Interest rates, distribution and capital accumulation – A Post-Kaleckian perspective on the US and Germany*

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Abstract
We analyse the effects of interest rate variations on the rates of capacity utilisation, capital accumulation and profit in a simple post-Kaleckian distribution and growth model. This model gives rise to different potential accumulation regimes depending on the values of the parameters in the investment, saving and distribution function. Estimating these core behavioural equations for the US and Germany in the period 1960-2007, we find significant and robust effects of interest payments with the expected sign in each of the equations. Our estimation results imply, both for the US and for Germany, that the effects of changes in the real long-term rate of interest on the equilibrium rates of capacity utilisation, capital accumulation and profits are characterised by the 'normal regime': Rising long-term real rates of interest cause falling rates of capacity utilisation, capital accumulation and profits, as well as redistribution at the expense of labour income and hence an increasing profit share in both countries.

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1. Introduction

Modern mainstream New Consensus Models (NCM), focussing on inflation targeting central banks as the main economic policy tool, hold that variations in the economic policy tool of the central bank, the rate of interest, only have short-run real effects on output and employment in the face of nominal rigidities, whereas in the long run the Phillips curve is vertical and only inflation is affected.[1] Post-Keynesian authors (PKs) have criticised these NCMs for a variety of reasons.[2] Broadly summarised, the critique is related to the assumption of a stable long-run equilibrium 'Non-Accelerating-Inflation-Rate-of-Unemployment' (NAIRU) determined exclusively by supply-side factors to which actual unemployment, determined by effective demand, can be adjusted by means of monetary policy interventions, on the one hand, and to the assumption of the independence of this NAIRU from the development of actual unemployment, and hence from demand and monetary as well as fiscal policies, on the other hand. In short, what is questioned is the assumed long-run neutrality of money and monetary policies in the NCMs.

Based on this critique, PKs have advanced alternative macroeconomic models, in which monetary policies and hence changes in the interest rate have short- and long-run real effects. First, regarding the inflation generation process, arguments either in favour of a non-vertical short- and long-run Phillips curve or of a long-run endogenous NAIRU have been put forward.[3] Second, regarding the income generation process, some PKs have replaced the simple interest rate inverse

[1] These models are basically characterised by three equations: 1. an aggregate demand function derived from households' and firms' optimisation behaviour which relates the output gap inversely to the real interest rate, 2. an expectations-augmented Phillips curve which makes the rate of inflation positively dependent on the output gap in the short run, and 3. a central bank reaction function in which the nominal interest rate set by the central bank is determined by the equilibrium real interest rate, by the output gap and by the deviation of actual inflation from the inflation target. See Clarida/Gali/Gertler (1999), Goodfriend (2007), McCallum (2001), Meyer (2001), Romer (2000), Taylor (2000), and Carlin/Soskice (2006: 27-172) for NCMs.

[2] For a discussion and a critique of the NCM and its main elements, the NAIRU and an inflation targeting central bank, and the development of PK alternatives see, among others, Angeriz/Arestis (2006), Arestis/Sawyer (2004a, 2004b, 2005, 2006, 2008), Arestis (2006, 2009), Atesoglu/Smithin (2006), Davidson (2006), Fontana (2006, 2009), Fontana/Palacio-Vera (2002, 2004, 2006, 2007), Hein (2002, 2006, 2008a: 133-152), Hein/Stockhammer (2009), Kriesler/Lavoie (2007), Lavoie (2004, 2006), Lima/Setterfield (2008), Palacio-Vera (2005), Palley (2006, 2007), Rochon/Rossi (2006a, 2006b), Rochon/Setterfield (2007, 2008), Sawyer (2001, 2002, 2006), Seccareccia (1998), Setterfield (2004, 2006, 2009), Smithin (2004, 2007), Stockhammer (2004a, 2004b, 2008), and Wray (2007).

[3] For models with short- and long-run non-vertical Phillips curves see Atesoglu/Smithin (2006), Lima/Setterfield (2008) and Setterfield (2004, 2006, 2009), and for models with an endogenous inflation barrier see Lavoie (2004, 2006), Hein (2006, 2008a: 133-152), Hein/Stockhammer (2009), and Stockhammer (2008).

IS-curve of the NCM by a more elaborated PK/Kaleckian approach to effective demand also allowing for different distribution effects of changing interest rates on effective demand.[4] These models are based on the recent extensions of the Kaleckian distribution and growth model by monetary variables (debt and interest rates).[5] Third, different economic policy assignments from the NCM have been proposed, allocating inflation stabilisation to incomes policy, real stabilisation to fiscal policies and advocating a "parking it" approach to interest rate policies by the monetary policy authorities in order to avoid contractive distribution and growth effects.[6]

Whereas there is abundant literature on the PK critique of the NCM and on alternative PK theoretical models and policy assignments, few attempts have been made to test empirically the effects of monetary policies and changes in the interest rate on distribution, aggregate demand and growth within the framework of the Kaleckian distribution and growth model – and thus to lend empirical support to the PK view of the effects of monetary policies on the income generating process.[7] One exception has been a paper by Hein/Ochsen (2003), in which a post-Kaleckian distribution and growth model, as a monetary extension of the Bhaduri/Marglin (1990) model, is estimated for four advanced OECD countries (France, Germany, UK, USA) using annual data from 1960 to 1995. For the entire period, they find negative impacts of rising interest rates on GDP growth, accumulation and profits in France and in Germany, but not in the UK or in the USA where they observe no significant effects. Looking at sub-periods, they find mixed results: In France, an increase in the interest rate was associated with a contraction of all three endogenous variables until the early 1980's, whereas no significant relationships could be found afterwards. In Germany, in the first period, rising interest rates had contractive effects, but in the second period they turned expansive. In the USA, only accumulation did not increase as a response to increasing interest rates

[4] See Hein (2006, 2008a: 133-152), Hein/Stockhammer (2009), Setterfield (2009), and Stockhammer (2008).
[5] See Taylor (1985), Dutt (1992, 1995), Dutt/Amadeo (1993), Lavoie (1993, 1995) and Hein (2008a), among others.
[6] See in particular Hein/Stockhammer (2009), Lavoie (1996a), Rochon/Setterfield (2007), Smithin (2004), Setterfield (2009), and for a recent critique Asensio/Hayes (2009).
[7] However, recently, there has been an outburst of empirical estimations of the effects of changes in functional income distribution based on the Bhaduri/Marglin (1990) variant of the Kaleckian model. See Hein/Vogel (2008) for an already incomplete overview.

in the first sub-period, whereas in the second, expansive effects on all three variables were observed. In the UK the effects in sub-periods remained insignificant. The authors conclude that their estimations do not offer a good explanation for the economic downturn in the aftermath of the 1980's recession. Several potential reasons for this can be identified: First, the failure to estimate robust effects of variations in the interest rate on distribution between capital and labour is a crucial shortcoming. Second, the firms' degree of indebtedness which affects interest payments is not taken into account. Third, related to this, rentiers' income was only roughly calculated by assuming rentiers' income to be equal to the rate of interest multiplied by the nominal capital stock. Fourth, some sub-period OLS-regressions suffered from too few observations.

In the present paper, we attempt to cope with these shortcomings and to further develop the approach by Hein/Ochsen (2003) by presenting alternative estimation results for the effects of change in the rate of interest in Germany and the USA for the period from 1960 to 2007. In Section 2, a post-Kaleckian distribution and growth model, including the rate of interest and the stock of debt, will be presented and the main properties of the model in the face of changing interest rates will be derived. In Section 3, we present our estimations obtained from an ADL approach and determine the demand, accumulation, and profit rate regimes for both countries for the entire period and for two sub-periods. Different from Hein/Ochsen (2003), first, we obtain robust results regarding the interest elasticity of income distribution between capital and labour; second, we include data on rentiers' income from national accounts; third, we take into account firms' debt-capital ratio in our econometric model; and fourth, we abstain from estimating coefficients for sub-periods due to a lack of observations, but we apply our estimated elasticities for the entire period and calculate partial effects for sub-periods. Section 4 will summarise and conclude.

2. The Post-Kaleckian model of distribution and growth

In this section, a simple post-Kaleckian distribution and growth model based on Bhaduri/Marglin

(1990) and suggested by Hein (2007, 2008a: 114-123) is extended in order to provide the theoretical framework for our estimations in Section 3.

2.1. The basic model

We use the standard assumptions made in recent Kaleckian distribution and growth models and suppose a closed economy without government activity. There is no technical progress, no overhead labour and no depreciation of the capital stock. Only one good is produced which can be used for both consumption and investment. We assume the coefficients of production to be constant and the economy usually to be operating below full utilisation of capacity given by the real capital stock.

Long-term finance of the nominal capital stock (pK) consists of firms' accumulated retained earnings (E^F), long-term credit granted by rentiers' households (B) and equity issued by firms and held by rentiers' household (E^R):

$$pK = B + E^R + E^F . \tag{1}$$

The debt-capital ratio (λ) and the rentiers' equity-capital ratio (ϕ):

$$\lambda = \frac{B}{pK}, \tag{2}$$

$$\phi = \frac{E^R}{pK}, \tag{3}$$

are assumed to be given in the short run without analysing the medium- to long-run dynamics in the present paper.[8] For our estimations in Section 3 these ratios will be taken from the statistics. Total

[8] For the analysis of the dynamics of the debt-capital ratio (or the outside finance-capital ratio) in similar models as the one presented here, see Hein (2007, 2010).

profits (Π) split into firms' retained profits (Π^F), on the one hand, and dividends paid on equity held by rentiers (D) as well as interest paid on debt (Z) also accruing to rentiers' households, on the other hand:

$$\Pi = \Pi^F + Z + D \,. \tag{4}$$

Firms have to pay interest (Z) on their outstanding debt according to the rate of interest (i) and the stock of debt (B). Likewise, dividends (D) have to be paid to shareholders according to the dividend rate (d) and the stocks of equity held by rentiers (E^R):

$$Z = iB \,, \tag{5}$$

$$D = dE \,. \tag{6}$$

Following Kalecki (1954: 11-41), distribution of income between capital and labour is given by mark-up pricing on unit labour costs in incompletely competitive goods market, with the mark-up being determined by the degree of price competition in the goods markets and by the relative powers of capital and labour in the labour market. According to Kalecki (1954: 17), the mark-up – and hence the profit share (h) – may be elastic with respect to overheads and hence to interest costs. Following this suggestion we shall assume that the mark-up and the profit share in the medium to long run may become elastic with respect to firms' interest payments: At least in the long run, firms have to recover interest costs when selling their products in the market in order to stay in business.[9] The share of profits (Π) in total income (pY) is therefore given as follows:

[9] We therefore follow the view of some Sraffians, as Panico (1985) and Pivetti (1985, 1991), and consider the cost aspect of interest payments. See Hein (2008a) for a more extensive discussion.

$$h = \frac{\Pi}{pY} = \gamma_0 + \gamma_1 \lambda i, \qquad \gamma_0 > 0, \gamma_1 \geq 0 \,. \tag{7}$$

The rate of profit (r), relating total profits (including interest and dividend payments) to the nominal capital stock is given by:

$$r = \frac{\Pi}{pK} = \frac{\Pi}{pY}\frac{Y}{K} = hu \,, \tag{8}$$

and can hence be decomposed into the profit share and into the output-capital ratio (u), our indicator for capacity utilisation.

