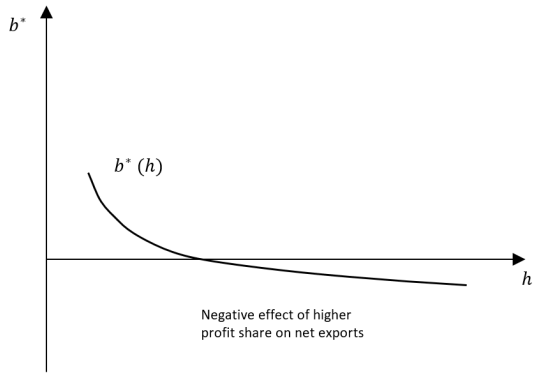
Figure 10: Equilibrium paths of net exports in a neo-Kaleckian model



Source: Author's illustration

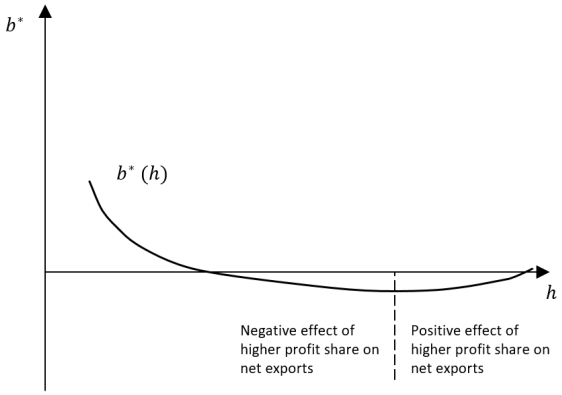
What about a scenario with profit-led capacity utilization, $\frac{\partial u^*}{\partial h} > 0$? In this case, if redistribution towards profits takes place through a higher markup and leads to a real appreciation, $\frac{\partial e^r(h)}{\partial h} < 0$, the overall effect on net exports is negative $\frac{\partial b^*}{\partial h} = \gamma \frac{\partial e^r(h)}{\partial h} - \phi \frac{\partial u^*}{\partial h} < 0$, but the negative effect will become smaller, $\frac{\partial^2 b^*}{\partial h^2} > 0$. This constellation is shown in Figure 11.

Figure 11: Equilibrium path of the net-export rate in a post-Kaleckian model under a profit-led utilization regime when redistribution towards profits goes along with a real appreciation



Source: Author's illustration

Figure 12: Equilibrium path of the net-export rate in a post-Kaleckian model under a profit-led utilization regime when redistribution towards profits goes along with a real depreciation



Source: Author's illustration

In contrast, if redistribution towards profits under a profit-led utilization regime, $\frac{\partial u^*}{\partial h} > 0$, comes along with a real depreciation, $\frac{\partial e^r(h)}{\partial h} > 0$, the effect on net exports is ambiguous, $\frac{\partial b^*}{\partial h} = \gamma \frac{\partial e^r(h)}{\partial h} - \phi \frac{\partial u^*}{\partial h}$. The falling multiplier will raise the relative importance of the real depreciation effect on the net-export rate, which might make a regime shift possible for the net export rate. This scenario is illustrated in Figure 12.

The theoretical discussion in this section has shown that distributional effects in Keynesian-Kaleckian models are not constant. Instead, they change with the state of income distribution itself. The underlying reason in every case discussed above is the distribution-sensitivity of the autonomous-demand multiplier. As has been mentioned earlier, a natural question that arises from the above theoretical discussion concerns the empirical relevance of the distribution-sensitive multiplier. In the next section, I will therefore provide a counterfactual illustration of the distribution-sensitive multiplier based on point estimates from the literature and time series data.

