

Finance-dominated capitalism, re-distribution, household debt and financial fragility in a Kaleckian distribution and growth model

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Abstract

In a Kaleckian distribution and growth model with workers' debt we examine the short- and long-run effects of three stylized facts of 'finance-dominated capitalism': a fall in animal spirits of the firm sector with respect to real investment in capital stock, re-distribution of income at the expense of the wage share, and increasing lending of rentiers to workers for consumption purposes. In particular, we specify the conditions for long-run stability of the workers' debt-capital ratio. We thus identify the threshold for this ratio to turn unstable causing increasing financial fragility and finally financial crisis due to systemic stock-flow or stock-stock dynamics.

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Key words: Finance-dominated capitalism, distribution, household debt, financial fragility, growth, Kaleckian model

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1. Introduction

The severity of the Great Recession, which started with the collapse of the subprime mortgage market in the US in summer 2007, which gained momentum with the breakdown of Lehman Brothers in September 2008, which then triggered a decline in world output in 2008/09 not seen for generations, and which reached another climax with the euro crisis in 2010, has its major causes in the medium- to long-run developments in the world economy since the early 1980s. Three of these causes for the crisis have been identified in the related literature: inefficient regulation of financial markets, increasing inequality in the distribution of income and rising imbalances at the global (and at the Euro area) level.¹ These developments have been dominated by the policies aimed at deregulation of labour markets, reduction of government intervention into the market economy and of government demand management, re-distribution of income from (lower) wages to profits and top management salaries, and deregulation and liberalisation of national and international financial markets. This policy stance, which has been termed ‘neo-liberalism’ by some authors, is interrelated with the emergence of ‘financialisation’ or ‘finance-dominated capitalism’, which also started in the US in the early 1980s,² but is not necessarily identical with it.³

From a Post-Keynesian macroeconomic perspective, ‘finance-dominated capitalism’ can be seen as affecting long-run economic development through the following channels.⁴ First, with regard to distribution, ‘finance dominated capitalism’ has been conducive to redistribution at the expense of the labour income share and to increasing inequality of wages and top-management salaries. Major reasons for this have been decreasing bargaining power of trade unions, associated with changing management strategies (‘downsize and distribute’ instead of ‘retain and invest’ (Lazonick/O’Sullivan 2000)), sectoral shifts in the structure of the economy away from the public and non-financial corporate sectors with strong trade unions towards the financial sector with weaker trade unions, deregulation of labour markets, the threat effect of increasing internationalisation of trade and finance, and so on, on the one

¹ On global imbalances and unequal distribution as causes for the present crisis, on top of the widely accepted inefficient regulation of the financial sector, see, with different emphasis, Bibow (2008), Hein/Truger (2010, 2011), Horn et al. (2009), Fitoussi/Stiglitz (2009), Sapir (2009), UNCTAD (2009), and Wade (2009). For a review of the changes in world wide financial markets and related imbalances which fed the financial crisis see Guttman (2009).

² Epstein (2005: 3) has presented a widely accepted definition, arguing that ‘(...) financialization means the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies’.

³ See Stockhammer (2010a, 2010b) for a similar distinction and Palma (2009) for a more extensive discussion of the relationship between neo-liberalism and the present crisis.

⁴ See Hein (2010a, 2010b) and Hein/van Treeck (2010a, 2010b) for overviews and related models.

hand, and increasing income claims of shareholders/rentiers and top-management, on the other hand.⁵

Second, regarding investment, ‘finance-dominated capitalism’ has been characterised by increasing shareholder power vis-à-vis management and workers, an increasing rate of return on equity and bonds held by rentiers, and an alignment of management with shareholder interests through short-run performance related pay schemes, bonuses, stock option programmes, and so on. On the one hand, this has imposed short-termism on management and has caused decreasing managements’ animal spirits with respect to real investment in capital stock and long-run growth of the firm. On the other hand, it has drained internal means of finance for real investment purposes from the corporations, through increasing dividend payments and share buybacks in order to boost stock prices and thus shareholder value. These ‘preference’ and ‘internal means of finance’ channels have each had partially negative effects on firms real investment in capital stock and hence on long-run growth of the economy.⁶

Third, regarding consumption, ‘finance-dominated capitalism’ has generated increasing potential for wealth-based and debt-financed consumption. Stock market and housing price booms have each increased notional wealth against which households were willing to borrow. Changing financial norms, new financial instruments (credit card debt, mortgage debt takeouts), deterioration of creditworthiness standards, triggered by securitisation of mortgage debt and ‘originate and distribute’ strategies of commercial banks, made increasing credit available to low income, low wealth households, in particular. This allowed consumption norms to rise faster than medium income, driven by habit persistence, social visibility of consumption (‘keeping up with the Joneses’), and a kind of ‘consumer arms race’ (Cynamon/Fazzari 2008).⁷

As we have analysed in detail in Hein (2011a, 2011b), in some countries, in particular in the US, the UK, Spain, Ireland and Greece, the emergence of a debt-led consumption boom was able to overcompensate the depressing effects of redistribution at the expense of labour and weak real investment, associated with ‘financialisation’, on aggregate demand and hence on growth. Other, export-led mercantilist economies, in particular Germany, Japan, Austria, Belgium, the Netherlands, Sweden (and the catching up China), managed to free-ride on the demand generated by the debt-led consumption boom economies and derived their growth

⁵ See Hein (2011a, 2011b) for a discussion of the determinants and the effects of changes in income distribution in the period of finance-dominated capitalism since the early 1980s.

⁶ See the empirical studies by Stockhammer (2004), van Treeck (2008) and Orhangazi (2008).

⁷ See Barba/Pivetti (2009), Cynamon/Fazzari (2008), and van Treeck (2009) for extensive discussions of the effects of finance-dominated capitalism on households’ (debt-financed) consumption, with a focus on the US.

mainly from export-surpluses in the face of weak domestic demand caused by redistribution at the expense of labour and weak real investment dynamics. This constellation, generating highly unbalanced current accounts at global and regional (European) levels, was therefore founded on increasing household debt-income ratios in the debt-led consumption boom economies, and it collapsed in the course of the Great Recession.

But does this empirical observation mean that economic expansion based on increasing household debt is necessarily bound to collapse for systemic reasons related to stock-flow or stock-stock dynamics? If not, what is the role of the other channels of influence of ‘financialisation’ on household indebtedness and growth, that is the redistribution at the expense of labour and weakened animal spirits of the firm sector with respect to real investment? What are the conditions under which household debt-income or debt-capital ratios become unstable, triggering increasing financial fragility and finally financial crisis? In the present paper we attempt to address these issues in a simple Kaleckian distribution and growth model, in which we allow for debt-financed consumption of workers households, along with redistribution at the expense of labour income and weakened animal spirits of the firm sector with respect to real investment, each caused by ‘finance-dominated capitalism’ and ‘neo-liberalism’.

The majority of models in the Kaleckian and Mynskian tradition has focussed on the role of corporate debt for the business cycle and for long-run growth, or on the role of outside finance including equity held by rentiers, when the effects of ‘finance-dominated capitalism’ were discussed.⁸ However, there have also been proposed three types of modelling approaches focussing on household debt.

The contradictive macroeconomic effects of household indebtedness for consumption purposes have already been included by Palley (1994) into a multiplier-accelerator business cycle model: An increase in household debt initially stimulates aggregate demand transferring purchasing power from lending high income households with a low marginal propensity to consume to borrowing low income households with a high propensity to consume. But interest payments on debt subsequently become a burden on aggregate demand, because purchasing power is re-distributed into the opposite direction. This model is then extended to include Minskyan ‘tranquility’ effects and to examine interactions of financial fragility and tranquillity. However, this business cycle model in level variables does neither treat the development of stock-flow (debt-income) or stock-stock (debt-capital) ratios, nor are changes in income distribution or in the propensities to invest in real capital stock examined.

⁸ See, for example, Charles (2008a, 2008b, 2008c), Hein (2006, 2007, 2010a, 2010b), Lavoie (1995), Lima/Meirelles (2007) and Meirelles/Lima (2006), among others.

Bhaduri/Laski/Riese (2006) have explicitly focused on the wealth-effect on consumption in their model, implying that increases in financial wealth stimulate households' willingness to consume. However, stock market wealth (and also housing wealth) is purely 'virtual wealth' and increasing consumption is hence associated with increasing indebtedness of private households. Therefore, a wealth-based credit boom may be maintained over a considerable period of time. Finally, however, the expansive effects of consumer borrowing may be overwhelmed in the long run by rising interest obligations, which reduce households' creditworthiness and eventually require higher saving. A debt-led consumption boom will then turn into a debt-burdened recession. Although the authors consider the debt-income ratio of households as a major determinant of creditworthiness and hence access to new borrowing, the dynamics of this ratio are not traced in the medium of long runs of their model. Potential 'paradoxes of debt' are not at issue, and distributional and investment effects of 'finance-dominated capitalism' on household indebtedness and growth are also missing in the medium- to long-run dynamics. The same is true for Bhaduri's (2010, 2011) extensions of this approach, which attempt to show how a debt-financed consumption boom supported by rising asset prices ultimately leads to credit crunch and debt deflation, and how the tendency towards Ponzi finance increases the fragility of the financial sector.