The accumulation function in our model is an extension of the function employed by Hein (2007, 2008a: 114-123), and it is based on the investment function proposed by Bhaduri/Marglin (1990) in their non-monetary Kaleckian distribution and growth model. Net investment (I) over the nominal capital stock (pK), the rate of capital accumulation (g^I), is determined as follows:

$$g^I = \frac{I}{pK} = \alpha + \beta(u - u_n) + \tau h - \theta_i \lambda i - \theta_d \phi d, \qquad \alpha, \beta, \tau, \theta_i, \theta_d \geq 0 \,. \tag{9}$$

In this function, we have positive effects of managements' 'animal spirits' (α), of unit profits and hence the profit share, and of capacity utilisation relative to long-run average utilisation (u_n). Note that we do not make any assumptions regarding an exogenous long run 'normal rate' of utilisation to which firms attempt to adjust actual utilisation. Long-run average utilisation may well be endogenous with respect to actual utilisation.[10] Following Lavoie/Rodriguez/Seccareccia (2004), however, we hold that it is the deviation from long-run average utilisation which affects

[10] See Hein/Lavoie/van Treeck (2008) for the debate on the requirement of a 'normal rate' of utilisation in Kaleckian distribution and growth models.

investment.[11] This procedure also has the advantage that long-run changes in the technical capital-potential output ratio can be considered to affect the trend and not the deviation from trend, which therefore is a true measure for the impact of changes in demand on investment. Finally, capital accumulation is negatively affected by distributed profits, i.e. interest and dividend payments relative to the capital stock, following Kalecki's (1937) 'principle of increasing risk'. Distributed profits diminish internal means of finance for real investment purposes, but they also reduce access to external means of finance in incompletely competitive capital markets. Since dividend payments may also indicate rising shareholder power, and may thus have an additional negative effect on real investment, apart from draining internal means of finance, as suggested by van Treeck (2008) and Hein (2008b), we have allocated separate coefficients to interest and dividend payments. A rise in the rate of interest, with a given debt-capital ratio, has thus a direct negative effect on investment via the internal means of finance channel. However, this negative effect may be dampened or even compensated for, if firms manage to increase the share of profits in the face of rising interest payments.

Saving (S) consists of firms' retained earnings, which are saved by definition, saving out of rentiers' income, and saving out of wages (W). The saving rate (g^S), relating total saving to the nominal capital stock, is thus determined as follows:

$$g^S = \frac{S}{pK} = \frac{\Pi^r + s_Z(Z+D) + s_W W}{pK} = hu - (1-s_Z)(\lambda i + \phi d) + s_W(1-h)u, \qquad 0 \le s_W \le s_Z \le 1 \,. \quad (10)$$

Generally, we assume the propensity to save out of wages (s_w) to fall short of the propensity to save out of rentiers' income (s_z), because rentiers' income mainly accrue to high income households.[12] Note that with a constant profit share – and hence constant distribution between capital and labour –

[11] See Stockhammer (2004c) for a similar procedure for empirical estimations.
[12] Note that wage income is not identical with income of workers' households as soon as saving out of wages is positive. In this case, workers' households will also receive rentiers' income.

and a given rate of capacity utilisation, an increase in the rate of interest will reduce the saving rate in our model, because income is transferred from firms which do not consume to households which consume a part of their income.

Our model is closed by the goods market equilibrium conditions:

$$g^I = g^S. \tag{11}$$

The Keynesian stability condition requires that saving responds more sensitively to variations in the endogenous variable, capacity utilisation, than accumulation:

$$\frac{\partial g^S}{\partial u} - \frac{\partial g^I}{\partial u} > 0 \qquad => \qquad s_W + (1-s_W)h - \beta > 0. \tag{12}$$

We obtain the following equilibrium values for the rate of capacity utilisation (u^*), for the accumulation rate (g^*) and for the profit rate (r^*):

$$u^* = \frac{\lambda i(1-s_Z-\theta_i) + \phi d(1-s_Z-\theta_d) + \alpha + \tau h - \beta u_n}{s_W + (1-s_W)h - \beta} \tag{13}$$

$$\begin{aligned} g^* = & \frac{\lambda i\{\beta(1-s_Z) - \theta_i[s_W + (1-s_W)h]\}}{s_W + (1-s_W)h - \beta} \\ & + \frac{\phi d\{\beta(1-s_Z) - \theta_d[s_W + (1-s_W)h]\}}{s_W + (1-s_W)h - \beta} \\ & + \frac{[s_W + (1-s_W)h](\alpha + \tau h - \beta u_n)}{s_W + (1-s_W)h - \beta} \end{aligned} \tag{14}$$

$$r^* = \frac{h[\lambda i(1-s_Z-\theta_i) + \phi d(1-s_Z-\theta_d) + \alpha + \tau h - \beta u_n]}{s_W + (1-s_W)h - \beta}. \tag{15}$$

2.2. Effects of interest rate variations on capacity utilisation, accumulation and profits

Following the Post-Keynesian 'horizontalist view', pioneered by Kaldor (1970, 1982, 1985), Lavoie (1984, 1996b) and Moore (1988, 1989a), we consider the rate of interest to be the exogenous variable in our model mainly determined by the interest rate policies of the central bank.[13] The volume of credit (as a flow) and the quantity of money (as a stock), however, are therefore endogenous to the income generation and accumulation process. The volume of credit supply is determined by the credit demand which commercial banks consider creditworthy, that is by that part of credit demand which is able to supply securities accepted by the central bank as collateral when providing commercial banks with central bank money in the money market. Loan demand which commercial banks deem creditworthy is granted, deposits are created with commercial banks, and the central bank accommodates the required amount of central bank money. The central bank determines the price for central bank money, the base rate of interest, and commercial banks mark-up this base rate when supplying credit to investors. The mark-up is affected by the degree of competition in the banking sector, on the one hand, and by commercial banks' liquidity preference and risk assessment, on the other hand.

If liquidity preference and risk considerations of commercial banks and, hence, their mark-ups remain constant, the central bank's interest rate setting in the money market also determines the market rate of interest in the credit market (Smithin 2003: 121-127). Under these conditions, changes in the base rate and in the credit market rate of interest are due to changes in the monetary policy stance. However, if commercial banks' liquidity and risk considerations or the degree of competition in the banking sector, and hence their mark-ups, change in the face of a changing base rate of interest, monetary policy may not be able to determine the credit market rate of interest directly. Here an asymmetry may arise: An increasing base rate of interest will always trigger an increasing credit market rate, because commercial banks have to recover costs of refinancing and

[13] For a review of the 'horizontalist view' and a comparison with the Post-Keynesian 'structuralist' view arguing in favour of a rising money and credit supply curves due to incomplete accommodation of the central and/or rising liquidity and risk premia of commercial banks, see Hein (2008a: 43-53).

have to gain minimum profits. But a decreasing base rate may not be followed immediately by a falling credit market rate, if commercial banks' liquidity and risk premia increase due to rising uncertainty, or if banks' profit aspirations increase. Note finally, that the horizontalist view does not imply that monetary policy is free to set the rate of interest at whatever level, irrespective of economic conditions. On the contrary, modern central banks use the interest rate tool in order to stabilise inflation – and/or the exchange rate, depending on the exchange rate regime, which is well acknowledged in this 'horizontalist' view.

In what follows, we concede that the degree of competition in the banking sector, expectations and risk and liquidity assessments may change in the process of time. However, this will affect the structure of interest rates building on the central bank base rate. We also concede that sudden increases in commercial banks' liquidity preference may limit the capacities of the central bank to lower market rates of interest in the short run. And there may be short-run inversions in the yield curves, as is usually witnessed in economic recessions. However, these are temporary phenomena. We hold that in the long run, it is monetary policies which determine the short-term rate of interest and also the tendency of development of the long-term rate, which is crucial for distribution and investment. Therefore, we consider the interest rate in our model to be mainly determined by the monetary policy stance of the central bank.

The effects of a variation in the rate of interest on the equilibrium values of the rates of capacity utilisation, accumulation rate and profit from equation (13) – (15), taking into account equation (7), are as follows:

$$\frac{\partial u^*}{\partial i} = \frac{\lambda\{(1-s_Z-\theta_i)+\gamma_1[\tau-(1-s_W)u]\}}{s_W+(1-s_W)h-\beta}, \tag{16}$$

$$\frac{\partial g^*}{\partial i} = \frac{\lambda\langle\{\beta(1-s_Z)-\theta_i[s_W+(1-s_W)h]\}+\gamma_1\{\tau[s_W+(1-s_W)h]-\beta u(1-s_W)\}\rangle}{s_W+(1-s_W)h-\beta}, \tag{17}$$

$$\frac{\partial r^*}{\partial i} = \frac{\lambda\{h(1-s_Z-\theta_i)+\gamma_1[\tau h-(\beta-s_W)u]\}}{s_W+(1-s_W)h-\beta}. \tag{18}$$

From this we get the following conditions for a negative effect of the rate of interest on the real equilibrium, provided that the goods market equilibrium is stable:

$$\frac{\partial u^*}{\partial i}<0, \qquad \text{if:} \qquad 1-s_Z<\theta_i-\gamma_1[\tau-(1-s_W)u], \tag{16'}$$

$$\frac{\partial g^*}{\partial i}<0, \qquad \text{if:} \qquad 1-s_Z<\theta_i\frac{[s_W+(1-s_W)h]}{\beta}-\gamma_1\left\{\frac{\tau[s_W+(1-s_W)h]}{\beta}-(1-s_W)u\right\}. \tag{17'}$$

$$\frac{\partial r^*}{\partial i}<0, \qquad \text{if:} \qquad 1-s_Z<\theta_i-\gamma_1\left[\tau-(\beta-s_W)\frac{u}{h}\right], \tag{18'}$$

The reactions of the rates of capacity utilisation, accumulation and profits to a variation in the interest rate depend on the coefficients of the accumulation and the saving function as well as on the effect of a variation in the rate of interest on the profit share, in the case of an interest elastic mark-up.