3 Illustrating the distribution-sensitive multiplier for selected EU countries

An important driver of the debate on wage-led vs. profit-led macroeconomic regimes can be found in the body of empirical studies which try to pin down the effects of income distribution for different time periods and countries (see Lavoie (2017) on the empirical origins of the debate, see Blecker (2016) and Stockhammer (2017) for recent reviews). The two most commonly used econometric models used in this empirical literature are structural-equation time-series models and vector-autoregressive (VAR) models. Similar to the theoretical literature, the endogeneity and path dependence of distributional effects arising from the non-linearity of the multiplier in basic models has not been discussed by most of the empirical literature on wage-led vs. profit-led regimes. There are some exceptions, for example, Stockhammer et al. (2008), who compare distributional effects at the sample mean and the sample end. However, they also do not present a systematic calculation of the effects nor of the distribution-sensitive multiplier over the sample period.

The lack of appreciation of the time-varying nature of the Keynesian-Kaleckian multiplier in the empirical research is, again, quite astonishing to some extent, because a certain degree of scepticism about the results of econometric studies which assume structurally stable conditions should be a natural concern in Keynesians thinking (Keynes, 1939, pp. 566–67), and even more so, if the theoretical models already do exhibit non-linearity, and therefore carry the potential for path dependency in an empirical context, as discussed in section 2. One could argue that in the empirical literature on the debate, the general issue of structural stability could be controlled for with structural break tests or rolling regressions, which have been applied by several authors.

However, such tests, while important for testing the stability of estimated parameters, cannot tell us much in the context of the above theoretical discussion on the distribution-sensitive multiplier because structural break tests are, if at all, only incompletely taking account of the endogeneity of distributional effects.[16] While they do test for potential regime shifts, they can hardly isolate the causes for a regime change, nor can they isolate or quantify the effect of income distribution on the multiplier. Indeed, the argument about the distribution-sensitive multiplier above is not one about parameter changes. Instead, in its empirical application it is about the (potentially continuous) change of an explanatory variable of the multiplier over the sample period. This means that even if the estimated parameters are structurally stable, a change of income distribution would still change the distribution-ledness of the system, due to the effect on the distribution-sensitive multiplier.

The strands of the literature that are based on vector autoregressive models do not allow for a calculation of the multiplier because they are not estimating the specific parameters for the multiplier, (and they are not distinguishing between income-autonomous demand and the multiplier effects). These type of models therefore cannot be used to say much about the question of how the multiplier has changed with income-distribution.[17] Instead, in order to get some tentative evidence whether the theoretical discussion in section 2 has any empirical relevance, it is necessary to calculate the distribution-induced change of the multiplier over a

[16] The fact that it is not possible to adequately take into account the non-linearity of the multiplier can be a potential problem for structural break tests, or similar methods, if they are aimed at inferring whether a change in some other variables has changed an economies wage- or profit-ledness over time, while not controlling for the induced change of the multiplier due to changing functional income distribution. This is for example done in Carvalho and Rezai (2016), who are using a threshold VAR to investigate if higher personal income inequality has changed the distribution-ledness of the US economy over time.

[17] Even more severely, the use of (standard) VARs in this literature is about directly estimating the equilibrium effects of changes in income distribution, however, if the methodology is not able to take into account the time-varying nature of these effects, it is likely to deliver biased estimates. Of course, it could be that this bias is not too severe, if the true endogeneity effects are rather small. The strength of this potential bias depends on two things: the strength of redistribution and the differential in propensities to consume. Therefore, the VAR methodology would require a country- and time-specific assessment of the potential bias.

period of time in which income distribution changed, while keeping parameters constant. Obviously, this can be done by estimating the parameters of the distribution-sensitive multiplier and calculating its value for the actual value of the profit share over time. In fact, since the structural equation time series models used in the literature are more closely related to the theoretical models, they do estimate the parameters for the multiplier. It is therefore possible to do such a calculation of distribution-induced change from structural single equation estimates and historical data on the profit share. Such a systematic calculation of the distribution-sensitive multiplier has not been done in the literature. Instead, if the multiplier is calculated, usually the calculation is done at sample averages of the profit share. As argued above, such a procedure ignores an important feature of the underlying theoretical model.

In this section, I will start filling this gap and calculate series for the distribution-sensitive multiplier for selected EU countries in the period from 1960 to 2017. This will enable a tentative assessment of the quantitative importance of the phenomenon described in the theoretical section. For this purpose, I use data from the AMECO database (last access 20 September 2018) and single equation estimates of the income elasticities of consumption, investment and imports from the relatively recent and methodologically representative study by Onaran and Obst (2016).