Dutt (2005, 2006) has analysed the effects of easier access to consumer credit associated with deregulation of the financial sector within a Steindlian model of growth and income distribution, making use of a similar mechanism as Palley (1994). Credit-based consumption of workers, facilitated by the deregulation of the financial system allowing home equity lending, adjustable consumer loans and securitisation, stimulates effective demand and growth in the short run. However, in the long run, contractive effects arise because interest payments mean re-distribution of income from workers to capitalists who have a lower propensity to consume. These effects may overwhelm the expansionary effects so that higher workers' debt has long-run contractionary effects on capital accumulation and growth under certain conditions. However, with a low rate of interest, high levels of autonomous investment and a low profit share, the long-run effects of workers' debt may remain expansionary, according to Dutt.

Our approach is close to Dutt's, albeit with a somewhat different modelling strategy. We focus more extensively on the issue of long-run stability of workers' debt-capital ratios, and attempt to treat the major effects of 'finance-dominated capitalism' outlined above in a direct and explicit way. In particular, by examining the conditions for long-run stability of the workers' debt-capital ratio in our model, we hope to identify the potential causes for systemic

instability, and thus increasing financial fragility and financial crisis, caused by stock-flow or stock-stock dynamics. The remainder of the paper is structured as follows: In Section 2 we outline the basic Kaleckian distribution and growth model with workers' debt. Section 3 discusses the properties of the short-run equilibrium, taking the workers' debt-capital ratio as an exogenously given constant. In Section 4 the long-run equilibrium values for the workers' debt-capital ratio are endogenously determined, together with the associated long-run equilibrium rates of capacity utilisation and capital accumulation, and the stability properties of this long-run equilibrium are discussed. Section 5 derives the effects of changes in exogenous parameters on the long-run equilibrium. Section 6 discusses the short- and long-run effects of 'finance-dominated capitalism': a fall in animal spirits of the firm sector with respect to real investment, an increase in the profit share, and a rise in lending to workers in context. It also elaborates on potential feedback effects of increasing workers' debt, and hence decreasing creditworthiness and limited access to credit, on aggregate demand, capital accumulation and growth. Section 7 summarises and concludes.

2. The basic model

In our basic closed economy one-good model without government activity, we assume the price (p) in the incompletely competitive goods market to be set by firms, marking up unit direct labour costs. There is no overhead labour, the capital stock (K) does not depreciate, and the labour-output ratio (L/Y) as well as the capital-potential output ratio ($v = K/Y^p$) is fixed, i.e. there is no technical progress. Unit direct labour costs are thus constant up to full capacity output. Productive capacity (Y^p) given by the capital stock is usually not fully utilised and the rate of capacity utilisation ($u = Y/Y^p$), given by the proportion of output in potential output determined by the capital stock, is treated as an endogenous variable. By means of firms setting the mark-up (m) in the goods market, functional income distribution between capital and labour is determined. The share of profits in national income ($h = \Pi/Y$) is therefore a function of those variables determining the mark-up, in particular the degree of competition in the goods market and the bargaining powers of capital and labour unions in the labour market:

$$(1) \quad h = h(m).$$

We will treat the profit share as an exogenous variable in our model, which of course may change over time due to the changes in the determinants of the mark-up associated with

‘finance-dominated capitalism’ (Hein 2011a, 2011b), and we will examine the effects of such a variation on output, growth and financial stability in our model.

In a closed private economy, we have two types of households, rentiers and workers, and a firm sector. In order to keep the model as simple as possible, we assume that the capital stock of the firm sector (K) is completely financed by equity issued by the firms and held by the rentiers households (E_R). Therefore, rentiers receive all the profits being made by the firms (Π) as dividend payments (Π_R), and there are no retained earnings of the firm sector in our model:⁹

$$(2) \Pi = \Pi_R = hY .$$

Since the capital stock is completely financed by equity issued by the firm sector and total profits are completely distributed as dividend payments to rentiers households, it also follows that in our model the dividend rate ($d = \Pi_R / E_F$) is equal to the rate of profit on capital stock ($r = \Pi / K$). And since the latter can be decomposed into the profit share, the rate of utilisation of productive capacities given by the capital stock, and the capital-potential output ratio, we have:

$$(3) d = \frac{\Pi_R}{E_F} = \frac{\Pi}{K} = \frac{\Pi}{Y} \frac{Y}{Y^p} \frac{Y^p}{K} = hu \frac{1}{v} = r .$$

Since the rate of capacity utilisation is an endogenous variable in our model, the same holds true for the profit rate and thus the dividend rate.

Workers’ consumption (C_W) is determined by their wage income [$W = (1-h)Y$], on the one hand, and by credit received from rentiers (ΔB_W) net of interest payments on their stock of debt (iB_W) to rentiers, on the other hand. Workers do not save and we thus obtain:

$$(4) C_W = W + \Delta B_W - iB_W = (1-h)Y + \Delta B_W - iB_W .$$

Loans from rentiers to workers thus have a twofold effect. On the hand, they increase available financial resources and boost consumption. On the other hand, they increase

⁹ Dividend payments are the only profit (claims) of the rentiers/shareholders in our model. See Hein (2010a, 2010b) for an attempt of integrating financialisation issues into (Post-)Kaleckian distribution and growth models, in which there are different types of rentiers income (interest, dividends), however without considering rentiers’ portfolio choice, and also retained earnings of the firm sector.

workers households' stock of debt and thus interest payments which reduce workers' consumption. The net effect may be positive or negative. We assume that the rate of interest is given by monetary policies of the central bank and by rentiers' liquidity and risk assessments. It is treated as an exogenous variable in our model.

Rentiers' consumption (C_R) is determined by their total income, consisting of distributed profits of firms ($hY = \Pi_R$) and interest payments of workers household (iB_W), and their propensity to consume (c_R):

$$(5) C_R = c_R (hY + iB_W), \quad 0 < c_R < 1.$$

There are only two types of assets available for rentiers' saving: equity issued by the firm sector and debt of workers' households.¹⁰ We assume that rentiers' saving (S_R), determined by their propensity to save ($s_R = 1 - c_R$) out of total income, is split in fixed proportion, so that we have:

$$(6) \Delta B_W = \theta S_R = \theta s_R (hY + iB_W),$$

$$(7) \Delta E_R = (1 - \theta) S_R = (1 - \theta) s_R (hY + iB_W).$$

The proportion of rentiers' saving going to workers households as loans (θ) is determined by several factors: workers households' willingness to go into debt, rentiers households' willingness to supply credit to workers, hence workers households' creditworthiness as perceived by rentiers and potentially affected by workers' debt-capital or -income ratios, regulation of the credit market and thus the standards for creditworthiness, and other factors influencing creditworthiness.¹¹ We will treat θ as an exogenous variable, which of course may vary over time, in particular due to the effects of 'financialisation' on consumption outlined in the introduction. However, our parameter θ can also be understood to be affected by the willingness of the firm sector to invest in capital stock and to issue equity to rentiers in order

¹⁰ Therefore, there is yet no central bank money in our model. The economy we are modelling can therefore be conceived of as a pure credit economy. However, central bank money could easily be introduced as a third asset. But this would require to include the state and would make things more complicated without adding to the intended insights.

¹¹ Palley (1994) has focussed on the debtor households' debt-income ratios as a determinant of obtainable credit. Dutt (2006) has used workers' income net of interest payments as a determinant for desired borrowing from the perspective of creditors, whereas Dutt (2005) treats workers' net income as a determinant for the desired stock of debt determined by creditors. Bhaduri/Laski/Riese (2006) and Bhaduri (2011) have included notional financial wealth as a main determinant of debt financed consumption, which is out of the scope of our simple model, because we have no saving of workers households and hence no wealth held by these households, neither financial wealth nor housing wealth.

to finance long-term real investment (or to issue debt to rentiers households in a more complex model). The literature on the effects of financialisation on real investment decision of the firm sector has shown that increasing shareholder dominance and shareholder value orientation of management tends to dampen investment in capital stock due to the perceived growth-profit trade-off at the firm level.¹² Therefore, because of the dominance of shareholders' interests firms prefer short-run profits instead of long-run growth of capital stock. This implies, on the one hand, increasing dividend payout ratios to rentiers, which, however, is not modelled here, because we assume profits to be completely paid out to rentiers. On the other hand, however, increasing shareholder value orientation also implies a reduction in real investment financed by issuing equity (or debt), and even share buybacks. In our model this would show up as a decline in the parameter $(1-\theta)$.

The basic structure of the model can be summarized by the balance sheet matrix in Table 1 and the transaction flow matrix in Table 2.