As long as the mark-up remains rigid in the face of a change in the rate of interest ($\gamma_1 = 0$), the effects on the equilibrium rates of utilisation, accumulation and profit mainly depend on the propensity to save out rentiers' income and on the response of investment towards changes in interest payments. Furthermore, the effects on capital accumulation also depend on the propensity to save out of wages, on the sensitivity of investment with respect to changes in demand, and on the profit share. Different potential accumulation regimes may arise, as has been made clear by Lavoie (1995) and Hein (2007): In the 'normal regime', an increase in the rate of interest has negative effects on the rates of capacity utilisation, accumulation and profit. This regime is characterised by a high propensity to save out of rentiers' income and by a high elasticity of investment with respect to

interest payments. A 'puzzling regime' will arise, if the propensity to save out of rentiers' income is low and firms' investment decisions are hardly affected by interest payments. Also an 'intermediate regime' may arise, in which rising interest rates have a positive effect on the rates of capacity utilisation and profit, but a negative effect on the rate of capital accumulation,[14] as van Treeck (2008) has pointed out. This regime is generated by a low propensity to save out rentiers' income, by a moderate response of firms' investment with respect to interest payments, which in sum boost demand, capacity utilisation and the rate of profit, but also by a low responsiveness of investment with respect to changes in capacity utilisation which does not compensate for the negative effect of rising interest payments on capital accumulation.

If the mark-up turns elastic with respect to firms' interest payments ($\gamma_1 > 0$), indirect effects through redistribution of income from workers to firms have to be considered, too. These 'secondary' effects of a change in the interest rate may reverse, dampen or amplify the 'primary' effects discussed in the case of a rigid mark-up. The direction of the effect of redistribution between capital and labour on the goods market equilibrium rates of capacity utilisation, profit and capital accumulation may be positive or negative, depending on whether demand, accumulation and profits are 'wage-led' or 'profit-led'.

With a low responsiveness of investment regarding the profit share and a low propensity to save out of labour income, redistribution at the expense of wages will decrease aggregate demand, and capacity utilisation becomes wage-led. In this case, capital accumulation will decrease, too, if capacity utilisation has a strong impact on investment decisions, which will make capital accumulation wage-led as well. In the opposite case, a high responsiveness of investment with regard to the profit share and a high propensity to save out of wages, aggregate demand tends to become profit-led, and capital accumulation will be profit-led, too.

If aggregate demand and capital accumulation are wage-led, negative direct effects of rising

[14] Note that in condition (18') $[sw+(1-sw)h]/\beta > 1$, in order for the stability condition in condition (12) to be satisfied.

interest rates on capacity utilisation, capital accumulation and the profit rate, as in the normal regime, are amplified when the mark-up becomes flexible with respect to interest payments, whereas positive effects, as in the puzzling regime, are dampened or even reversed. And if aggregate demand and capital accumulation are profit-led, positive direct effects of rising interest rates on capacity utilisation, capital accumulation and the profit rate, as in the puzzling regime, are amplified, whereas negative direct effects, as in the normal regime, are dampened or even reversed.

If the mark-up becomes flexible in the intermediate regime, positive effects of an increasing interest rate on capacity utilisation and the rate of profit will be amplified if aggregate demand is profit-led, and they will be dampened or reversed if aggregate demand is wage led. The negative effects of rising interest rates on capital accumulation will be dampened or reversed if capital accumulation is profit-led and they will be amplified if capital accumulation is wage-led.

3. Interest rates, output, capital accumulation and profits in the US and Germany

In this section we apply the distribution and growth model developed so far to the US and (West-)Germany in the period from 1960 to 2007.[15] We estimate the investment function (9), the saving function (10) and the profit share function (7) for the whole period under investigation using annual data. Then we calculate the overall effect of a change in the interest rate on the equilibrium rates of capacity utilisation, capital accumulation and profit, for the whole period under investigation and for two sub-periods.

3.1. The data

Estimating the growth model discussed in the previous section requires a broad set of data. Since these data on the US and on Germany are not available from a single source, several sources have been used, in particular the OECD, European Commission, US Bureau of Economic Analysis, the

[15] In the following, *Germany* will refer to West Germany until 1990 and, thereafter, to unified Germany.

Federal Reserve, the Statistisches Bundesamt Deutschland and the German Bundesbank.[16] This comes at a cost: The data set used is not fully consistent regarding sector demarcation. For example, data on the adjusted net profit share is for the total economy, capital stock data only for the business sector.

We use data on the net capital stock which recently ceased to be published by the OECD. For Germany its quality may be low. The OECD used to estimate a German gross capital stock according to Schreyer/Webb (2006). Crosschecking this data with investment data from AMECO provided by the European Commission and with data from the Statistisches Bundesamt Deutschland offers a surprising result: The capital stock data the OECD has published seems to be net rather than gross, so that we use it for German net capital stock of the business sector.

Accumulation in our estimations is represented by the growth rate of the real net capital stock of the business sector. To obtain a measure for capacity utilisation we relate real net domestic income to the real net capital stock. This approximation is consistent with our theoretical definition of the rate of capacity utilisation presented in the previous section.[17] The trend rate of capacity utilisation has been derived by applying a Hodrick-Prescott filter. For the profit share, the net operating surplus of the total economy adjusted for the labour income of the self-employed is related to the net value added. Net interest and net dividend payments of non-financial business taken from the statistics enter the accumulation function, each in relation to the nominal net capital stock. In the saving function, wage income is indicated by the compensation of employees. Rentiers' income is the net interest and dividend income received by private households. Several control variables have been applied in the saving function: proprietors' income, rental income, transfer income, and transfer payments. In the profit share function, the net interest payments of non-financial business in relation to the nominal net capital stock has been used, in addition to the

[16] For a detailed description of the data set and its sources, see table A1.
[17] Therefore, our measure differs from recent empirical work based on Kaleckian distribution and growth models in which capacity utilisation is usually approximated by the growth rate of real GDP (Hein/Ochsen 2003, Hein/Vogel 2008, 2009, Stockhammer 2004c, van Treeck 2008).

following control variables: the unemployment rate, inflation for private final consumption expenditure and the growth rate of real net domestic income.

3.2. Stylized facts

For the period from 1960 to 2007, Table 1 displays the development of the main variables under consideration. All variables have been averaged over the total period under consideration, over each sub-period, and over each business cycle, in order to get an impression of the long-run trends, independently of short-run variations in the course of business cycle.[18]

In the USA and in Germany, capital accumulation has displayed a decreasing trend since the early 1960s. However, the US managed to slightly increase accumulation during the new economy boom in the 1990s, whereas Germany faced a dramatic decline in accumulation rates in this period, too. Dividing our total period into two sub-periods of roughly equal length for the reasons given below, we observe that accumulation in the second period (1983-2007) was significantly lower than in the first one (1960-1982) in both countries.

Growth of net domestic income shows a similar pattern. In Germany, high growth rates persisted until the mid 1970s and have been followed by slow growth since then. This is also partly reflected in our measure for the rate of capacity utilisation relating output to the capital stock, which shows a falling trend throughout the entire time period. However, part of this decline is of course due to the increase in the capital-potential output ratio.

[18] A local minimum of the growth rate of net domestic income designates the end of a business cycle.

Table 1: Average values for capital accumulation, growth, distribution, debt-capital ratios, interest rates, and interest payments for the total period, sub-periods, and business cycles (in percent)

	Total period	Sub-periods		Business cycles					
USA	**1960-2007**	**1960-1982**	**1983-2007**	**1960-1970**	**1971-1974**	**1975-1982**	**1983-1991**	**1992-2001**	**2002-2007[f]**
G [a]	3.41	4.14	2.77	4.43	4.33	3.68	2.88	3.01	2.23
$\hat{Y}$ [a]	3.27	3.26	3.29	4.22	3.33	2.03	3.63	3.31	2.74
U	83.30	86.57	80.28	91.31	86.31	80.19	78.02	81.27	82.04
H	22.14	21.47	22.75	22.55	20.74	20.61	21.96	23.03	23.47
λ [d]	14.85	13.88	15.79	11.64	14.09	17.27	21.03	16.02	5.89
i [a]	3.18	1.96	4.26	2.26	0.70	2.22	5.97	4.18	1.81
$\frac{Z}{pK}$ [d]	3.23	2.65	3.79	2.15	3.01	3.16	4.13	3.68	3.38

	Total period	Sub-periods		Business cycles					
Germany	**1960-2007**	**1960-1982**	**1983-2007**	**1960-1967**	**1968-1975**	**1976-1982**	**1983-1993**	**1994-2003**	**2004-2007[f]**
G [a]	4.08	6.15	2.25	8.95	5.84	3.71	3.17	1.71	1.09
$\hat{Y}$ [a][e]	2.55	3.08	2.09	3.36	3.60	2.19	2.63	1.54	2.01
U	53.12	61.65	45.28	74.61	58.22	50.75	46.17	44.58	44.59
H	20.58	20.75	20.42	23.48	20.52	17.87	20.43	19.71	22.20
λ [b][c]	32.75	43.55	24.30	41.63	44.68	43.08	33.07	19.77	-1.31
i [a][e]	3.79	3.28	4.24	3.20	2.69	4.03	4.58	4.45	2.78
$\frac{Z}{pK}$	0.88	0.97	0.80	0.83	1.04	1.06	0.87	0.80	0.60

Notes: g, growth rate of the real net capital stock; $\hat{Y}$, growth rate of real net domestic income; u, rate of capacity utilisation; h, adjusted profit share; λ, debt-capital ratio; i, real long-term interest rate on government bonds; $\frac{Z}{pK}$, net interest payments of non-financial private business related to the nominal net capital stock. For a description of the data set and its sources, see Table A1.