However, before proceeding with the calculations, it is necessary to rewrite the multiplier of the theoretical post-Kaleckian open-economy model of section 2 such that it is compatible with the structural single-equation models that are usually estimated in the literature. The models discussed in section 2 above are written in rates, which is in line with most of the theoretical post-Keynesian literature on distribution and growth. However, estimations of Kaleckian single-equation models are usually based on an open-economy version of the Bhaduri-Marglin model in levels, not in rates. The multiplier in Kaleckian models in rates is given by $\mu = \frac{1}{SC}$, where SC here stands for the term defining the stability condition of the respective model in rates. Fortunately, the multiplier of the post-Kaleckian open-economy model from above in rates can easily be converted into a multiplier of a model in levels, denoted with m. This can be achieved by dividing the levels-multiplier by the capital-potential output ratio, v: $m = \frac{\mu}{v}$. The income-autonomous

demand multiplier in a basic Keynesian-Kaleckian model of a private open economy in levels then is:

(29) $m = \frac{1}{1-\left(\frac{\partial C}{\partial Y}+\frac{\partial I}{\partial Y}-\frac{\partial M}{\partial Y}\right)}$

where C, I, M and Y are consumption, investment, imports and income, respectively, all in levels.

In Onaran and Obst (2016), the partial effect of income on consumption was estimated with a consumption function in analogy to the theoretical saving function (1) from section 2. Assuming that there are different propensities to consume for different income categories implies that the partial effect of income on consumption is given by the average propensity to consume (c_Y). The average propensity to consume is then given by a weighted average of the different propensities to consume (c_R for profits and c_W for wages). The weights to be used to calculate the average MPC are the respective income shares (π/Y and W/Y) as can be easily checked with the following consumption function:

$$C = c_0 + c_\pi \pi + c_W W = c_0 + c_\pi \frac{\pi}{Y} Y + c_W \frac{(Y-\pi)}{Y} Y = c_0 + \left(c_\pi \frac{\pi}{Y} + c_W \frac{(Y-\pi)}{Y} \right) Y$$

$$= c_0 + c_Y Y$$

where the partial effect of consumption is the average MPC:

$$\frac{\partial C}{\partial Y} = c_Y = \left(c_\pi \frac{\pi}{Y} + c_W \frac{(Y-\pi)}{Y} \right)$$

Obviously, any change of income distribution between total profits and total wages will lead to a change of the income-autonomous demand multiplier, everything else constant.

To calculate the multiplier from estimated coefficients of Onaran and Obst (2016) the long-run income elasticities, e, for each dependent variable (x) of each country (i) need to be calculated and transformed into marginal effects.

For error correction models with a significant long-run relationship, this can be done by dividing the statistically significant coefficient of the log-level of the lagged explanatory variable ($b_{x,-1}$) by the coefficient of the log-level of the dependent variable (adj_{-1}) and multiplied by -1:

$$e_{xYi} = \frac{b_{x,-1}}{-adj_{-1}}$$

For models without a significant long-run relationship, the sum of the (statistically significant) coefficients of the independent variable (lagged and contemporaneous) needs to be divided by 1 minus the coefficient of the lagged endogenous variable:

$$e_{xYi} = \frac{\left(\beta_x + \beta_{x,-1} + \ldots + \beta_{x,-l}\right)}{(1 - \gamma_{-1})}$$

For marginal effect on consumption, the calculation of the average income elasticity requires one more step. The estimation of the consumption function in Onaran and Obst (2016) was done using aggregate wage and profit income as separate explanatory variables. Corresponding to the consumption function from above. Therefore, the average income elasticity of consumption is calculated as a weighted average of the factor income elasticities, with the weights being the respective factor share, i.e.:

$$e_{CYi} = e_{WYi}(1 - h) + e_{RYi}h$$

In the empirical literature, the total income elasticity of consumption is usually calculated at the sample average of these weights (Onaran and Galanis, 2014; Onaran and Obst, 2016)[18]. As discussed above, this is not in line with the underlying theoretical model assumed in these studies. Instead, the income elasticity of consumption and the multiplier effect should be analysed for the specific observation of income distribution in the respective time period. Such a treatment allows looking more carefully at the distributional dependence of the multiplier and it also has implications for the overall effects of a change in income distribution.