< Tables 1 and 2 around here >

Introducing workers household's debt into the basic Kaleckian distribution and growth model,¹³ we start by normalising equations (4) – (6) by the capital stock:

$$(7) \frac{C_w}{K} = (1-h) \frac{u}{v} + \hat{B}_w \lambda_w - i \lambda_w,$$

$$(8) \frac{C_R}{K} = c_R \left(h \frac{u}{v} + i \lambda_w \right),$$

$$(9) \frac{\Delta B_w}{K} = \hat{B}_w \lambda_w = \theta_{S_R} \left(h \frac{u}{v} + i \lambda_w \right),$$

The workers' debt-capital ratio ($\lambda_w = B_w / K$) is treated as a constant in short-run analysis but will be endogenously determined in the long run of our model. Examining its stability in the long run will be a major task. Finally, $\hat{B}_w = \Delta B_w / B_w$ is the rate of change of workers' debt.

¹² See Hein/van Treeck (2010b) for a theoretical discussion, starting from the Post-Keynesian theory of the firm, and Stockhammer (2004), van Treeck (2008) and Orhangazi (2008) for empirical results.

¹³ On the basic Kaleckian distribution and growth model and its variations and developments see Blecker (2002), Dutt (2011), Lavoie (1992: chapter 6) and Hein (2004: chapter 8).

We can now include the creditor-debtor-relationship between rentiers households and workers households into the three basic equations of the Kaleckian model and the stability condition for the goods market equilibrium:

$$(11) \quad g = \frac{I}{K} = \alpha + \beta u, \quad 0 < \beta,$$

$$(12) \quad \sigma = \frac{S}{K} = s_R \left(h \frac{u}{v} + i \lambda_w \right), \quad 0 < s_R < 1,$$

$$(13) \quad g = (1 - \theta) \sigma,$$

$$(14) \quad (1 - \theta) s_R \frac{h}{v} - \beta > 0.$$

The rate of investment (I) in capital stock (g) is determined by (expected) sales and hence by the rate of capacity utilisation and by ‘animal spirits’ of the firm sector (α), so that we obtain the basic Kaleckian function for capital accumulation in equation (11). Equation (12) defines the saving rate (σ), i.e. saving in relation to the capital stock, which is determined by rentiers’ income normalised by the capital stock and their propensity to save. In equation (13) we have the goods market equilibrium condition, i.e. rentiers’ saving which is not used for workers’ consumption has to be invested by firms. The usual Kaleckian/Keynesian goods market stability condition (14) requires that rentiers’ saving net of workers’ debt financed consumption has to respond more elastically to the endogenous variable of the model, the rate of capacity utilisation, than does real investment of the firm sector. For the following analysis we assume that the goods market stability holds.

3. The short-run equilibrium

For the short-run equilibrium we take the workers’ debt-capital ratio as given and constant. From equations (11) – (13) we obtain for the short-run equilibrium rates of capacity utilisation (u^*) and capital accumulation (g^*):

$$(15) \quad u^* = \frac{\alpha - (1 - \theta) s_R i \lambda_w}{(1 - \theta) s_R \frac{h}{v} - \beta},$$

$$(16) \quad g^* = \frac{(1-\theta)s_R \left(\alpha \frac{h}{v} - \beta i \lambda_w \right)}{(1-\theta)s_R \frac{h}{v} - \beta}.$$

The following effects of changes in exogenous variables on the stable goods market equilibrium are derived:

$$(15a) \quad \frac{\partial u^*}{\partial \alpha} = \frac{1}{(1-\theta)s_R \frac{h}{v} - \beta} > 0,$$

$$(16a) \quad \frac{\partial g^*}{\partial \alpha} = \frac{(1-\theta)s_R \frac{h}{v}}{(1-\theta)s_R \frac{h}{v} - \beta} > 0,$$

$$(15b) \quad \frac{\partial u^*}{\partial h} = \frac{-(1-\theta)s_R \frac{u^*}{v}}{(1-\theta)s_R \frac{h}{v} - \beta} < 0,$$

$$(16b) \quad \frac{\partial g^*}{\partial h} = \frac{-\beta(1-\theta)s_R \frac{u^*}{v}}{(1-\theta)s_R \frac{h}{v} - \beta} < 0,$$

$$(15c) \quad \frac{\partial u^*}{\partial \theta} = \frac{s_R \left(i \lambda_w + \frac{h}{v} u^* \right)}{(1-\theta)s_R \frac{h}{v} - \beta} > 0,$$

$$(16c) \quad \frac{\partial g^*}{\partial \theta} = \frac{\beta s_R \left(i \lambda_w + \frac{h}{v} u^* \right)}{(1-\theta)s_R \frac{h}{v} - \beta} > 0,$$

$$(15d) \quad \frac{\partial u^*}{\partial i} = \frac{-(1-\theta)s_R \lambda_w}{(1-\theta)s_R \frac{h}{v} - \beta} < 0,$$

$$(16d) \quad \frac{\partial g^*}{\partial i} = \frac{-\beta(1-\theta)s_R \lambda_w}{(1-\theta)s_R \frac{h}{v} - \beta} < 0,$$

$$(15e) \quad \frac{\partial u^*}{\partial s_R} = \frac{-(1-\theta)\left(i\lambda_w + \frac{h}{v}u^*\right)}{(1-\theta)s_R \frac{h}{v} - \beta} < 0,$$

$$(16e) \quad \frac{\partial g^*}{\partial s_R} = \frac{-\beta(1-\theta)\left(i\lambda_w + \frac{h}{v}u^*\right)}{(1-\theta)s_R \frac{h}{v} - \beta} < 0,$$

$$(15f) \quad \frac{\partial u^*}{\partial \lambda_w} = \frac{-(1-\theta)s_R i}{(1-\theta)s_R \frac{h}{v} - \beta} < 0,$$

$$(16f) \quad \frac{\partial g^*}{\partial \lambda_w} = \frac{-\beta(1-\theta)s_R i}{(1-\theta)s_R \frac{h}{v} - \beta} < 0.$$

A change in animal spirits is positively associated with the goods market equilibrium [equations (15a) and (16a)]. A higher profit share will cause lower values for equilibrium capacity utilisation and capital accumulation [equations (15b) and (16b)], i.e. the paradox of costs applies to our model. An increase in the share of rentiers' lending to workers is expansionary in the short run with workers' debt-capital ratio given [equations (15c) and (16c)]. An increase in the rate of interest will have a negative effect on the goods market equilibrium [equations (15d) and (16d)], because income is redistributed from workers to rentiers who have a lower propensity to consume. For the same reason an increase in the short-run exogenous workers' debt-capital ratio means lower goods market equilibrium rates of capacity utilisation and capital accumulation [equations (15f) and (16f)]. And a higher propensity to save out of rentiers' income means lower values for the goods market equilibrium [equations (15e) and (16e)], that is, the paradox of saving is valid.

Therefore, in the short run, redistribution at the expense of labour associated with finance-dominated capitalism is contractionary. The same is true for dampened 'animal spirits' of the firm sector with respect to real investment. However, these contractionary impacts may be (over-)compensated if lending of rentiers to workers increases sufficiently, too. A lower rentiers' propensity to save also contributes to dampening the contractionary effects of redistribution at the expense of workers lower 'animal spirits'. The same is true for a lower rate of interest imposed by monetary authorities. Next we have to examine the related long-run effects by means of endogenising the determination of the workers' debt-capital ratio and the related feedback effects on capacity utilisation and capital accumulation.

4. The long-run equilibrium: existence and stability

In the long run of our model workers' debt-capital ratio may vary and the equilibrium value has to be determined endogenously. Determining the equilibrium workers' debt-capital-ratio also means determining their long-run equilibrium debt-income ratio, too, which may be considered to be more appropriate as an indicator for creditworthiness. However, since the sum of wages is given as $W = [(1-h)u/v]K$, the equilibrium workers' debt-income ratio (τ_w) is strictly related to the equilibrium workers' debt-capital ratio:

$$(17) \quad \tau_w = \frac{B_w}{W} = \frac{\lambda_w}{(1-h)\frac{u}{v}}.$$

With a given workers' debt-capital ratio, workers' debt-income ratio is positively related to the profit share and inversely to the rate of capacity utilisation. We will come back to these relationships when discussing potential feedback effects on the share of rentiers' saving lent to workers in Section 6. In what follows, however, we will focus on the workers' debt-capital ratio for reasons of convenience. Long-run equilibrium requires the endogenously determined value of this ratio to be constant. If we assume goods market prices to be constant – mark-ups may change but the price level remains the same, which means that unit labour costs will have to vary inversely with the mark-up – the rate of change in the workers' debt-capital ratio is given as:

$$(18) \quad \hat{\lambda}_w = \hat{B}_w - \hat{K} = \hat{B}_w - g.$$

In long-run equilibrium we need $\hat{\lambda}_w = 0$ and hence:

$$(19) \quad \hat{B}_w = g.$$

From equations (9) and (15) we obtain:

$$(20) \hat{B}_w = \frac{\theta s_R \left(\alpha \frac{h}{v} - \beta i \lambda_w \right)}{\lambda_w \left[(1-\theta) s_R \frac{h}{v} - \beta \right]}.$$