[a] beginning 1961, [b] beginning 1965, [c] until 2005, [d] until 2006, [e] Unified Germany beginning in 1992, [f] not an entire business cycle

In the US, growth rates decreased enormously in the late 1970s/early 1980s, recovered during the 1980s and 1990s and decreased again in the current business cycle. The boom in the 1980s and 1990s has been pronounced and accounts for the high average level of economic growth which we observe in the US for the second sub-period. On average, our measure for capacity utilisation decreased less dramatically than in Germany from the first to the second sub-period.[19]

Until the early 1980s, both the US and Germany faced a redistribution of income from profits to wages, i.e. decreasing profit shares. Since the 1980s, profit shares have displayed an increasing trend, which is especially pronounced in the US and less visible in Germany due to unification. Thus the US profit share increased from the first to the second period, whereas the German remained roughly constant.

In the US, net interest payments of non-financial corporations as a share of the nominal capital stock increased permanently until the early 1990s and decreased thereafter. In Germany, the development of interest payments of non-financial business takes a similar course, with the peak in the 1976-1982 cycle and a declining trend since then.[20] The US rate of net interest payments increased from the first to the second sub-period, whereas the German rate decreased. In the US, the net debt-capital ratio of non-financial business was rising until the early 1990s and has been declining since then; on average this ratio has increased in the second sub-period as compared to the first. The long-term real interest rate did not show any pronounced trend until the early 1980s, when it increased tremendously showing a declining trend since then. On average, the long-term real rate of interest is much higher in the second sub-period than in the first. In Germany, the debt-capital ratio has declined remarkably in the second sub-period, whereas the real long-term rate of interest has increased already in the mid 1970s, remaining on a higher level in the second sub-period relative to the first.

[19] The difference between the US and the German rate of capacity utilisation is partly caused by differences in the methods by which the OECD measures the capital stock in the US and in Germany. It also reflects different changes in the capital-potential output ratios over time.

[20] The difference between the US and the German interest payments in relation to the capital stock partly originates from the utilisation of different databases. See Table A1.

It should be noted that due to data problems, in particular with respect to capital stock, and due to problems of sector demarcations, net interest payments in relation to the capital stock are not equivalent to the product of the long-term rate of interest and the net debt-capital ratio, neither in the US nor in Germany. For these reasons also the levels of the data should not be compared between countries.[21] However, since we mostly use first differences in the estimations below, we hold that the data presented in Table 1 can be used for our estimation purposes.

Summing up our observations so far, the recession in the early 1980s seems to mark a break in long-run development, as has been suggested by several authors (Boyer 2000, Hein/Ochsen 2003, Stockhammer 2005-6, van Treeck 2008).[22] Average capital accumulation, GDP growth and capacity utilisation declined from the period 1960-1982 to the period 1983-2007. The real rate of interest increased remarkably from the first to the second period and distribution improved in favour of capital income. Whereas the total profit share, including interest and other rentiers' income, showed a declining tendency in the first period, it has shown a tendency to increase in the second period.

3.3. Estimation results

Estimation strategy

Since almost all relevant variables in levels exhibit a unit root, as suggested by an Augmented Dicky-Fuller test,[23] we first tried to estimate error correction models for accumulation, saving and the profit share both for the US and for Germany, following the bounds testing approach by Pesaran/Shin/Smith (2001), according to which level relationships between variables can be consistently modelled, although the respective variables are not integrated of the same order.

[21] For example, net interest payments in the US are related to total non-financial business, whereas for Germany only non-financial corporations are included.

[22] This break in long-run development can be related to several factors which cannot be discussed here. One of them, of course, is the fact that Keynesianism has been replaced by Monetarism as economic policy orientation in the late 1970s/early 1980s, and German and US monetary policy has been imprinted by monetarist theory since the early 1980s (Arestis/Chortareas 2006, Bernanke/Mishkin 1992, Bhaduri/Steindl 1985).

[23] See Table A2 in the appendix.

However, this approach did not yield significant and satisfying results, in particular for Germany. Autoregressive distributed lag (ADL) modelling with OLS-regressions in first differences was chosen instead as the main estimation strategy. Following the general to specific approach (Charemza/Deadman 1997), we started from a general model including several variables and lags, gradually reducing its size by dropping the most insignificant ones until only significant regressors remained.

If not stated otherwise, all regression results passed the White (1980) test for heteroscedasticity, the Ramsey (1969) RESET specification test, the CUSUM parameter stability test, the Doornik/Hansen (2008) test for normality of the residuals and the Breusch (1978)-Godfrey (1978) LM tests for autocorrelation up to order 1, 2 and 3, each at least at the 10 percent significance level.[24] Since the time period under consideration covers more than 45 years, tests for structural breaks in the regressions were also required. Chow (1960) breakpoint tests do not provide any significant evidence for structural breaks in 1982.[25] All estimations and tests have been performed with *Gnu Regression, Econometrics and Time-series Library (gretl), version 1.7.8.*

Investment function

For the US and for Germany, we estimated the investment function given in equation (9) in first differences including three lags of each variable:

$$\Delta g^{I}_{t} = a_0 + \sum_{j=0}^{3} a_{1j}\left(u - u_n\right)_{t-j} + \sum_{j=0}^{3} a_{2j}\Delta h_{t-j} + \sum_{j=0}^{3} a_{3j}\Delta\left(\frac{Z}{pK}\right)_{t-j} + \sum_{j=0}^{3} a_{4j}\Delta\left(\frac{D}{pK}\right)_{t-j} + \sum_{j=1}^{3} a_{5j}\Delta g^{I}_{t-j} + e_t \qquad (19)$$

Capital accumulation is measured by the growth rate of the real net capital stock and is explained by animal spirits, by the deviation of capacity utilisation from its normal rate, by the adjusted net profit

[24] See Table A3 in the appendix.
[25] See Table A4 in the appendix.

share, by net interest payments and net dividend payments. Apart from the profit share, all variables are normalized by the nominal net capital stock. The OLS-regression results of the investment function are summarized in Table 2. Except from the rate of net dividend payments, which does not offer significant coefficients in any of the two countries for the whole period under investigation, all variables show the expected signs.

Since we have used the lagged endogenous variable as a determinant, the long-run effects of the endogenous variables capacity utilisation, the profit share, net interest and of net dividend payments on accumulation have to be calculated.[26] The results are presented in Table 3.

We find a reaction of the accumulation rate to a 1 percentage point change in capacity utilisation of 0.14 percentage points for the US and 0.15 percentage points for Germany. The profit share has also positive impacts on accumulation in both countries. In the US, a 1 percentage point increase in the profit share raises the rate of accumulation by 0.14 percentage points, whereas in Germany, accumulation increases by 0.33 percentage points. Both in the US and in Germany, net interest payments in relation to the capital stock have a considerable impact on the rate of accumulation: In the US a 1 percentage point increase in this ratio will decrease capital accumulation by 0.72 percentage points, in Germany capital accumulation will decline by 1.03 percentage points.

[26] The long-run effect of an explanatory variable x with N lags and significant coefficients $\beta_1, \beta_2, \ldots, \beta_N$ on an endogenous variable y with M lags and significant coefficients $\gamma_1, \gamma_2, \ldots, \gamma_M$ is given by $\frac{\sum_{i=1}^{N} \beta_i}{1-\sum_{i=1}^{M} \gamma_i}$. This long-run effect is significantly different from zero, if the Wald (1943) test allows to reject the null hypothesis of $\sum_{i=1}^{N} \beta_i = 0$ at least at the 10% significance level.

Table 2: OLS-regression results for equation (19): investment function

	USA		Germany	
Dependent variable	Δg_t^I		Δg_t^I	
Constant	0.00	(-0.81)	0.00***[(a)]	(-5.82)
$(u-u_n)_t$	0.30***	(8.70)	0.40***	(9.90)
$(u-u_n)_{t-1}$	-0.18***	(-3.01)		
$(u-u_n)_{t-2}$	-0.14**	(-2.29)	-0.25***	(-5.15)
$(u-u_n)_{t-3}$	0.13***	(3.23)		
Δh_t			0.14***	(3.51)
Δh_{t-1}			0.08*	(1.71)
Δh_{t-3}	0.10*	(1.90)	0.12***	(3.38)
$\Delta\left(\frac{Z}{pK}\right)_t$			-1.03**	(-2.53)
$\Delta\left(\frac{Z}{pK}\right)_{t-3}$	-0.52**	(-2.41)		
$\Delta\left(\frac{D}{pK}\right)_t$			-0.27***	(2.76)
$\Delta\left(\frac{D}{pK}\right)_{t-2}$			0.27**	(2.52)
$\Delta\left(\frac{D}{pK}\right)_{t-3}$			0.25**	(2.47)
Δg_{t-1}^I	0.53***	(3.94)		
Δg_{t-2}^I	-0.25*	(2.89)		
dum75			0.01***	(3.18)
dum81	0.01***	(2.89)		
dum93			0.01***	(3.95)
dum07			-0.01**	(-2.33)
Period	1965-2006		1965-2007	
Observations	42		43	
R-squared	0.88		0.87	
Adj. R-squared	0.84		0.81	

Notes: Δg^I, $u-u_n$, h, $\frac{Z}{pK}$, and $\frac{D}{pK}$ denote the rate of accumulation or real net capital stock, the deviation of the rate of capacity utilisation from its long-run average value, the adjusted net profit share, the rate of net interest payments and the rate of net dividend payments, respectively. dum75, dum81, dum93, and dum07 are dummies for the years 1975, 1981, 1993, and 2007, respectively. Numbers in parenthesis are t-values. *, **, and ***denote the significance level at 10%, 5%, and 1%, respectively.
[(a)] Coefficient has been rounded off to 0, although it is significantly different from 0.
Data Sources: See Table A1

Table 3: The long-run determinants of the accumulation rate

$g^I = \alpha + \beta(u - u_n) + \tau h + \theta_i \frac{Z}{pK} + \theta_d \frac{D}{pK}$

	USA	Germany
α	0.00	0.00
β	0.14	0.15
τ	0.14	0.33
θ_i	-0.72	-1.03
θ_d	0.00	0.00[(a)]

Notes: The values of the coefficients have been derived from the coefficients of the estimated accumulation function presented in Table 2.
[(a)] The Wald (1943) test does not allow to reject the null hypothesis that the sum of the coeffcients of the significant lags is different from 0 at the 10% significance level.