To derive the multiplier, the calculated empirical elasticities have to be transformed into the respective partial effects. This is done by multiplying each elasticity with the respective demand

[18] Again, an exception is Stockhammer et al. (2008), who provide calculations of the consumption differential in the Euro area at the sample mean and sample end, but they do not calculate the evolution of the multiplier over the full sample period.

component's share in GDP. The partial effects on consumption, investment and imports can then be calculated as follows:

$$\frac{\partial C}{\partial Y_i} = e_{CYi}\left(\frac{C}{Y}\right)_i$$

$$\frac{\partial I}{\partial Y_i} = e_{IYi}\left(\frac{I}{Y}\right)_i$$

$$\frac{\partial M}{\partial Y_i} = e_{MYi}\left(\frac{M}{Y}\right)_i$$

Again, in the empirical literature this transformation into partial effects is usually done at the respective sample mean of the component shares. Similar to the calculation of the average MPC at sample mean of factor shares this procedure omits the varying nature of the partial effects due to changes in component shares. However, the time-varying nature of the partial effects due to changes in income distribution or component shares is an important feature because it can also lead to a time-varying multiplier. Yet, this is issue has to be distinguished from the distribution-induced change.[19] Therefore, in order to concentrate on the distribution-sensitivity of the multiplier I follow the literature in the transformation of the elasticities into partial effects via average GDP-component shares. Calculating the distribution-induced change of the multiplier in this way means that it delivers a partial account of the change in the multiplier. Other partial effects arise from potentially changing parameters and GDP-component shares.

Considering this qualifier and assuming that no structural changes other than in functional income distribution occur, Figure 13 shows the trend development of the multiplier that is due to changes in functional income distribution for the countries analysed in Onaran and Obst (2016).[20] Given

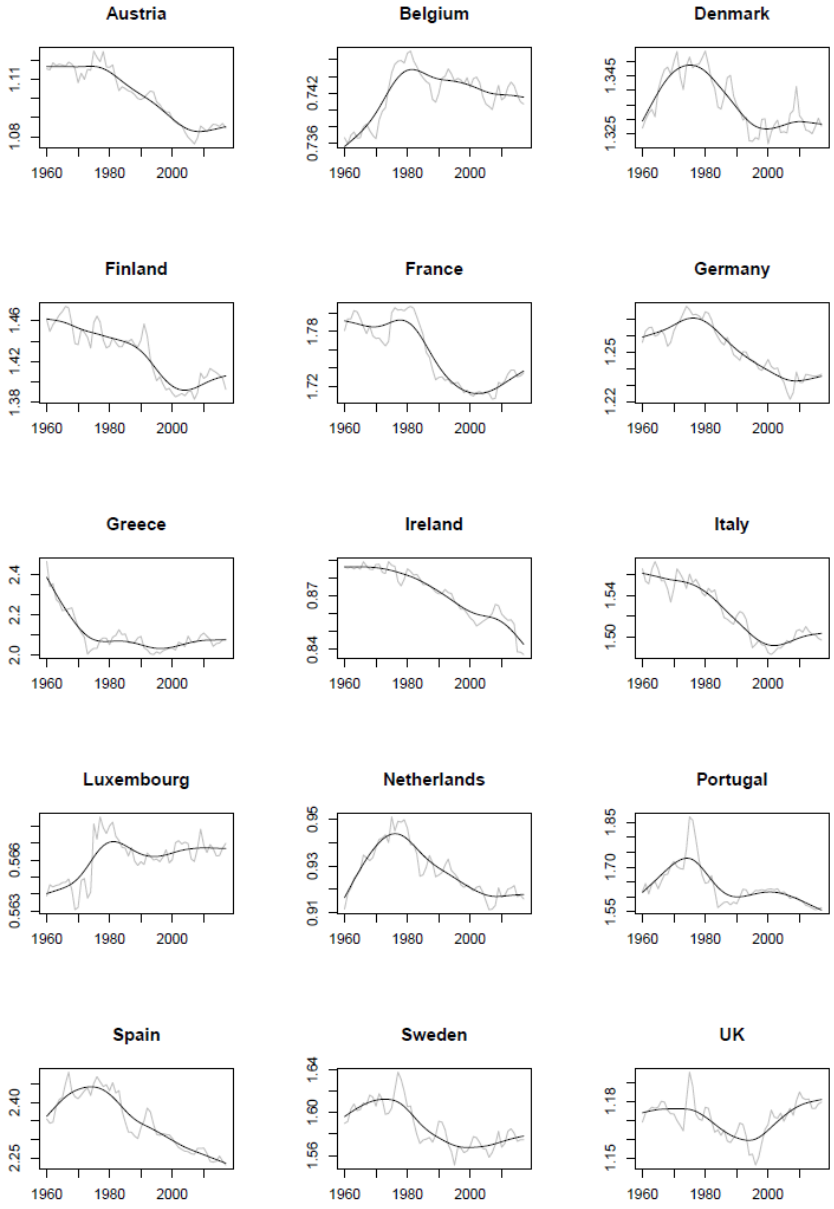
[19] As mentioned above, Stockhammer et al. (2008) touch upon both issues in the calculation of their empirical marginal effects by comparing sample mean and end of sample effects. However, rather than sample mean and sample end values, minimum and maximum values should be compared to understand the induced change (see below).