Inserting equation (16) and equation (20) into equation (19) yields two long-run equilibrium values for the workers' debt-capital ratio:

$$(21) \lambda_{w1}^{**} = \frac{\theta}{1-\theta}$$

and

$$(22) \lambda_{w2}^{**} = \frac{\alpha h}{\beta i v}.$$

Stability of the long-run equilibrium workers' debt-capital ratio requires:

$$(23) \frac{\partial \hat{\lambda}_w}{\partial \lambda_w} < 0.$$

Starting from equation (18), inserting equations (16) and (20) yields:

$$(24) \hat{\lambda}_w = \frac{s_R \left[\alpha \theta \frac{h}{v} \lambda_w^{-1} + \beta (1-\theta) i \lambda_w - \alpha (1-\theta) \frac{h}{v} - \beta \theta i \right]}{(1-\theta) s_R \frac{h}{v} - \beta}.$$

From this we obtain:

$$(24a) \frac{\partial \hat{\lambda}_w}{\partial \lambda_w} = \frac{s_R \left[\beta (1-\theta) i - \alpha \theta \frac{h}{v} \lambda_w^{-2} \right]}{(1-\theta) s_R \frac{h}{v} - \beta}.$$

Since the denominator will be positive, if we only deal with stable short-run goods market equilibria, stability of long-run equilibrium is given if the numerator in equation (24a) is negative. Therefore, stability is obtained under the following condition:

$$(24a') \quad \frac{\partial \hat{\lambda}_w}{\partial \lambda_w} < 0 \quad \text{if : } \lambda_w < \sqrt{\frac{\theta}{(1-\theta)} \frac{\alpha h}{\beta i v}} \quad \Rightarrow \quad \lambda_w < \sqrt{\lambda_{w1}^{**} \lambda_{w2}^{**}} .$$

Instability will hence prevail under the following condition:

$$(24a'') \quad \frac{\partial \hat{\lambda}_w}{\partial \lambda_w} > 0 \quad \text{if : } \lambda_w > \sqrt{\frac{\theta}{(1-\theta)} \frac{\alpha h}{\beta i v}} \quad \Rightarrow \quad \lambda_w > \sqrt{\lambda_{w1}^{**} \lambda_{w2}^{**}} .$$

Since we have two equilibrium values for the workers' debt-capital ratio and the benchmark for stability is given by the root of the product of these two values, only the lower value is stable whereas the upper value is unstable. This is shown in Figure 1, where we assume that $\lambda_{w1}^{**} = \theta/(1-\theta) < \lambda_{w2}^{**} = (\alpha h)/(\beta i v)$. In this case, λ_{w1}^{**} is stable whereas λ_{w2}^{**} is unstable. We will come back to this issue below.

< Figure 1 around here >

Determining the long-run equilibrium values for capacity utilisation (u_i^{**}) and capital accumulation (g_i^{**}) related to the two potential equilibrium values, we start with the first long-run equilibrium value for the workers' debt-capital ratio given in equation (21) and insert it into equations (15) and (16) for the short-run goods market equilibrium values of the rates of capacity utilisation and capital accumulation, respectively:

$$(25) \quad u_1^{**} = \frac{\alpha - \theta s_R i}{(1-\theta) s_R \frac{h}{v} - \beta} ,$$

$$(26) \quad g_1^{**} = \frac{s_R \left[\alpha (1-\theta) \frac{h}{v} - \beta \theta i \right]}{(1-\theta) s_R \frac{h}{v} - \beta} .$$

For a positive long-run equilibrium rate of capacity utilisation, with short-run goods market stability assumed to hold, we need: $\alpha > \theta s_R i$, and for a positive equilibrium rate of capital

accumulation it is required that: $\alpha > [\theta/(1-\theta)][(\beta_{iv})/h]$. Note that the latter implies that $\lambda_{w1}^{**} = \theta/(1-\theta) < \lambda_{w2}^{**} = (\alpha h)/(\beta_{iv})$.

For the second long-run equilibrium value for the workers' debt-capital ratio given in equation (22) we obtain the following solutions for the related long-run equilibrium rates of capacity utilisation and capital accumulation:

$$(27) \quad u_2^{**} = \frac{\alpha \left[1 - (1-\theta) \frac{s_R h}{\beta_V} \right]}{(1-\theta) s_R \frac{h}{V} - \beta},$$

$$(28) \quad g_2^{**} = 0.$$

For stable goods market equilibria we get $u_2^{**} < 0$, because the goods market stability condition (14) implies that $[(1-\theta)s_R h]/(\beta_V) > 1$, which would make the numerator in equation (27) negative. Only with an unstable goods market equilibrium we would obtain positive values for u_2^{**} . The long-run equilibrium value for capital accumulation is zero for the second value of the long-run equilibrium workers' debt-capital ratio.

Before discussing the effects of changes in parameters, we can now summarize our findings so far: Our model yields two long-run equilibrium values for the workers' debt-capital ratio, and hence also for their debt-income ratio. If we are only discussing stable goods market equilibria, the lower value of the two long-run equilibrium results of the workers' debt-capital ratio will be stable, whereas the upper value will be unstable. This means that as soon as the actual workers debt-capital ratio exceeds the upper value, it will increase without limits, whereas up to this ratio it will converge towards the lower equilibrium value. Therefore, as long as workers' debt-capital ratio remains below the upper equilibrium value it will not explode but converge towards a definite value and there is no built-in de-stabiliser.

Generally, we cannot exclude that λ_{w1}^{**} is the upper value and hence $\lambda_{w1}^{**} = \theta/(1-\theta) > \lambda_{w2}^{**} = (\alpha h)/(\beta_{iv})$. For this constellation and the short-run goods market stability condition to hold simultaneously, however, it is required that $\alpha < \theta s_R i$, as is shown in Appendix A. This means that in this constellation not only the long-run equilibrium rate of capacity utilisation u_2^{**} associated with the then stable long-run workers' debt-capital ratio λ_{w2}^{**} is negative, as shown in equation (27), but also the long-run equilibrium rate of capacity utilisation u_1^{**}

associated with the then unstable long-run workers' debt-capital ratio λ_{w1}^{**} will become negative, as can be seen by means of inserting the condition $\alpha < \theta s_R i$ into equation (25). Therefore, $\lambda_{w1}^{**} = \theta / (1 - \theta) > \lambda_{w2}^{**} = (\alpha h) / (\beta_{iv})$ for economically meaningful positive rates of capacity utilisation implies that these rates do not adhere to the goods market stability condition and thus have to be unstable.

Having clarified this, in what follows we will assume that $\lambda_{w1}^{**} = \theta / (1 - \theta) < \lambda_{w2}^{**} = (\alpha h) / (\beta_{iv})$. In this case, λ_{w1}^{**} is stable whereas λ_{w2}^{**} is unstable. Since in this case $\alpha > \theta s_R i$, the long-run equilibrium rate of capacity utilisation u_1^{**} associated with the then stable long-run workers' debt-capital ratio λ_{w1}^{**} will be positive and stable, as will be the long-run rate of capital accumulation. The long-run equilibrium rate of capacity utilisation u_2^{**} associated with the then unstable long-run workers' debt-capital ratio λ_{w2}^{**} will be negative and stable or positive but unstable, and the related long-run equilibrium rate of capital accumulation will be zero.

5. The long-run equilibrium: effects of changes in the parameters

Examining the effects of finance-dominated capitalism ('financialisation') on the long-run equilibrium of our model, we focus on decreasing animal spirits of the firm sector with respect to investment in real capital stock, i.e. a falling α , redistribution at the expense of labour, i.e. a rising h , and rising willingness of rentiers to lend to workers households and a rising willingness of workers households to borrow, i.e. a rising θ . We also include the effects of a change in the rate of interest (i) and in the rentiers' propensity to save (s_R). We examine the partial effects of changes in these variables on the long-run equilibrium workers' debt-capital ratio, on the range of stability of this ratio, and on the long-run equilibrium values of the rates of capacity utilisation and capital accumulation associated with the stable workers' debt-capital ratio. As mentioned in the previous section, we assume $\alpha > \theta s_R i$ and thus the following constellation to hold for our exercises:

$$(29) \lambda_{w2}^{**} = \frac{\alpha h}{\beta_{iv}} > \frac{\theta s_R h}{\beta_v} > \lambda_{w1}^{**} = \frac{\theta}{1 - \theta}.$$