Our results for the two countries are basically in line with recent findings in the macro-econometric literature on investment,[27] but they add to these results because of the significant and robust negative effects of interest payments on investment we obtained in addition to the effects of capacity utilisation and the profit share. This has previously only been found in micro-econometric investment estimations.[28] The only macro-econometric exception is van Treeck's (2008) estimation on the US (1965-2004) in which he finds significantly negative effects of both interest and dividend payments, each in relation to the capital stock, a significantly positive effect of GDP growth, but no effects of the profit share on the rate of capital accumulation in an ADL error correction model applying the method suggested by Pesaran/Shin/Smith (2001). Hein/Ochsen (2003), who estimated the determinants of the growth rate of real gross capital stock for Germany (1961-93) and the US (1962) in a simple OLS estimation with a trend and a first-order autoregressive term, find a significantly positive effect of GDP growth, which is their indicator for capacity utilisation, of similar magnitude for both countries. However, the rate of interest as an indicator of interest payments, on the one hand, and opportunity costs of investment, on the other hand, has only a significantly negative effect in Germany, but not in the US. The profit share has no significant effect on investment in both countries. Stockhammer (2004c) applies partial adjustment models (PAM)

[27] For a comparison with further empirical results based on estimations of a Kaleckian investment function see the survey in Hein/Vogel (2008).
[28] For estimation results related to similar investment functions using micro data see, for example Fazzari/Hubbard/Petersen (1988), Hubbard (1998), Ndikumana (1999), Gander (2008), and Orhangazi (2008).

and ADL models to four different countries. The results indicate a positive effect of capacity utilisation, the de-trended capital productivity in his model – similar to our procedure – for Germany (1963-90), which is stronger than in our model, and a very small positive effect of the profit share, too. However, in Germany neither interest and dividend income of non-financial business, an indicator for financial activities of non-financial business with supposedly negative effect on real investment in his approach, nor dividend and interest payments of this sector have a significant effect on real accumulation. For the US (1963-90), however, dividend and interest receipts have a significantly negative effect, but payments to rentiers have not, and neither capacity utilisation nor the profit share have a significant effect on real investment in non-financial business. Naastepad/Storm (2006-07) estimated the log of the investment share in GDP as a function of the profit share and of real GDP, both variables entering the model in lagged logs, further including autoregressive processes where necessary, for several OECD countries from 1960 to 2000. For the US and for Germany, they find a statistically significant effect of the profit share, but real GDP, as an indicator for demand, only has a significant effect in the US, but not in Germany. Effects of interest or dividend payments are not included in their estimations. The lack of statistically significant effects of the demand variables in Stockhammer's (2004c) estimations for the US and Naastepaad/Storm's (2006-7) results for Germany casts some doubts regarding reliability, because 'conventional wisdom' in estimating investment equations usually tells us that the demand variable should have strong and statistically significant effects, whereas profitability and interest rates or capital costs variables usually perform much weaker.[29] This is also the result, Hein/Vogel (2008) obtain for several countries for the period 1960-2005. For Germany and the US, they estimate log investment as a function of log real GDP, the adjusted profit share, and the long-term real rate of interest, each in first differences in order to avoid spurious regressions in the face of non-stationary time series, in a PAM. Neither the rate of interest nor the profit share has a significant effect on

[29] See the surveys by Jorgensen (1971) and Chirinko (1993), and the more studies by Ford/Poret (1991), Bhaskar/Glyn (1995) and Ndikumana (1999).

capital formation in these two countries, whereas real GDP has extraordinarily large effects. However, these may be overstated due to endogeneity problems in the specification of the investment function. Hein/Vogel (2009) correct for this problem in an ADL approach for Germany (1960-2005) and estimate the share of investment in GDP as a function of real GDP growth and the profit share. GDP growth has significantly positive effects, whereas the profit share is only "weakly significant".[30] Finally, Stockhammer/Hein/Grafl (2009) estimated the log of investment as a function of log real GDP, log profits and the long-term real rate of interest, each in first differences, augmented by an AR(1) process for Germany (1970-2005). They find statistically significant positive effects of GDP and negative effects of the interest rate on investment, but no significant effects of profits.

Saving function

In our model, saving consist of two parts: firms' and households' savings. Retained earnings are saved by definition. Hence, we focus on the determinants of private households' saving (S_H) in our estimations in order to obtain the propensity to save out of rentiers' income and the propensity to save out of wages. For the US, we estimated the following model in first differences applying the general to specific estimation strategy:

$$\Delta\left(\frac{S_H}{pK}\right)_t = a_0 + \sum_{j=0}^{2} a_{1j}\Delta\left(\frac{W}{pK}\right)_{t-j} + \sum_{j=0}^{2} a_{2j}\Delta\left(\frac{Z+D}{pK}\right)_{t-j} + \sum_{j=0}^{2} a_{3j}\Delta\left(\frac{PI}{pK}\right)_{t-j} + \sum_{j=0}^{2} a_{4j}\Delta\left(\frac{RI}{pK}\right)_{t-j} + \sum_{j=0}^{2} a_{5j}\Delta\left(\frac{TrI}{pK}\right)_{t-j} + \sum_{j=0}^{2} a_{6j}\Delta\left(\frac{TrP}{pK}\right)_{t-j} + \sum_{j=1}^{2} a_{7j}\Delta\left(\frac{S_H}{pK}\right)_{t-j} + a_8\psi_t + e_t \quad (20a)$$

In the statistics saving of private households consist of saving out of compensation of employees (W), out of net interest and dividend income (Z+D), out of proprietors' income (PI), out of personal

[30] The Wald test fails to confirm that the sum of the lagged and the contemporaneous effects of the profit share, each of them statistically significant, is different from zero.

rental income (RI), and out of transfer income (TrI). Since all of these types of income are gross values, the amount of tax and transfer payments (TrP) may also affect households' saving. In order to estimate coefficients that are consistent with our theoretical model, we normalized all variables with the nominal capital stock. A deterministic time trend ($a_8\psi_t$) has been added to the model in order to account for linear, non-stochastic change in saving behaviour of private households. Note that we make no difference between saving out of interest and saving out of dividend income and just consider it as saving out of rentiers' income. The regression results are to be found in Table 4.

For Germany, the regression analysis in first differences did not offer significant results. Hence, we followed the modelling approach by Hein/Ochsen (2003) who estimated their saving function as an OLS-regression in levels, included a deterministic time trend as well as a first-order autoregressive process and applied Newey/West (1987) t-statistics to cope with remaining autocorrelation and heteroscedasticity problems (Davidson/MacKinnon 1993).[31] We estimated the following saving function, eliminated insignificant variables and re-estimated the function until only significant regressors were left:

$$\left(\frac{S_H}{pK}\right)_t = a_1\left(\frac{W}{pK}\right)_t + a_2\left(\frac{Z+D}{pK}\right)_t + a_3\left(\frac{PI}{pK}\right)_t + a_4\psi_t + a_5 e_{t-1} + \varepsilon_t . \qquad (20b)$$

Saving of private households related to the capital stock are explained by compensation of employees, net interest and dividend income, and by proprietors' income, each variable related to the nominal capital stock. The deterministic time trend and the stochastic first-order autoregressive process are captured by $a_4\psi_t$ and $a_5 e_{t-1} + \varepsilon_t$, respectively.[32] The regression results for Germany are

[31] After the deterministic time trend and the first-order autoregressive process have been added to our model, non-stationarity of the error terms was not a problem anymore. This is confirmed by the Augmented Dickey-Fuller test on a unit root in the error term which yields a test-statistic of -7.06, allowing to reject the null hypothesis of a unit root within the 1% significance level.

[32] The first-order autoregressive process is $e_t = a_5 e_{t-1} + \varepsilon_t$.

also presented in Table 4.

From the estimated coefficients of the households' saving function we can again derive the long-run determinants in Table 5. As expected, the propensity to save out of rentiers' income is considerably higher than out of labour income: In the US the propensity to save out of wages is 0.09 and the propensity to save out of rentiers' income amounts to 0.76, whereas the respective values for Germany are 0.13 and 0.6. For Germany, the quality of the estimation may be low, as the CUSUM test suggests low parameter stability.

Our results do not deviate much from previous macro-econometric estimations of propensities to consume or to save out of different types of income for the countries and time period under consideration, and add some insights into the propensity to save out of rentiers' income. Hein/Ochsen (2003) estimated the share of saving of private households in national income as a function of the wage share and the share of interest income in national income in the way described above. They do not find a significantly positive propensity to save out of wage income, neither for the US nor for Germany. Their propensities to save out of rentiers' income exceed unity in both countries, which is due to their somewhat unrealistic construction of the rentiers' income as the product of the nominal net capital stock and the nominal long-term interest rate, as acknowledged by the authors. Naastepad/Storm (2006-7) estimated propensities to save out of wage income and out of profits for the US and Germany for the period 1960-2000 explaining saving as a proportion of GDP at factor costs. Their estimates for the propensity to save out of wages are close to ours. Although the propensity to save out of total profits should exceed the propensity to save out of rentiers' income from our theoretical point of view, their propensities to save out of total profits are well below our propensities to save out of rentiers' income. This may be due to the fact that they relate saving to GDP and not to national income.

Table 4: OLS-regression results for equations (20a) and (20b): households' saving function

USA			**Germany**		
Dependent variable	$\Delta\left(\frac{S_H}{pK}\right)_t$		Dependent variable	$\left(\frac{S_H}{pK}\right)_t$	
Constant	0.00***[(a)]	(-0.15)			
			$\left(\frac{W}{pK}\right)_t$	0.13***	(19.11)
$\Delta\left(\frac{W}{pK}\right)_{t-1}$	0.11**	(2.08)			
$\Delta\left(\frac{Z+D}{pK}\right)_t$	0.99***	(5.31)	$\left(\frac{Z+D}{pK}\right)_t$	0.60***	(3.95)
$\Delta\left(\frac{PI}{pK}\right)_t$	0.47**	(2.26)			
$\Delta\left(\frac{RI}{pK}\right)_t$	0.85*	(1.93)			
$\Delta\left(\frac{RI}{pK}\right)_{t-1}$	-0.94**	(-2.18)			
$\Delta\left(\frac{TrI}{pK}\right)_t$	0.79***	(3.03)			
$\Delta\left(\frac{TrP}{pK}\right)_t$	-0.48***	(-4.18)			
$\Delta\left(\frac{S_H}{pK}\right)_{t-1}$	-0,31***	(-2.91)			
ψ_t	0.00***[(a)]	(-3.34)	ψ_t	0.00***[(a)]	(-6.14)
			e_{t-1}	0.77***	(9.54)
Period	1963-2007		Period	1961-2007	
Observations	45		Observations	47	
R-squared	0.66		R-squared	0.996	
Adj. R-squared	0.57		Adj. R-squared	0.996	
			DW	1.94	
			White	28.89***	
			CUSUM	-1.85**	

Notes: $\frac{S_H}{pK}$, $\frac{W}{pK}$, $\frac{Z+D}{pK}$, $\frac{PI}{pK}$, $\frac{RI}{pK}$, $\frac{TrI}{pK}$, $\frac{TrP}{pK}$, ψ, and e denote the rate of households' saving, the rate of households' wage income, the rate of households' net interest and dividend income, the rate of proprietors' income, the rate of rental income, the rate of households' transfer income, the rate of households' transfer payments, the time factor, and the residuals, respectively. Numbers in parenthesis are t-values. For Germany, Newey/West (1987) t-statistics have been applied. *, **, and *** denote the significance level at 10%, 5%, and 1%, respectively. DW is the Durbin-Watson statistic. White is the White (1980) test for heteroscedasticity with the null of no heteroscedasticity. CUSUM is the CUSUM test for parameter stability with the null of no changes in parameters. [(a)] Coefficient has been rounded off to 0, although it is significantly different from 0. Data Sources: See Table A1.