[20] The trend lines where extracted using a Hodrick-Prescott filter in order to concentrate on long-run developments. It illustrates the change of the multiplier given the long-run change of income distribution which is due to structural features related to the determinants of the wage share.

the discussion in section 2, it should not come as a surprise that the movement of the distribution-sensitive multiplier parallels the development of the wage share (not shown). For most countries, the time-varying multiplier as calculated above shows a downward trend beginning about 1980 and lasting at least until the great recession. This is the result of a pronounced decline of the wage share in most countries in the same period. Only Greece, Luxembourg and the UK break this pattern. In Greece, the wage share and with it the multiplier declined strongly in the 1960s but stayed roughly constant after 1980. In Luxembourg, the wage share and the multiplier increased before 1980 and stayed relatively constant afterwards. In the UK, the negative trend of the wage-share and the multiplier in the 1980s reversed in the 1990s.

The grey lines in figure 13 indicate the value of the multiplier at a specific year, however, short-run fluctuations of the wage share are partly driven by the business cycle.

Figure 13: The distribution-sensitive multiplier for selected EU countries, 1960 to 2017

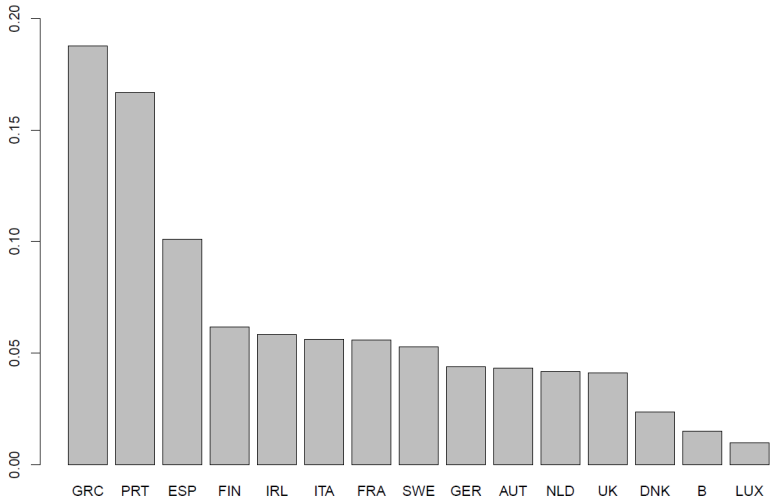


Note: Solid lines show trends of the distribution-sensitive multiplier assuming no other structural change than a changing wage share. Transparent lines show series with trend and business cycle fluctuations. Source: Author's calculations based on AMECO data and point estimates by Onaran and Obst (2016).