First, we discuss the effects of changes in the parameters on the workers' debt-capital ratio and its stability. From equations (21) we obtain for the lower long-run equilibrium value of λ_w :

$$(21a) \quad \frac{\partial \lambda_{w1}^{**}}{\partial \alpha} = 0,$$

$$(21b) \quad \frac{\partial \lambda_{w1}^{**}}{\partial h} = 0,$$

$$(21c) \quad \frac{\partial \lambda_{w1}^{**}}{\partial \theta} = \frac{1}{(1-\theta)^2} > 0,$$

$$(21d) \quad \frac{\partial \lambda_{w1}^{**}}{\partial i} = 0,$$

$$(21e) \quad \frac{\partial \lambda_{w1}^{**}}{\partial s_R} = 0.$$

From equations (22) for the upper long-run equilibrium value of λ_w it can be derived:

$$(22a) \quad \frac{\partial \lambda_{w2}^{**}}{\partial \alpha} = \frac{h}{\beta_{iv}} > 0,$$

$$(22b) \quad \frac{\partial \lambda_{w2}^{**}}{\partial h} = \frac{\alpha}{\beta_{iv}} > 0,$$

$$(22c) \quad \frac{\partial \lambda_{w2}^{**}}{\partial \theta} = 0,$$

$$(22d) \quad \frac{\partial \lambda_{w2}^{**}}{\partial i} = \frac{-\alpha \beta h v}{(\beta_{iv})^2} < 0,$$

$$(22e) \quad \frac{\partial \lambda_{w2}^{**}}{\partial s_R} = 0.$$

Decreasing animal spirits only affect the unstable, higher value of the equilibrium workers' debt-capital ratio in the negative. Therefore, the corridor of stability for the lower value of the workers' debt-capital ratio is reduced, as shown in Figure 2. An increase in the profit share has the opposite effect: The value for the unstable upper equilibrium of workers' debt-capital ratio is increasing, thereby increasing the stability corridor for the lower equilibrium which is not affected by a change in the profit share, as is shown in Figure 3. A higher proportion of

rentiers' saving going to workers as credits increases the lower, stable equilibrium value of the workers' debt-capital ratio without affecting the unstable upper equilibrium. The upwards corridor of stability for the stable lower equilibrium therefore shrinks, as is shown in Figure 4. A higher rate of interest only affects the upper equilibrium in the negative and therefore reduces the upwards stability corridor for the lower equilibrium as can be seen in Figure 5. A change in the rentiers' propensity to save has no effects on the equilibrium values of the workers' debt-capital ratio.

< Figures 2 – 5 around here >

Discussing the effects on the long-run real equilibrium, we focus on the equilibrium rates of capacity utilisation and capital accumulation associated with λ_{w1}^{**} . As we have shown above, for these rates the goods market stability condition is met for positive values of the rate of capacity utilisation. From equations (25) for the long-run equilibrium rate of capacity utilisation we obtain:

$$(25a) \quad \frac{\partial u_1^{**}}{\partial \alpha} = \frac{1}{(1-\theta)s_R \frac{h}{v} - \beta} > 0,$$

$$(25b) \quad \frac{\partial u_1^{**}}{\partial h} = \frac{-(1-\theta)s_R \frac{u_1^{**}}{v}}{(1-\theta)s_R \frac{h}{v} - \beta} < 0,$$

$$(25c) \quad \frac{\partial u_1^{**}}{\partial \theta} = \frac{s_R \left(\frac{h}{v} u_1^{**} - i \right)}{(1-\theta)s_R \frac{h}{v} - \beta} = \frac{s_R (r_1^{**} - i)}{(1-\theta)s_R \frac{h}{v} - \beta} = \frac{s_R (d_1^{**} - i)}{(1-\theta)s_R \frac{h}{v} - \beta},$$

$$(25d) \quad \frac{\partial u_1^{**}}{\partial i} = \frac{-\theta s_R}{(1-\theta)s_R \frac{h}{v} - \beta} < 0,$$

$$(25e) \quad \frac{\partial u_1^{**}}{\partial s_R} = \frac{-\left[\theta i + (1-\theta) \frac{h}{v} u_1^{**} \right]}{(1-\theta)s_R \frac{h}{v} - \beta} = \frac{-\left[\theta i + (1-\theta) r_1^{**} \right]}{(1-\theta)s_R \frac{h}{v} - \beta} = \frac{-\left[\theta i + (1-\theta) d_1^{**} \right]}{(1-\theta)s_R \frac{h}{v} - \beta} < 0.$$

From the long-run equilibrium rate of capital accumulation in equation (26) it can be derived:

$$(26a) \quad \frac{\partial g_1^{**}}{\partial \alpha} = \frac{s_R(1-\theta)\frac{h}{v}}{(1-\theta)s_R\frac{h}{v}-\beta} > 0,$$

$$(26b) \quad \frac{\partial g_1^{**}}{\partial h} = \frac{-\beta(1-\theta)s_R\frac{u_1^{**}}{v}}{(1-\theta)s_R\frac{h}{v}-\beta} < 0,$$

$$(25c) \quad \frac{\partial g_1^{**}}{\partial \theta} = \frac{\beta s_R \left(\frac{h}{v} u_1^{**} - i \right)}{(1-\theta)s_R\frac{h}{v}-\beta} = \frac{\beta s_R (r_1^{**} - i)}{(1-\theta)s_R\frac{h}{v}-\beta} = \frac{\beta s_R (d_1^{**} - i)}{(1-\theta)s_R\frac{h}{v}-\beta}$$

$$(25d) \quad \frac{\partial g_1^{**}}{\partial i} = \frac{-\beta \theta s_R}{(1-\theta)s_R\frac{h}{v}-\beta} < 0,$$

$$(26e) \quad \frac{\partial g_1^{**}}{\partial s_R} = \frac{-\beta \left[\theta i + (1-\theta)\frac{h}{v} u_1^{**} \right]}{(1-\theta)s_R\frac{h}{v}-\beta} = \frac{-\beta \left[\theta i + (1-\theta)r_1^{**} \right]}{(1-\theta)s_R\frac{h}{v}-\beta} = \frac{-\beta \left[\theta i + (1-\theta)d_1^{**} \right]}{(1-\theta)s_R\frac{h}{v}-\beta} < 0.$$

Lower animal spirits and a higher profit share have both uniquely depressing effects on the long-run equilibrium rates of capacity utilisation and capital accumulation in our model. Therefore, aggregate demand and capital accumulation remain wage-led in the long run. Increases in the rate of interest and in the rentiers' propensity to save have both uniquely negative effects on the long-run equilibrium rate.¹⁴ Therefore, the paradox of thrift also applies to the long run of the model.

The effects of an increasing share of rentiers' saving being lent to workers depend on the relative values of the rate of interest paid by workers on their debt and the rate of profit, which in our model is equal to the dividend rate [equation (3)]. The profit or dividend rate is an endogenous variable in our model because of the endogeneity of the rate of capacity utilisation, whereas the rate of interest is treated as an exogenous variable. We can now distinguish two cases:¹⁵

¹⁴ These long-run results are consistent with the one derived by Dutt (2005, 2006) in his Steindlian model the structure of which is broadly similar to ours.

¹⁵ This result is again similar to the one in Dutt's (2005, 2006) models in which an increase in lending to workers has a long-run expansionary effect on capital accumulation and growth, if the endogenously determined rate of accumulation exceeds the product of the propensity to save out of profits and the rate of interest, which are each exogenously given.

1. If the exogenous rate of interest falls short of the endogenously determined profit rate or dividend rate ($r_1^{**} = d_1^{**} > i$), an increase in θ will cause higher long-run equilibrium rates of capacity utilisation and capital accumulation. Aggregate demand and capital accumulation, and hence growth, will therefore be debt-led: An increase in the proportion of rentiers' saving lent to workers will increase the workers' debt-capital ratio but also the long-run equilibrium rates of capacity utilisation and capital accumulation.
2. If the exogenous rate of interest exceeds the endogenously determined profit rate or dividend rate ($r_1^{**} = d_1^{**} < i$), an increase in θ will cause lower long-run equilibrium rates of capacity utilisation and capital accumulation. Aggregate demand, capital accumulation and growth will hence be debt-burdened. An increase in the proportion of rentiers' saving lent to workers will increase the workers' debt-capital ratio but the long-run equilibrium rates of capacity utilisation and capital accumulation will fall.

In the first, the debt-led case, the direct expansionary effect of an increase in θ will exceed the indirect contractionary effect via the long-run increase in the workers' debt-capital ratio and the related interest payments, because of a low exogenous rate of interest, in particular. In the second, the debt-burdened case, however, a high rate of interest will cause the contractionary effect of rising interest payments associated with higher long-run workers' debt to overwhelm the expansionary effect of higher workers' debt.

6. Short- and long-run effects of financialisation on capacity utilisation, capital accumulation and workers' debt – and potential feedbacks

Summing up the short- and long-run effects of financialisation on capacity utilisation, capital accumulation and workers' debt-capital ratio, our model yields the following results (Table 3). In the short run, taking workers' debt-capital ratio as given, falling animal spirits of the firm sector with respect to investment in real capital and redistribution at the expense of workers have both negative effects on capacity utilisation and capital accumulation. However, these contractionary effects of financialisation may be over-compensated by increasing lending of rentiers to workers for consumption purposes, i.e. by an increasing proportion of rentiers' saving being lent to workers. Also a lower rentiers' propensity to save and a lower rate of interest on workers' debt help to stabilise private consumption and thus contribute to compensate for the depressing effects of low animal spirits and redistribution at the expense of workers.