Table 5: The long-run determinants of the households' saving rate

$$\frac{S_H}{pK} = s_0 + s_W\left(\frac{W}{pK}\right) + s_Z\left(\frac{Z+D}{pK}\right) + s_{PI}\left(\frac{PI}{pK}\right) + s_{RI}\left(\frac{RI}{pK}\right) + s_{TrI}\left(\frac{TrI}{pK}\right) + s_{TrP}\left(\frac{TrP}{pK}\right)$$

	USA	**Germany**
s_0	0.00	
s_W	0.09	0.13
s_Z	0.76	0.60
s_{PI}	0.36	0.00
s_{RI}	0.00[(a)]	
s_{TrI}	0.60	
s_{TrP}	-0.37	

Notes: $s_W, s_Z, s_{PI}, s_{RI}, s_{TrI}, s_{TrP}$ denote the propensities to save out of wage, rentiers', proprietors', rental, transfer income, and transfer payments respectively. All values have been derived from the coefficients of the estimated saving function presented in Table 4.
[(a)] The Wald (1943) test does not allow to reject the null hypothesis that the sum of the coefficients of the significant lags is different from 0 at the 10% significance level.

Hein/Vogel (2008) estimated log consumption as a function of log compensation of employees and log gross operating surplus, each variable in first difference, for several countries, including Germany and the US for the period 1960-2005. The propensities to save out of total profits calculated from their estimated elasticities are close to our propensities to save out of rentiers' income for both countries. But their propensities to save out of wages are well above ours. Again, deviations may be due to the fact that they use gross profits including depreciations in their estimations. Another reason for the deviation may be the use of the deflator in the estimated consumption function. Whereas Hein/Vogel (2008) used the deflator for private consumption for each variable, in Hein/Vogel (2009) the GDP deflator for an otherwise identical estimation equation of the consumption function for Germany (1960-2005) is applied and a lower propensity to save out of wages and a higher propensity to save out of profits than in their previous study are obtained, which are more in line with our present estimates. Finally, Stockhammer/Hein/Grafl (2009) also estimate real consumption as a function of real compensation of employees and real gross operating surplus for Germany (1970-2005) and obtain a propensity to save out of total profits exceeding our propensity to save out rentiers' income, in line with our theoretical expectation, and a propensity to

save out of wages well above our estimate.

Profit share function

For estimating the interest sensitivity of the profit share, the net interest payments of non-financial business in relation to the nominal net capital stock has been used as a determinant. In addition the following control variables have been applied: the unemployment rate (ur) indicating the relative powers of labourers and firms in the distribution struggle; consumer price inflation ($\hat{p}$) indicating exogenous price shocks and the growth rate of real net domestic income ($\hat{Y}$) as an indicator for demand.

$$\Delta h_t = a_0 + \sum_{j=1}^{2} a_{1j} \Delta \left(\frac{Z}{pK} \right)_{t-j} + \sum_{j=0}^{2} a_{2j} \Delta ur_{t-j} + \sum_{j=0}^{2} a_{3j} \hat{p}_{t-j} + \sum_{j=0}^{2} a_{4j} \hat{Y}_{t-j} + \sum_{j=1}^{2} a_{5j} \Delta h_{t-j} + e_t \qquad (21)$$

Apart from one exception, variables with a unit root entered the model in first differences.[33] The current lag of the rate of net interest payments was dropped in the model in order to avoid negative first-round effects of contractive monetary policies aimed at cooling off the economy. Again, we followed the general to specific estimation strategy. We started with estimating a comprehensive model with up to two lags for each variable, removed the most insignificant one and re-estimated the model until only significant variables remained. Table 6 reports our regression results.

Table 7 displays the long-run determinants of the profit share. Apart from unemployment in Germany, all exogenous variables contribute significantly to the explanation of the profit share in both countries. We are particularly interested in the coefficient capturing the marginal responsiveness of the profit share towards variations in the rate of net interest payments. For both

[33] US-inflation has been used in levels although it exhibits a unit root because it is theoretically implausible why growth rates such as the rate of inflation should have a unit root. Moreover, the power of unit root tests is weak, as stochastic processes can be approximated by trend-stationary processes quite well (Christiano/Eichenbaum 1990).

countries, we find a high sensitivity of the profit share with respect to changes in the firms' net interest costs. In the US, a 1 percentage point increase in net interest payments in relation to the net nominal net capital stock raises the profit share by 2.44 percentage points. In Germany the corresponding effect is 2.16 percentage points. While, on average, the rate of unemployment did not affect the profit share significantly in Germany, unemployment played a significant role in the US. Inflation affected the profit share negatively in both countries. Hence, on average, trade unions were strong enough to compensate for inflation induced losses in the real wage position of labourers. Surprisingly, demand had negative long-run impacts on the profit share in both countries. This puzzling result can be explained by looking at the short-run effects reported in Table 6: In compliance with a Kaldorian distribution effect, the profit share increases with current economic growth, as sticky wages do not immediately respond to the rise in prices. In the succeeding year, however, our results suggest that labour unions are able to enforce the adjustment of nominal wages, which then reduces the profit share.

To our knowledge, our estimations are the first to show a significant effect of changes in interest payments on distribution between capital and labour. It thus lends econometric support to several recent studies which have argued that rising interest payments of non-financial business, associated with monetarist policies in the 1980s and inflation targeting policies since the 1990s, have induced a falling wage share, but have not presented any econometric evidence.[34] Examining the experience in several countries, Rochon/Rossi (2006a, 2006b) have argued that the wage share has decreased more strongly in those countries which have adopted inflation targeting regimes.

[34] For earlier studies in a similar vein see Moore (1989b), Niggle (1989) and Pollin (1986-7).

Table 6: OLS-regression results for equation (21): profit share function

	USA		**Germany**	
Dependent variable	Δh_t		Δh_t	
Constant	0.01**	(2.35)	0.01***	(6.29)
$\Delta\left(\frac{Z}{pK}\right)_{t-1}$	0.96*	(1.89)	2.16*	(1.77)
Δur_t			-0.53***	(-3.29)
Δur_{t-2}	0.34**	(2.61)	0.39**	(2.29)
$\hat{p}_t$			-0.09*	(-1.70)
$\hat{p}_{t-2}$	-0.10**	(-2.25)		
$\hat{Y}_t$	0.24***	(5.80)		
$\hat{Y}_{t-1}$	-0.38***	(-6.30)	-0.39***	(-7.74)
Δh_{t-1}	0.24*	(1.93)		
Δh_{t-2}	0.37***	(3.66)		
dum89	0.02***	(2.90)	0.02***	(3.19)
dum98	-0.02***	(-3.18)		
dum99			-0.02***	(-2.95)
dum00			-0.02***	(-3.10)
Period	1963-2007		1963-2007	
Observations	45		45	
R-squared	0.74		0.76	
Adj. R-squared	0.67		0.70	

Notes: h, $\frac{Z}{pK}$, ur, $\hat{p}$, and $\hat{Y}$ denote the adjusted net profit share, the rate of net interest payments, the unemployment rate, the inflation rate, and the growth rate of real net domestic income, respectively. dum89, dum98, dum99, and dum00 are dummies for the years 1989, 1991, 1998, 1999, and 2000, respectively. Numbers in parenthesis are t-values. *, **, and *** denote the significance level at 10%, 5%, and 1%, respectively. For a description of the data set and its sources, see Table A1.

Table 7: The long-run determinants of the profit share

$$h = \gamma_0 + \gamma_1 \frac{Z}{pK} + \gamma_2 ur + \gamma_3 \hat{p} + \gamma_4 \hat{Y}$$

	USA	Germany
γ_0	0.02	0.01
γ_1	2.44	2.16
γ_2	0.86	0.00[(a)]
γ_3	-0.26	-0.09
γ_4	-0.35	-0.39

Notes: All values have been derived from the coefficients of the estimated profit share function presented in Table 6.
[(a)] The Wald (1943) test does not allow to reject the null hypothesis that the sum of the coefficients of the significant lags is different from 0 at the 10% significance level.

Studying the development of the profit rate of non-financial corporations in France and the US (1960-2001), Dumenil/Levy (2001, 2005) have found that the rise in this profit rate since the early 1980s has been mainly due to the rise in net real interest payments. Excluding these payments from profits, the profit rate of the non-financial corporate sector has remained constant in France and has increased only slightly in the US. In a more general study on 29 OECD countries (1960-2000) focussing on the development of the share of rentiers' income in GDP, Epstein/Power (2003) confirm the results by Dumenil/Levy. Epstein/Power show that the share of rentiers' income in GDP increased at the expense of the wage share in most countries during the 1980s until the early 1990s. In their study, rentiers' income is more broadly defined as the sum of profits of the financial sector plus interest income of the non-financial sector and households. Since nominal interest payments also compensate for capital losses due to inflation, Epstein/Jayadev (2005) have extended the analysis for 15 OECD countries (1960-2000), correcting the share of rentiers' income in GDP for inflation. Applying this method, they mainly confirm the earlier results by Epstein/Power (2003).

Marterbauer/Walterskirchen (2002) have estimated the determinants of the adjusted wage share in Austria, Germany and several other European countries from 1970 to 2000. They used GDP growth, the unemployment rate, inflation and the real long-term interest rate as determinants. For

Germany they find the wage share to be negatively affected by demand and by unemployment; however, they only consider the contemporaneous and no lagged effects which might explain the difference from our results. Inflation shocks have a positive impact on the wage share as in our case, but the real long-term interest rate is not significant in their estimations. However, they have not tried actual interest payments. Argitis/Pitelis (2001) obtained for the USA and the UK in the period 1965-1997 that the nominal interest rate negatively affects the share of industrial profits in both countries. Further determinants are nominal wages and the bargaining power of labour unions, measured by unemployment and strike intensity. Therefore, according to these results, a rise in interest payments to rentiers does not seem to harm the wage share directly but rather seems to compress industrial profits. However, if rising interest payments are accompanied by weakened bargaining power of labour unions and lower wage demands, the redistribution will take place at the expense of labour income. Therefore, at the end of the day their results may come close to ours.