The falling multiplier means that the distribution-ledness of aggregate demand in the specific countries in Figure 13 has changed. Onaran and Obst (2016) find Finland, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the UK to be wage-led in isolation. Together with the trend lines in figure 13, this implies that the long-term fall of the wage share since the 1960s has put partial downward pressure on the wage-ledness of the aggregate demand regime in Finland, France, Germany, Greece, Italy, Portugal, Spain and Sweden. In Luxembourg, the rise of the wage share would have made aggregate demand more wage-led, ceteris paribus. In the UK, while there where fluctuations, the wage-ledness would have reversed to roughly the 1960s levels, again assuming everything else constant. In the Netherlands, the aggregate demand regime would have become more wage-led during the 1960s/70s, but this change would have completely reversed in the decades after 1980. The profit-led countries in the sample according to the analysis of Onaran and Obst (2016) are Austria, Belgium, Denmark and Ireland. The profit-ledness of Belgium and Denmark would have increased during the 1960s and 70s, but would have fallen again after the 1980s, ceteris paribus. Taken in isolation, the profit-ledness of Austria and Ireland would have fallen in the decades after 1980. However, as Austria and Ireland turn wage-led in the analysis of Onaran and Obst (2016) if a simultaneous 1 percent increase of the wage share happens across the sample countries, in this case, the wage-ledness in Austria and Ireland would have fallen due to the development of the wage share.

Figure 14 shows the sample range of the distribution-sensitive multiplier for each country, calculated as the distribution-induced percentage change of the multiplier from each country's maximum to minimum in the sample assuming again that GDP-component shares and parameters do not change over time. It illustrates, that the partial effects of distributional changes on the multiplier have been relatively small and negative for most countries, although there are some exceptions. For most countries in the sample, the distribution-induced change of the multiplier from its maximum to its minimum is about 4 to 6 percent. The exceptions are Greece, Portugal and Spain on the one hand, which experienced a strong distribution-induced decline of the multiplier. This drop was well above 15 percent for Greece and Portugal and more than 10 percent for Spain. For Denmark, Belgium and Luxembourg on the other hand, the distribution-induced partial change of the multiplier was less than 3 percent.

Figure 14: Distribution induced percentage change of the multiplier from maximum to minimum in the sample (1960 - 2017)



Note: The direction of change over time is given by the time order of minimum and maximum values of the multiplier in Figure 13. This implies a decline of the multiplier over time from max to min for: GRC, PRT, ESP, FIN, IRL, ITA, FRA, SWE, GER, AUT, DNK, and an increase over time from min to max for: NLD, UK, B, LUX. Source: Author's illustration.

The counterfactual illustrations in figures 13 and 14 show that the theoretical discussion on the distribution-sensitive multiplier in section 2 is not a minor modelling detail that can safely be ignored in an analysis of the macroeconomic effects of income distribution. Instead, it seems to be relevant from an empirical perspective. While most studies have only estimated the effect of distribution on excess demand, the ones that go beyond excess demand effects by calculating the multiplier and equilibrium effects of distribution are – if at all – only presenting a very limited treatment of their time-evolving and distribution-dependent nature (e.g. Stockhammer et al. 2008). In order to come up with an even richer and more precise analyses of macroeconomic effects of income distribution and their evolving nature, future studies of demand regimes should therefore also present the time-varying features of the distribution-ledness they might find for specific countries.

Furthermore, a couple of policy-relevant conclusions can be drawn from the above analysis. The clearly emerging downward trend for most countries in figure 13 underlines that the global decline of the labour income share has put partial downward pressure on the autonomous-demand multiplier in many countries. This also means that demand management policies are less effective than they could have been, if the wage share would have remained at the relatively high levels of the 1960s/70s. In terms of modern policy proposals of a wage-led strategy to overcome secular stagnation in many countries (Lavoie and Stockhammer 2013; Onaran and Galanis, 2014; Onaran and Obst, 2016), the widespread downward pressure on the multiplier due to falling wage share means that wage-led policies will only reach their full potential if they are consistently pursued for a rather long time. This provides another reason, why wage-led policies can only be part of a broader strategy including mainly expansionary fiscal and monetary policies, as proposed for example by Hein and Truger (2012/13). The trends of a partially negative effect on the multiplier in many countries as indicated in figure 13 can only reverse, if there is continuous redistribution towards wages. A mere stabilization of the labour income share would fail to make use of the room for increasingly expansionary wage-led scenarios.