In the long run, the endogeneity of workers' debt-capital ratio has to be taken into account. Our model yields two potential long-run equilibrium values for this ratio. For

economically meaningful results for stable equilibrium capacity utilisation, the lower equilibrium value for workers' debt-capital ratio is stable whereas the upper value is unstable. Therefore, within the limits given by the unstable upper equilibrium value, the workers' debt-capital (and –income) ratio will converge towards a definite value. Only if it exceeds the upper equilibrium it will become unstable and explode.

< Table 3 around here >

Lower animal spirits of the firms sector with respect to real investment as well as a higher rate of interest each have a negative effect on the upper equilibrium value for workers' debt-capital ratio and thus compress the corridor of stability, whereas a higher profit share extends it. A higher proportion of rentiers' saving lent to workers increases the stable equilibrium value of workers' debt-capital ratio but thereby compresses the corridor of upwards stability.

The long-run effects of lower animal spirits, a higher profit share – and also a higher rate of interest or a higher rentiers' propensity to save – on equilibrium capacity utilisation and capital accumulation are each negative. However, increasing lending of rentiers to workers can be expansionary also in the long run, taking the negative feedback effects of increasing debt and higher interest payments on workers' consumption into account, provided that the exogenous rate of interest is lower than the endogenously determined rate of profit. But if the rate of interest is higher than the rate of profit, the negative feedback effect of increasing debt and higher interest payments overcompensates the short-run expansionary effect of increasing lending to workers and turns it contractionary in the long run.

Depending on the level of the rate of interest relative to the rate of profit, we may therefore have two stable long-run constellations in the face of higher lending of rentiers to workers. With a low rate of interest a higher proportion of rentiers' saving being lent to workers, causing a higher workers' debt-capital ratio, will be accompanied by higher rates of capacity utilisation and capital accumulation. Aggregate demand and growth will hence be debt-led. With a high rate of interest, however, a higher proportion of rentiers' saving being lent to workers causing a higher workers' debt-capital ratio will be accompanied by lower rates of capacity utilisation and capital accumulation. In this case, aggregate demand and growth will be debt-burdened. Both constellations are locally stable. However, the upwards corridor of stability will shrink due to the increase in the equilibrium workers' debt-capital ratio in each constellation.

Since our model economy in the short run is always debt-led, a higher proportion of rentiers' saving being lent to workers will always be accompanied by higher rates of capacity utilisation and capital accumulation. Moving from the short to the long run, the stock-flow dynamics may therefore turn the short-run debt-led into a long-run debt-burdened constellation if the rate of interest, relative to the rate of profit, is too high. With a low rate of interest, relative to the rate of profit, however, this will not happen and the economy remains debt-led in the long run, too.

In the long run, a shift from debt-led aggregate demand and growth to a debt-burdened constellation will only take place, if there is a change in parameters which affect the long-run equilibrium rate of profit relative to the rate of interest: a fall in animal spirits, a change in the profit share, a rise in the rentiers' propensity to save, or an increase in the rate of interest. Whereas the effects of changes in animal spirits, the rentiers' propensity to save, and the rate of interest on the long-run equilibrium profit rate are unique – through the effects on the rate of capacity utilisation, the effects of a change in the profit share are not. The profit share has a direct positive effect on the profit rate and an indirect negative effect through the rate of capacity utilisation. The overall effect will therefore depend on the relative strengths of these two effects, as can be seen in Appendix B.

It should be noted that the considerations so far only apply if $\alpha > \theta s_{r,i}$, because this condition assures that there is a stable and economically meaningful goods market equilibrium associated with a stable workers' debt-capital ratio. If this condition is violated in the course of 'finance-dominated capitalism', either by the decrease in animal spirits, by the increase in the proportion of rentiers' saving lent to workers, by an increasing rate of interest or an increasing rentiers' propensity to save, economically meaningful goods market equilibria would have to be unstable (or the stable goods market equilibrium rate of capacity utilisation would be negative), and the system would turn unstable in the short and in the long run.

Finally, we can discuss some potential feedback effects of increasing workers' indebtedness on the proportion of rentiers' saving lent to workers. First, we turn to the long-run stable case in which workers' debt-capital ratio does not exceed the upper bound for stability given by λ_{w2}^{**} . Here we have to distinguish the debt-led from the debt-burdened case:

1a) In the long-run debt-led constellation, a higher θ will be associated with higher rates of capacity utilisation and capital accumulation. Therefore, the impact of a higher workers' debt-capital ratio on the workers' debt-income ratio will be weakened or even reversed by a higher rate of capacity utilisation, according to equation (17). In the latter case we would see a

macroeconomic ‘paradox of debt’: workers’ debt-income ratio will be lower in the face of a higher share of rentiers’ saving lent to workers and a higher workers’ debt-capital ratio. Therefore, in the debt-led case a negative feedback of workers’ debt-capital ratio on the proportion of rentiers’ saving lent to workers is less likely. If it occurs and rentiers reduce the proportion of their saving lent to workers, this will have contractionary effects, and the equilibrium rates of capacity utilisation and capital accumulation will decline, together with the workers’ debt-capital ratio. If the paradox of debt constellation prevails, workers’ debt-income ratios will increase in the face of a falling proportion of rentiers’ saving lent to workers and a falling workers’ debt-capital ratio.

1b) In the debt-burdened constellation, however, in which a higher stable workers’ debt-capital ratio is associated with lower equilibrium rates of capacity utilisation and capital accumulation, workers’ debt-income ratio will rise even more than the workers’ debt-capital ratio, as can be seen in equation (17). In this case, rentiers may be tempted to reduce the share of their saving lent to workers. This will reduce workers’ debt-capital and –income ratios, and it will have a long-run expansionary effect on capacity utilisation and capital accumulation so that the effect on workers’ debt-income ratio will be stronger than the effect on the workers’ debt-capital ratio.

As soon as workers’ debt-capital ratio exceeds the upper bound of local stability of λ_{w1}^{**} given by λ_{w2}^{**} , workers’ debt-capital ratio will keep on increasing and feedback negatively on the goods market equilibrium: the rate of capacity utilisation will converge towards its stable negative equilibrium value u_2^{**} , and the rate of capital accumulation will converge towards its long run equilibrium $g_2^{**} = 0$. Rising indebtedness of workers and a collapsing economy will most likely induce rentiers to reduce the share of their saving lent to workers. However, this will further dampen economic activity and capital accumulation while workers’ debt-capital ratio, and also their debt-income ratio will keep on rising. The economy will thus again be characterised by a macroeconomic ‘paradox of debt’, a falling share of rentiers’ saving lent to workers but rising workers’ debt-capital and –income ratios due to the associated collapse in aggregate demand and capital accumulation.

7. Conclusions

Within our simple Kaleckian distribution and growth model with workers’ debt we have obtained the following results with respect to the effects of some important channels of influence of ‘finance-dominated capitalism’ on short- and long-run economic development, that is a fall in animal spirits of the firm sector with respect to real investment in capital stock,

redistribution of income at the expense of the labour income share and increasing credit to workers households.

Lending of rentiers to workers can compensate for the depressing effects of lower animal spirits of firms with respect to real investment and redistribution at the expense of workers in the short and in the long run without necessarily triggering cumulative processes of increasing indebtedness.

Provided that animal spirits of firms with respect to real investment have not decreased by too much, and that the rentiers' propensity to save and the rate of interest are low, locally stable long-run equilibrium workers' debt-capital ratios associated with positive and stable long-run equilibrium rates of capacity utilisation and capital accumulation can emerge in the face of moderately higher shares of rentiers' saving being lent to workers.

If the endogenously determined rate of profit exceeds the rate of interest, indicating that expansionary effects of new lending exceed the contractionary effects of interest payments due to a higher stock of debt, stable long-run debt-led regimes may emerge, in which a higher and stable workers' debt-capital ratio is associated with higher and stable rates of capacity utilisation, capital accumulation and growth. With strong effects of higher lending to workers on aggregate demand, workers' debt-income ratios may even decrease and the debt-led regime may be characterised by a macroeconomic 'paradox of debt', that is a higher share of rentiers' saving lent to workers but a lower workers' debt-income ratio.

If the endogenously determined rate of profit falls short of the rate of interest, indicating that expansionary effects of new lending fall short of the contractionary effects of interest payments on the stock of debt, a stable long-run debt-burdened regime may emerge, in which a higher and stable workers' debt-capital ratio is associated with lower but stable rates of capacity utilisation, capital accumulation and growth.

In the long-run stable constellations, a reduction of lending of rentiers to workers will cause a lower equilibrium workers' debt-capital ratio associated with stable but lower capacity utilisation and capital accumulation in the debt-led constellation – and probably higher stable workers' debt-income ratios (again the macroeconomic 'paradox of debt'). In the debt-burdened constellation, equilibrium capacity utilisation and capital accumulation will increase and the workers' debt-capital and -income ratios will decrease, if rentiers decide to reduce the share of their saving being lent to workers.