3.4. Interpretation of the estimation results

Having estimated the relevant coefficients in the investment, saving and profit functions we are now in a position to calculate the overall regime the two economies are facing when interest rates change. For this purpose we insert the estimated long-run coefficients from Tables 3, 5 and 7 together with the values from Table 1 for the debt-capital ratio, the profit share and the rate of capacity utilisation, each taken from the statistics, into the equations (16), (17) and (18). In order to examine whether the change in the debt-capital ratio, the profit share and the rate of capacity utilisation between the first and the second sub-period makes any difference, we also calculated the regimes for the two sub-periods, assuming that the estimated coefficients can be applied to both periods – which is rather restrictive as we acknowledge. Before describing the results it is worth noting that the goods market stability condition (12) is fulfilled for both countries, for the total period and for the two sub-periods, as can be seen in Table A5 in the appendix.

In Table 8 the results for the effects of an increase in the real rate of interest on the equilibrium rates of capacity utilisation, capital accumulation and profit for the entire period under investigation, 1960-2007, can be found. Following the theoretical model, we have distinguished between a 'primary effect' deriving from the redistribution between firms and rentiers, holding distribution between capital and labour and hence the profit share constant, and a 'secondary effect' via the impact of a change in the rate of interest on the profit share.

We find that for the whole period the 'primary effect' of a change in the rate of interest on the equilibrium rates of capacity utilisation, capital accumulation and profit via redistribution between firms and rentiers is negative in both countries. For the US also the 'secondary effect' via redistribution between capital and labour is negative throughout the rates of capacity utilisation, capital accumulation and profit. For Germany, however, the secondary effect is negative for the rate of capacity utilisation, but positive for the rates of capital accumulation and profit. This means that in the US aggregate demand, capital accumulation and profits are wage-led, whereas in Germany aggregate demand is wage-led, but capital accumulation and the profit rate are profit-led.

The finding of a wage-led nature of aggregate demand in both countries is in accordance with several recent studies for similar time periods examining the demand regime against the background of the Bhaduri/Marglin (1990) model: Naastepad/Storm (2006-7), Hein/Vogel (2008, 2009) and Stockhammer/Hein/Grafl (2009) find wage-led demand regimes for Germany, even when including the effects of redistribution on net exports which is not considered in our study. For the US, Hein/Vogel (2008) also find aggregate demand to be wage-led, whereas Naastepad/Storm (2006-7) obtain a profit-led demand regime. Here it is not the place to discuss this issue any further, because we are rather interested in the total effect of changes in the rate of interest – as the sum of the 'primary' and the 'secondary effect'.

Table 8: Effects of interest rate variations on the rates of capacity utilisation, accumulation, and profit in the US and Germany, 1960 – 2007

	USA	**Germany**
$\frac{\partial u^*}{\partial i}$	-0.47 – 1.49 = -1.96	-1.27 – 0.55 = -1.82
$\frac{\partial g^*}{\partial i}$	-0.17 – 0.15 = -0.32	-0.53 + 0.16 = -0.37
$\frac{\partial r^*}{\partial i}$	-0.10 – 0.03 = -0.13	-0.26 + 0.26 = 0.00
where		
λ [(a)]	0.15	0.33
h	0.22	0.21
u	0.83	0.53
β	0.14	0.15
τ	0.14	0.33
θ_i	-0.72	-1.03
s_W	0.09	0.13
s_Z	0.76	0.60
γ_1	2.44	2.16

Notes: The effects of an increase in the interest rate on the rates of capacity utilisation, accumulation and profit are derived in equations (16) to (18). λ, h, and u denote the debt-capital ratio, the profit share, and the rate of capacity utilisation, respectively, and are average values over the entire time period taken from the statistics. β, τ, θ_i, s_W, s_Z, and γ_1 are the relevant estimated coefficients from the investment, savings, and profit share function, respectively. The first term in rows 1, 2 and 3 denotes the 'primary effect' of change in the rate of interest via redistribution between firms and rentiers and the second term represents 'secondary effect' via redistribution between capital and labour, i.e. between total profits including interest payments and wages. The sum of these effects gives the total effect on the respective equilibrium.
[(a)] Time series from 1965 to 2005 for Germany and from 1960 to 2006 for the US.

The total effect remains negative for the rates of capacity utilisation, capital accumulation and profits for both countries – apart from the effect on the rate of profit in Germany which is close to zero. Subject to this small exception, both in the US and Germany, the 'normal regime' with respect to the effects of changes in the long-term real rate of interest on the goods market equilibrium seem to prevail. In the US, a one percentage point increase in the real long-term rate of interest decreases capacity utilisation by 1.96 percentage points, capital accumulation by 0.33 percentage points and the rate of profit by 0.13 percentage points. In Germany capacity utilisation decreases by 1.83 percentage points and capital accumulation by 0.37 percentage points whereas the rate of profit does not change in the face of a one percentage point increase in the real long-term rate of interest.

Our results can thus be seen as a development of the findings by Hein/Ochsen (2003) who identify a 'normal regime' for Germany from the 1960s to the mid 1990s, but do not find any response of the rates of capacity utilisation, capital accumulation and profits with respect to the rate of interest for the US in that period. The results generated for the US and Germany in this study also seem to be broadly in line with recent results by Argitis (2009). He presents panel estimation results for annual data of 11 West European countries, Canada and the US in the period 1981-2003 which show that share of interest income of banks in GDP has a negative effect on aggregate demand growth whereas the wage share has a positive impact.

Applying the coefficients estimated for the whole period to the two sub-periods does not change our general results (Table 9). Both the US and Germany are characterised by the 'normal regime' in both sub-periods – with the effect on the rate of profit being close to zero. The US is dominated by wage-led aggregate demand, capital accumulation and profits in both periods, whereas in Germany aggregate demand is wage-led, but capital accumulation and profits are profit-led in both periods. Whereas the US constellation seems to be rather stable comparing the two periods, in Germany 'primary' and 'secondary effects' of changes in the rate of interest seem to weaken due to a drastic decline in the firms' net debt-capital ratio from the first period to the second.

Table 9: The effects of interest rate variations on capacity utilisation, accumulation, and profits in the USA and Germany in two sub-periods

	USA		**Germany**	
	1960-82	1983-07	1960-82	1983-07
$\frac{\partial u^*}{\partial i}$	-0.46 – 1.52 = -1.98	-0.48 – 1.46 = -1.94	-1.68 – 1.15 = -2.83	-0.95 – 0.19 = -1.14
$\frac{\partial g^*}{\partial i}$	-0.16 – 0.16 = -0.32	-0.18 – 0.15 = -0.33	-0.70 + 0.15 = -0.55	-0.39 + 0.15 = -0.24
$\frac{\partial r^*}{\partial i}$	-0.10 – 0.03 = -0.13	-0.11 – 0.02 = -0.13	-0.35 + 0.34 = -0.01	-0.19 + 0.20 = 0.01
where				
λ [(a)]	0.14	0.16	0.44	0.24
h	0.21	0.23	0.21	0.20
u	0.87	0.80	0.62	0.45
β	0.14	0.14	0.15	0.15
τ	0.14	0.14	0.33	0.33
θ_i	-0.72	-0.72	-1.03	-1.03
s_W	0.09	0.09	0.13	0.13
s_Z	0.76	0.76	0.60	0.60
γ_1	2.44	2.44	2.16	2.16

Notes: The effects of an increase in the interest rate on the rates of capacity utilisation, accumulation and profit are derived in equations (16) to (18). λ, h, and u denote the debt-capital ratio, the profit share, and the rate of capacity utilisation, respectively, and are average values over the entire time period taken from the statistics. β, τ, θ_i, s_W, s_Z, and γ_1 are the relevant estimated coefficients from the investment, savings, and profit share function, respectively. The first term in rows 1, 2 and 3 denotes the 'primary effect' of change in the rate of interest via redistribution between firms and rentiers and the second term represents 'secondary effect' via redistribution between capital and labour, i.e. between total profits including interest payments and wages. The sum of these effects gives the total effect on the respective equilibrium

[(a)] Time series from 1965 to 2005 for Germany and from 1960 to 2006 for the US.

4. Conclusions

We have analyzed the effects of interest rate variations on the rates of capacity utilisation, capital accumulation and profit in a simple post-Kaleckian distribution and growth model based on the work of Bhaduri/Marglin (1990), Lavoie (1995) and Hein (2007). Taking the debt-capital ratio as given, this model gives rise to different potential accumulation regimes, depending on the values of the parameters in the investment, saving and distribution function of the model: the 'normal regime' with a negative effect of an increasing interest rate on the endogenously determined rates of capacity utilisation, capital accumulation and profit throughout, a 'puzzling regime' with positive effects throughout, and an 'intermediate regime' with positive effects on the rates of capacity utilisation and profit and negative effects on the rate of capital accumulation. Estimating the core behavioural equations of the model for the US and Germany in the period 1960-2007, we have found significant and robust effects of interest payments – and thus of the long-term rate of interest when the debt-capital ratio is taken as given – with the expected sign in each of the equations: the investment, the saving and the distribution equation. Our estimation results imply, both for the US and for Germany, that the effects of changes in the real long-term rate of interest on the equilibrium rates of capacity utilisation, capital accumulation and profits are characterised by the 'normal regime'. Rising long-term real rates of interest cause falling rates of capacity utilisation, capital accumulation and profits, as well as redistribution at the expense of labour income and hence an increasing profit share in both countries. Since we hold that the monetary policies by central banks, controlling the short-term real rate of interest, also affect the trend level of the long-term real rate of interest, we have shown empirically that monetary policies have long-run demand and growth effects through the distribution channels included in our model, as supposed in many recent theoretical Post-Keynesian models. Restrictive inflation targeting monetary policies inducing a higher level of real short-term and long-term interest rates as well as redistribution at the expense of labour income have contributed significantly to the lower trend rates of capital accumulation and

GDP growth, and to the lower level of capacity utilisation, observed in the period since the early 1980s as compared to the period from the early 1960s to the late 1970s/early 1980s.