4 Conclusion

The aim of this paper was to stress the importance of the connection between income distribution and the multiplier in Keynesian-Kaleckian macroeconomic models. This important feature of neo- and post-Kaleckian models is commonly ignored in the related literature on distribution and growth. Two main contributions of the paper underline the relevance of this phenomenon from a theoretical, an empirical and a policy perspective. First, even the most basic linear Keynesian-Kaleckian models exhibit a form of non-linearity when it comes to the effect of changing income distribution on aggregate demand and growth. This directly results from the distribution-sensitive multiplier. The lack of recognition of this feature is quite surprising given the structural and rather long-term arguments and viewpoints on changing income distribution that build the underlying motivation for much of the literature. An important related theoretical consequence of the distribution-sensitive multiplier in Keynesian-Kaleckian models is that – under certain circumstances – a rising wage share can make a profit-led growth regime switch to a wage-led

growth regime. From a policy perspective, this means, that in an intermediate macroeconomic regime, in which capacity utilization is wage-led but accumulation is profit-led, a wage-led economic policy orientation can be consistent, given that it can be pursued for a long enough time. In this regard, one of the most important conclusions from this paper is that the potential fear of policymakers that an increasing wage share in a wage-led regime will at some point overthrow investment demand is not very well founded. At least not, when we look at standard Keynesian-Kaleckian models and their empirical applications. Potential extensions of these models could of course include endogeneity mechanisms, which can provide a partially dampening channel of a continuously increasing wage share, for example through a negative effect on the accelerator effect in the investment function or on firms animal spirits. However, in a wage-led regime, such effects would need to overcompensate the effect of the rising multiplier in order to become an obstacle for a wage-led policy strategy. The second point I have made is that the theoretical clarification on the distribution-sensitive multiplier is also relevant from an empirical perspective. Under the counterfactual assumption of no other structural change except for income distribution, I have presented illustrative multiplier simulations which indicate that the trend of a falling profit share had a partially negative effect on the multiplier in many EU countries. This also implies that the wage-ledness of aggregate demand in many of these countries was partially reduced due to changes in income distribution. The counterfactual illustration presented in this paper does not necessarily imply that the autonomous-demand multiplier or the fiscal multiplier in the respective countries has actually decreased. Other influences could have counteracted, strengthened or overcompensated the effects of the wage share. Instead, the point of the above analysis was the fact that functional income distribution has a partial effect on the multiplier and that redistribution towards wages, will, ceteris paribus, make the multiplier larger. A rising wage share can therefore help to make aggregate demand management, monetary, fiscal or wage-led policies more effective. This does not imply that it will suffice on its own to raise the wage share in order to raise the multiplier, but given the abovementioned conditions, it will certainly help.

References

Bhaduri, A. and Marglin, S. 1990. Unemployment and the real wage: The economic basis for contesting political ideologies, *Cambridge Journal of Economics*, vol. 14, no. 4, 375–93.

Blecker, R. A. 1989. International competition, income distribution and economic growth, *Cambridge Journal of Economics*, vol. 13, no. 3, 395–412.

Blecker, R. A. 2016. Wage-led versus profit-led demand regimes: The long and the short of it, *Review of Keynesian Economics*, vol. 4, no. 4, 373–90.

Carvalho, L. and Rezai, A. 2016. Personal income inequality and aggregate demand, *Cambridge Journal of Economics*, vol. 40, no. 2, 491–505.

Dutt, A. K. 1984. Stagnation, income distribution and monopoly power, *Cambridge Journal of Economics*, vol. 8, no. 1, 25–40.