As soon as workers' debt-capital ratio exceeds the upper limit of stability, it will keep on increasing and feedback negatively on the goods market equilibrium. If rising indebtedness of workers and a collapsing economy induce rentiers to reduce the share of their saving lent to

workers, this will further dampen economic activity and capital accumulation while workers' debt-capital ratio and also their debt-income ratio will keep on rising. The economy will thus again be characterised by a macroeconomic 'paradox of debt'. Such an unstable process may either be triggered by an increase in the share of rentiers' lending to workers, which makes workers' debt-capital ratio exceed the upper limit of stability and/or a fall in animal spirits of the firm with respect to investment in capital stock or a rise in the rate of interest, which each lower the upper limit of stability.

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Appendix A: Workers' debt-capital ratio and stability of short-run goods market equilibrium

From the condition for goods market stability (14) we obtain:

$$(A.1) \quad \frac{\theta_{s_R} h}{\beta_V} > \frac{\theta}{1-\theta}.$$

If the first value for the long-run equilibrium workers' debt-capital ratio in equation (21) exceeds the second one in equation (22), we have:

$$(A.2) \quad \lambda_{w_1}^{**} = \frac{\theta}{1-\theta} > \lambda_{w_2}^{**} = \frac{\alpha h}{\beta_{iV}}.$$

Combining condition (A.1) and (A.2) yields:

$$(A.3) \quad \frac{\theta_{s_R} h}{\beta_V} > \frac{\theta}{1-\theta} > \frac{\alpha h}{\beta_{iV}},$$

and hence:

$$(A.4) \quad \theta_{s_R} i > \alpha.$$

Therefore, stability of the goods market equilibrium and $\lambda_{w_1}^{**} > \lambda_{w_2}^{**}$ to hold simultaneously is possible, provided that animal spirits are low. However, the long-run equilibrium rate of capacity utilisation u_1^{**} associated with the then unstable long-run workers' debt-capital ratio $\lambda_{w_1}^{**}$ will become negative, as can be seen by means of inserting the condition $\alpha < \theta_{s_R} i$ into equation (25). The long-run equilibrium rates of capacity utilisation associated with the two potential long-run equilibrium workers' debt-capital ratios would thus both be negative. Economically meaningful positive equilibrium rates of capacity utilisation would not meet the condition for stability of the goods market equilibrium. If however:

$$(A.5) \quad \theta_{s_R} i < \alpha,$$

this implies:

$$(A.6) \frac{\alpha h}{\beta_{iv}} > \frac{\theta s_R h}{\beta_v},$$

and the goods market equilibrium rate of capacity utilisation associated with the long-run equilibrium workers' debt capital ratio $\lambda_{w2}^{**} = (\alpha h)/(\beta_{iv})$ is therefore stable and negative, or positive but unstable. Combining this with condition (A.1) yields:

$$(A.7) \frac{\alpha h}{\beta_{iv}} > \frac{\theta s_R h}{\beta_v} > \frac{\theta}{1-\theta}.$$

In this constellation $\lambda_{w1}^{**} < \lambda_{w2}^{**}$, and the goods market equilibrium rate of capacity utilisation associated with λ_{w1}^{**} is positive and stable whereas the one associated with λ_{w2}^{**} is either negative and stable, or positive and unstable.

Appendix B: Effects of parameter changes in the short and in the long run on the equilibrium rates of profit

Inserting the short-run equilibrium value for the rate of capacity utilisation from equation (15) into equation (3) for the rate of profit yields the short-run equilibrium rate of profit:

$$(B.1) r^* = \frac{\frac{h}{v} [\alpha - (1-\theta)s_R i \lambda_w]}{(1-\theta)s_R \frac{h}{v} - \beta}.$$

From this we obtain:

$$(B.1a) \frac{\partial r^*}{\partial \alpha} = \frac{\frac{h}{v}}{(1-\theta)s_R \frac{h}{v} - \beta} > 0,$$

$$(B.1b) \frac{\partial r^*}{\partial h} = \frac{\frac{1}{v} \left[\alpha - (1-\theta)s_R \left(\frac{h}{v} u^* + i \lambda_w \right) \right]}{(1-\theta)s_R \frac{h}{v} - \beta},$$

$$(B.1c) \quad \frac{\partial r^*}{\partial \theta} = \frac{s_R \frac{h}{v} \left(i \lambda_w + \frac{h}{v} u^* \right)}{(1-\theta) s_R \frac{h}{v} - \beta} > 0,$$

$$(B.1d) \quad \frac{\partial r^*}{\partial i} = \frac{-\frac{h}{v} (1-\theta) s_R \lambda_w}{(1-\theta) s_R \frac{h}{v} - \beta} < 0,$$

$$(B.1e) \quad \frac{\partial r^*}{\partial s_R} = \frac{-(1-\theta) \frac{h}{v} \left(i \lambda_w + \frac{h}{v} u^* \right)}{(1-\theta) s_R \frac{h}{v} - \beta} < 0,$$

$$(B.1f) \quad \frac{\partial r^*}{\partial \lambda_w} = \frac{-(1-\theta) \frac{h}{v} s_R i}{(1-\theta) s_R \frac{h}{v} - \beta} < 0,$$

Inserting the long-run equilibrium value for the stable rate of capacity utilisation from equation (25) into equation (3) for the rate of profit yields the long-run equilibrium rate of profit:

$$(B.2) \quad r_1^{**} = \frac{\frac{h}{v} (\alpha - \theta s_R i)}{(1-\theta) s_R \frac{h}{v} - \beta},$$

From this we obtain:

$$(B.2a) \quad \frac{\partial r_1^{**}}{\partial \alpha} = \frac{\frac{h}{v}}{(1-\theta) s_R \frac{h}{v} - \beta} > 0,$$

$$(B.2b) \quad \frac{\partial r_1^{**}}{\partial h} = \frac{\frac{1}{v} \left\{ \alpha - s_R \left[\theta i + (1-\theta) \frac{h}{v} u_1^{**} \right] \right\}}{(1-\theta) s_R \frac{h}{v} - \beta},$$

$$(B.2c) \quad \frac{\partial r_1^{**}}{\partial \theta} = \frac{s_R \frac{h}{v} \left(\frac{h}{v} u_1^{**} - i \right)}{(1-\theta) s_R \frac{h}{v} - \beta},$$

$$(B.2d) \quad \frac{\partial r_1^{**}}{\partial i} = \frac{-\theta s_R \frac{h}{v}}{(1-\theta) s_R \frac{h}{v} - \beta} < 0,$$

$$(B.2e) \quad \frac{\partial r_1^{**}}{\partial s_R} = \frac{-\frac{h}{v} \left[\theta i + (1-\theta) \frac{h}{v} u_1^{**} \right]}{(1-\theta) s_R \frac{h}{v} - \beta} < 0.$$

Tables and figures

	Workers households	Rentiers households	Firms	Σ
Loans	$-B_W$	$+B_W$		0
Equities		$+E_R$	$-E_R$	0
Capital	0	0	K	K
Σ	$-B_W$	$+B_W+E_R$	0	$K = E_R$

	Workers households	Rentiers households	Firms current	Firms Capital	Σ
Consumption	$-C_W$	$-C_R$	$+C_W + C_R$		0
Investment			$+I$	$-I$	0
Wages	$+W$		$-W$		0
Retained profits			0	0	0
Distributed profits (dividends)		$+P_R$	$-P_R$		0
Change in equity		$-\Delta E_R$		$+\Delta E_R$	0
Interest on loans	$-iB_W$	$+iB_W$			0
Change in loans	$+\Delta B_W$	$-\Delta B_W$			0
Σ	0	0	0	0	0

Table 3: Short-run and long-run effects of changes in exogenous model variables, assuming $\alpha > \theta_{s_r i}$

	α	h	θ	i	s_R	λ_W
<i>Short run</i>						
u^* (stable)	+	- (wage-led)	+ (debt-led)	-	-	-
g^* (stable)	+	- (wage-led)	+ (debt-led)	-	-	-
<i>Long run</i>						
$\lambda_{w_1}^{**}$ (stable)	0	0	+	0	0	...
$\lambda_{w_2}^{**}$ (unstable)	+	+	0	-	0	...
u_1^{**} (stable)	+	- (wage-led)	+ for $r_1^{**} = d_1^{**} > i$ (debt-led) - for $r_1^{**} = d_1^{**} < i$ (debt-burdened)	-	-	...
g_1^{**} (stable)	+	- (wage-led)	+ for $r_1^{**} = d_1^{**} > i$ (debt-led) - for $r_1^{**} = d_1^{**} < i$ (debt-burdened)	-	-	...