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Appendix

Table A1: Description of the data set and of the sources

Capital stock (K)	Real net capital stock of the business sector (OECD EOL 75, 78; o.c.)
Rate of capital accumulation (g)	Growth rate of K
Rate of capacity utilisation (u)	Net domestic income at current market prices of the total economy (AMECO) deflated by the price deflator of gross domestic product at market prices (AMECO) over K
Average or trend rate of capacity utilisation (u_n)	Trend of u extracted using the Hodrick-Prescott filter ($\lambda = 100$)
Profit share (h)	Net operating surplus of the total economy adjusted for imputed compensation of self-employed (AMECO) over domestic income at current factor cost of the total economy (AMECO)
Rate of net interest payments ($\frac{Z}{pK}$)	Interest payments net of interest income of the non-financial business sector (BEA NIPA Tab.7.11; o.c.) over K with K inflated by the price index of gross capital formation of the total economy (AMECO)
Rate of net dividend payments ($\frac{D}{pK}$)	Dividend payments net of dividend income of the non-financial business sector (BEA NIPA Tab.7.10; o.c.) over K with K inflated by the price index of gross capital formation of the total economy (AMECO)
Debt-capital ratio (λ)	Liabilities net of financial assets over tangible assets of the non-financial business sector (FED FOF Tab.B.102, Tab.B.103; BuBa; o.c.)
Saving rate of private households ($\frac{S_H}{pK}$)	Saving of private households (BEA NIPA Tab.2.1; DESTATIS; o.c.) over K with K inflated by the price index of gross capital formation of the total economy (AMECO)
Rate of households' wage income ($\frac{W}{pK}$)	Compensation of employees (BEA NIPA Tab.2.1; DESTATIS; o.c.) over K with K inflated by the price index of gross capital formation of the total economy (AMECO)
Rate of households' net interest and dividend income ($\frac{Z+D}{pK}$)	Interest and dividend income net of interest and dividend payments of private households (BEA NIPA Tab.2.1; DESTATIS; o.c.) over K with K inflated by the price index of gross capital formation of the total economy (AMECO)
Rate of households' proprietors' income ($\frac{PI}{pK}$)	USA: Proprietors' income with inventory valuation and capital consumption adjustments (BEA NIPA Tab.2.1) over K with K inflated by the price index of gross capital formation of the total economy (AMECO); Germany: Income of self-employed and transfers from reserves (DESTATIS, o.c.) over inflated K
Rate of households' rental income ($\frac{RI}{pK}$)	Rental income of persons with capital consumption adjustment (BEA NIPA Tab.2.1) over K with K inflated by the price index of gross capital formation of the total economy (AMECO)
Rate of households' transfer income ($\frac{TrI}{pK}$)	Personal current transfer income (BEA NIPA Tab.2.1; o.c.) over K with K inflated by the price index of gross capital formation of the total economy (AMECO)
Rate of households' transfer payments ($\frac{TrP}{pK}$)	Personal current transfer payments (BEA NIPA Tab.2.1; o.c.) over K with K inflated by the price index of gross capital formation of the total economy (AMECO)
Unemployment rate (ur)	Unemployment rate (OECD EOL 82)
Rate of inflation ($\hat{p}$)[(i)]	Growth rate of deflator of private final consumption expenditure (OECD EOL 82; o.c.)
Real output growth ($\hat{Y}$)[(a)]	Growth rate of the net domestic income at current market prices (AMECO) deflated by the price deflator of gross domestic product at market prices (AMECO)
Real long-term interest rate (i)[(a)]	Long-term interest rate on government bonds (OECD EOL 82) minus the growth rate of the gross domestic product deflator (OECD EOL 82; o.c.)

Notes: OECD EOL stands for OECD Economic Outlook (http://stats.oecd.org, download 08/2008); AMECO for annual macro-economic database of the European Commission's Directorate General for Economic and Financial Affairs (http://ec.europa.eu/economy_finance/db_indicators/db_indicators8646_en.htm, download 08/2008); BEA NIPA for Bureau of Economic Analysis, National Income and Product Accounts (http://www.bea.gov/national/nipaweb/index.asp, download 08/2008); FED FOF for Federal Reserve, Flow of Funds (http://www.federalreserve.gov/releases/z1/Current/data.htm, download 08/2008); DESTATIS for Statistisches Bundesamt Deutschland (Fachserie 18, 1997, 2008; https://www-genesis.destatis.de/genesis/online/logon?language=en, download 08/2008); BuBa for the German Bundesbank (Statistische Sonderveröffentlichung, o.c. stands for own calculations; [(a)] United Germany unification since 1992

Table A2: Augmented Dickey-Fuller unit root tests

	USA		**Germany**	
	in levels[(b)]	in first differences[(a)]	in levels[(b)]	in first differences[(a)]
g	-1.94	-6.02***	-2.31	-4.02***
$(u - u_n)$	-5.55***[(i)]		-5.37***[(a)]	
h	-2.31	-6.46***	-2.07	-5.33***
$\frac{Z}{pK}$	-2.26	-4.47***	-1.50	-6.14***
$\frac{D}{pK}$	-0.29	-13.24***	-0.59	-6.34***
λ	-0.50	-3.04**	1.35	-5.13***
$\frac{S^H}{pK}$	0.55	-8.74***	-0.84	-6.51***
$\frac{W}{pK}$	-1.00	-2.20**	-1.85	-4.03***
$\frac{Z+D}{pK}$	-0.92	-4.52***	-0.89	-3.24***
$\frac{PI}{pK}$	-1.72	-4.78***	-2.45	-3.89***
$\frac{RI}{pK}$	-2.47	-2.73***		
$\frac{TrI}{pK}$	-0.21	-3.79***		
$\frac{TrP}{pK}$	-0.65	-5.07***		
ur	-2.80[(c)]	-5.47***	-1.24	-4.27***
$\hat{p}$	-1.70	-6.55***	-3.03**	
$\hat{Y}$	-5.40***		-4.86***	

Notes: The variables in order of appearance denote the accumulation rate, the deviation of capacity utilisation from its normal rate, the adjusted net profit share, the rate of net interest payments, the rate of net dividend payments, the debt-capital ratio, household saving over the capital stock, compensation of employees over the capital stock, net interest and dividend income over the capital stock, proprietors' income over the capital stock, rental income over the capital stock, transfer income over the capital stock, transfer payments over the capital stock, the unemployment rate, inflation, and the growth rate of net domestic income, respectively. We tested down from the maximum lag order 3. *, **, and *** denote the significance level of 10%, 5%, and 1%, respectively. The critical values are taken from MacKinnon (1996). For a discussion of the data set and its sources, see table A1.

[(a)] ADF test without constant

[(b)] ADF test with constant

[(c)] ADF test with constant and trend

Table A3: Various econometric standard tests

	USA	**Germany**
Investment function (equation (19)): Specifications of Table 2		
White	5.87	20.97
RESET	-2.51	1.04
CUSUM	-0.19	1.38
Normality	1.65	0.32
Breusch-Godfrey L(1)	1.41	0.00
Breusch-Godfrey L(2)	1.97	0.09
Breusch-Godfrey L(3)	1.38	0.97
Savings function (equation (20a) and (20b), respectively): Specifications of Table 4		
White	9.48	28.89***
RESET	0.68	0.67
CUSUM	0.65	-1.85*
Normality	3.99	0.08
Breusch-Godfrey L(1)	0.03	0.02
Breusch-Godfrey L(2)	0.37	2.81*
Breusch-Godfrey L(3)	0.25	1.85
Profit share function (equation (21)): Specifications of Table 6		
White	9.51	19.24
RESET	0.40	0.53
CUSUM	0.18	-1.06
Normality	0.28	4.84*
Breusch-Godfrey L(1)	0.00	0.42
Breusch-Godfrey L(2)	0.68	0.25
Breusch-Godfrey L(3)	0.84	0.82

Notes: Apart from the constant, only significant variables are considered in the tests, as all insignificant variables have been omitted according to the general to specific approach. *, **, and *** denote the significance level of the test statistics at 10%, 5%, and 1%, respectively. *White* is the White (1980) test for heteroscedasticity with the null of no heteroscedasticity. *RESET* is the Ramsey (1969) Regression Equation Specification Error Test (RESET) with the null of a correct specification of the model. *CUSUM* is the CUSUM test for parameter stability with the null of stable parameters. *Normality* is the Doornik and Hansen (2008) test for normality applied on the residuals with the null hypothesis of no normality. *Breusch-Godfrey L(i)* (i=1, 2, 3) is the Breusch (1978)-Godfrey(1978) serial correlation LM test with the null of no autocorrelation of any order up to i in the residuals.

Table A4: Chow breakpoint tests

	USA	Germany
Investment function (equation (19)): Specifications of Table 2		
Year	1982	1982
Test statistic	1.07	0.62
P-value	0.41	0.78
Savings function (equation (20a) and (20b), respectively): Specifications of Table 4		
Year	1982	1982
Test statistic[(a)]	0.79	3.69
P-value	0.64	0.45
Profit share function (equation (21)): Specifications of Table 6		
Year	1982	1982
Test statistic	0.76	1.54
P-value	0.64	0.19

Notes: The Chow tests have been applied for 1982. Apart from the constant, only significant variables are considered in the tests, as all insignificant variables have been omitted according to the general to specific approach.
[(a)] As we estimated the savings function for Germany applying Newey and West (1987) t-statistics, the test statistic of the Chow test is chi-squared distributed.

Table A5: Stability of the goods market equilibrium

Stability condition (12): $s_W + (1 - s_W)h - \beta > 0$

Entire period		
USA	1960-2007	$0.09 + (1 - 0.09) * 0.22 - 0.14 = 0.15 > 0$
Germany	1960-2007	$0.13 + (1 - 0.13) * 0.21 - 0.15 = 0.16 > 0$
Sub-periods		
USA	1960-1982	$0.09 + (1 - 0.09) * 0.21 - 0.14 = 0.14 > 0$
	1983-2007	$0.09 + (1 - 0.09) * 0.23 - 0.14 = 0.16 > 0$
Germany	1960-1982	$0.13 + (1 - 0.13) * 0.21 - 0.15 = 0.16 > 0$
	1983-2007	$0.13 + (1 - 0.13) * 0.20 - 0.15 = 0.15 > 0$

Notes: s_W, h and β denote the propensity to save out of wage income, the adjusted net profit share and the elasticity of investment with respect to capacity utilisation, respectively. Values are taken from Tables 1, 3, and 5, respectively.