Hein, E. 2014. *Distribution and growth after keynes: A post-keynesian guide*, Edward Elgar Publishing.

Hein, E. 2017. Post-keynesian macroeconomics since the mid 1990s: Main developments, *European Journal of Economics and Economic Policies*, vol. 14, no. 2, 131–72.

Hein, E. and Prante, F. J. forthcoming. Functional distribution and wage inequality in recent Kaleckian growth models, in: Bougrine, H., Rochon, L.-P. (eds.), *Economic Growth and Macroeconomic Stabilization Policies in Post-Keynesian Economics, Essays in Honour of Marc Lavoie and Mario Seccareccia*, Book Two, Cheltenham: Edward Elgar.

Hein, E. and Stockhammer, E. 2011. A post- keynesian macroeconomic model of inflation, distribution and employment, in Hein, E. and Stockhammer, E. (eds.), *A modern guide to keynesian macroeconomics and economic policies*, Cheltenham, UK; Northampton, MA, USA, Edward Elgar Publishing.

Hein, E. and Truger, A. 2012/13. Finance- dominated capitalism in crisis – the case for a Global Keynesian New Deal, *Journal of Post Keynesian Economics*, vol. 35, 183–210.

Hein, E. and Vogel, L. 2008. Distribution and growth reconsidered: Empirical results for six oecd countries, *Cambridge Journal of Economics*, vol. 32, no. 3, 479–511.

Keynes, J. M. 1936. *The general theory of employment, interest, and money*, London: Macmillan.

Keynes, J. M. 1939. Professor Tinbergen's method, *The Economic Journal*, vol. 49, no. 195, 558–77.

Köhler, K. 2018. The limits to profit-wage redistribution: Endogenous regime shifts in Kaleckian models of growth and distribution: IPE Working Paper, Institute for International Political Economy (IPE) 112/2018.

Kurz, H. 1990. 'Technical change, growth and distribution: A steady-state approach to 'unsteady' growth, in Kurz, H. (ed.), *Capital, distribution and effective demand*, Cambridge, UK, Polity Press.

Lavoie, M. 2009. Cadrisme within a post-keynesian model of growth and distribution, *Review of Political Economy*, vol. 21, no. 3, 369–91.

Lavoie, M. and Stockhammer, E. 2013. *Wage-led growth: An equitable strategy for economic recovery*, Basingstoke, UK: Palgrave Macmillan.

Lavoie, M. 2017. The origins and evolution of the debate on wage-led and profit-led regimes, *European Journal of Economics and Economic Policies*, vol. 14, no. 2, 200–221.

Nikiforos, M. 2016. Distribution-led growth in the long run, *Review of Keynesian Economics*, vol. 4, no. 4, 391–408.

Onaran, Ö. and Galanis, G. 2014. Income distribution and growth: A global model, *Environment and Planning A: Economy and Space*, vol. 46, no. 10, 2489–2513.

Onaran, O. and Obst, T. 2016. Wage-led growth in the eu15 member-states: The effects of income distribution on growth, investment, trade balance and inflation, *Cambridge Journal of Economics*, vol. 40, no. 6, 1517–51.

Palley, T. I. 2015. The middle class in macroeconomics and growth theory: A three-class neo-kaleckian–Goodwin model, *Cambridge Journal of Economics*, vol. 39, no. 1, 221–43.

Palley, T. I. 2017. Wage- vs. profit-led growth: The role of the distribution of wages in determining regime character, *Cambridge Journal of Economics*, vol. 41, no. 1, 49–61.

Rowthorn, R. 1981. Demand, real wages and economic growth, *Thames Papers in Political Economy*, vol. Autumn, 1–39.

Stockhammer, E. 2017. Wage-led versus profit-led demand: What have we learned? A kaleckian–Minskyan view, *Review of Keynesian Economics*, vol. 5, no. 1, 25–42.

Stockhammer, E., Onaran, Ö., and Ederer, S. 2008. Functional income distribution and aggregate demand in the Euro area, *Cambridge Journal of Economics*, vol. 33, no. 1, 139–59.

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