Figure 1: Long-run equilibrium values for workers' debt-capital ratio and their stability with positive stable goods market equilibrium at λ_{W1}^{}**

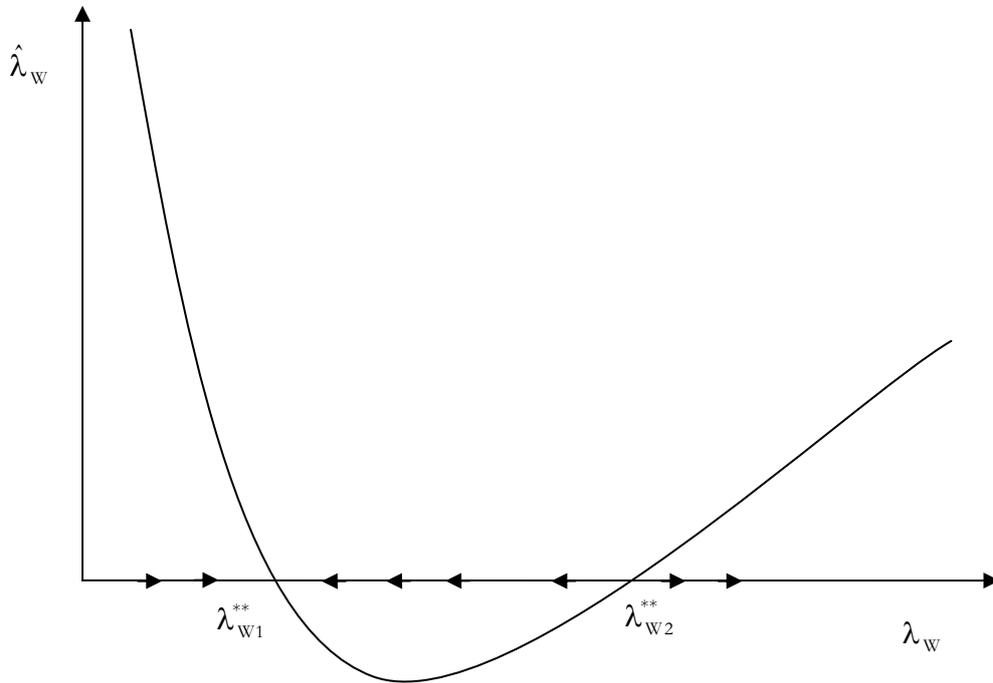


Figure 2: Effect of a decrease in 'animal spirits of firms on the long-run equilibrium values for workers' debt-capital ratio

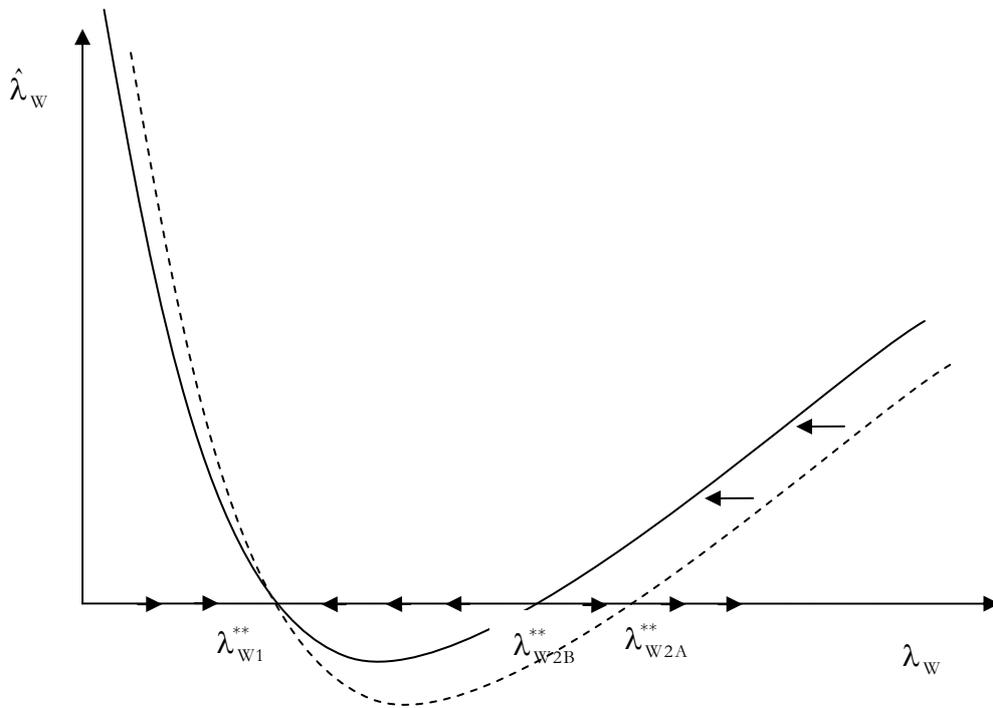


Figure 3: Effect of an increase in the profit share on the long-run equilibrium values for workers' debt-capital ratio

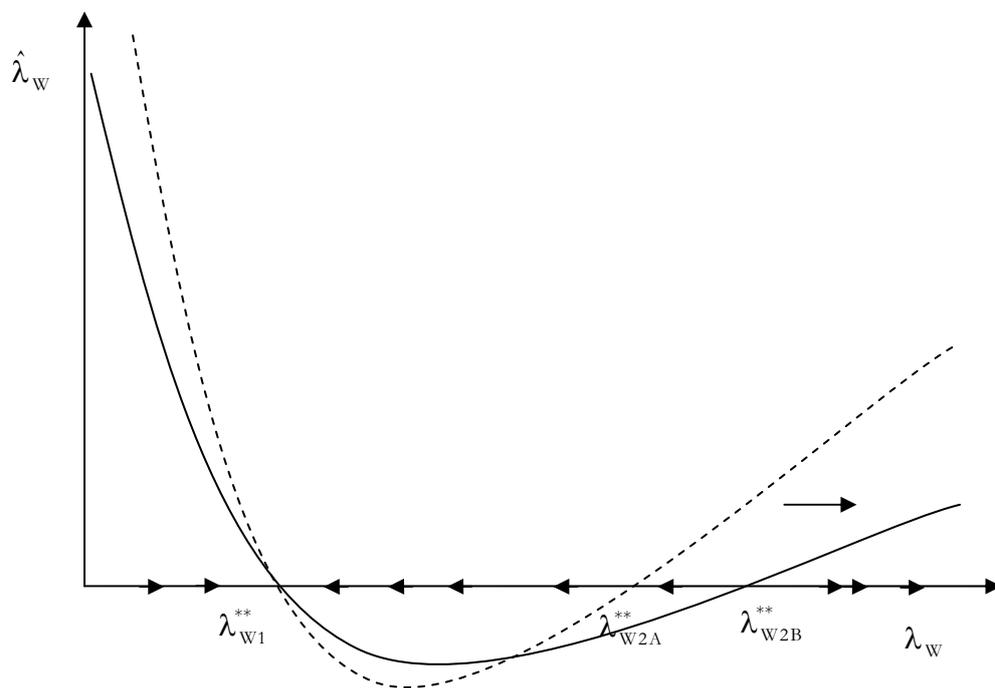


Figure 4: Effect of an increase in the share of rentiers' saving being lent to workers on the long-run equilibrium values for workers' debt-capital ratio

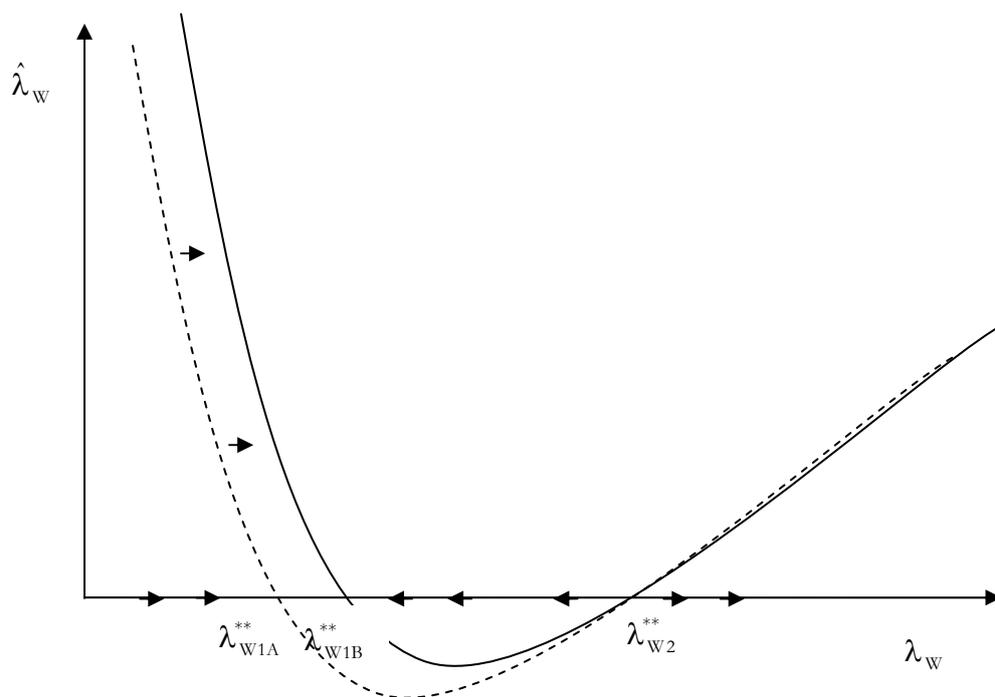


Figure 5: Effect an increase in the rate of interest on the long-run equilibrium values for workers' debt-capital ratio

