WORKERS AND ENTERPRISES DEBT IN A BASIC POST-KEYNESIAN – CLASSICAL MODEL OF GROWTH AND INCOME DISTRIBUTION

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1. INTRODUCTION

In this paper we develop a basic Post-Keynesian – Classical model of growth and income distribution in order to reveal the channels through which financial activities may affect income distribution. By doing so, we follow Marx’s analysis in Volume III of Capital (part IV) and assume that there are three classes: industrial capitalists, financial capitalists and workers. One channel by which financial variables affect income distribution is through the debt-financed consumption while the other is through the debt-financed investment. This model is an extension of Dutt’s (2004 [2006]) Post Keynesian-Steindlian model of growth and income distribution, in order to incorporate the class of financial capitalists who own commercial banks and are the sole providers of credit money to the working class and to the industrial capitalist class that invests to fixed capital but do not consume. The functioning and stability of the macro system is both dependent on industrial capitalists and workers’ indebtedness, with the later being closer to play a destabilizing role.

There is no commonly accepted definition of the financial capitalist class. This discussion has its roots at the times of Tooke and Mill. Financial (“moneyed”) capitalists are considered in various ways: as rentiers, shareholders, financiers, bankers, even workers with deposits.

1 This distinction has its roots in Marx’s distinction between the circuit of revenue, C-M-C, and the circuit of capital, M-C-M’, (with C for commodities and M for money). In the circuit of revenue, consumption and the conversion of money into commodities is the end-selling in order to buy (Marx, 1990, ch.4). Both wages and financial income, either in the form of dividends and interest on deposits or in the form of credit, are spent for consumption goods at the current period (wages and credit) or for future consumption and contingencies (deposits and other financial assets). In the circuit of capital, however, money is the end in-it-self; buying in order to sell at a higher value (Marx, 1990, ch.4). Enterprises use either their retained earnings in order to accumulate and obtain a higher value than the initial. With the earnings of this process they pay profits, dividends to the stockholders and interest to banks. So, as this distinction between the circuits of revenue and capital, implies that household and business savings are fundamentally different in purpose (Shaikh, 2009, p. 478), the same can be argued that holds about households and business borrowing, i.e. workers borrow to finance consumption while industrial capitalists (given they have run out of retained earnings) borrow to finance investment.
Following the Marxian literature, we define financial (“moneyed’) capitalists as consisting of the independent social class of bankers.

In this literature some focus on the antagonistic relations between financial and industrial capitalists (Bhaduri, 1986). Bhaduri (1983) in his discussion of the differences between productive and unproductive investment also gives some insights that under certain conditions could be related to the relations between financial and industrial capitalists. Panico (1980; 1988) and Pivetti (1985) discuss the effects of financial variables (personified as financial capitalists) on pricing and hence distribution and accumulation.

More recently, in Lapavitsas (2009) financial capitalists are considered as a subsection of the capitalist class identified with the rentier class. In the post-Keynesian literature one can find a variety of interpretations. Stockhammer (2004) in his analysis of the effects of financialization on capital accumulation emphasizes the internal power structure of the firm and based on the post-Keynesian theory of the firm identifies rentiers with shareholders. Orhangazi (2008) also resides in the same theoretical context. Epstein et al. (2002, 2003, 2007) stand somewhere between the previous two approaches since rentiers’ income is loosely defined as “income that accrues from financial market activity and the ownership of financial assets”. In Hein (2006) bankers and rentiers are two distinct classes with the latter providing savings to the bankers who in their turn lend industrial capitalists.

Our economy is a mature monetary economy. The key idea is that investment and consumption are partly financed by borrowing from the banking system, i.e. commercial banks that are owned by financial capitalists, and as a result borrowers must pay interest on loans to their lenders. This process generates credit money endogenously. Interest payments on outstanding loans are assumed to be a “cost of production” for industrial capitalists and an expense for workers, while at the same time they constitute a flow of income for financial capitalists. It is also assumed, that financial capitalists are the only institutional providers of loans to industrial capitalists and workers and that workers and industrial capitalists cannot lend directly to each other. Loans provided to industrial capitalists are long-term loans; they have a maturity period longer than one year or a production period. We assume away any other source of investment finance like corporate bonds and share issuance. Loans provided to workers are either short (credit cards, consumer loans etc) or long (housing loans) term, and

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2 “Though Marx did not use the term in this context, ‘moneyed’ capitalists are essentially rentiers, in contrast to active capitalists who borrow capital to generate profits” (Lapavitsas, 2009, pp. 24).
they have maturity period longer than one year. We assume also that the only source of income for the working class is wages, neglecting any dividends coming from ownership of shares of stock and interest income accruing from deposits. Thus, workers and industrial capitalists in every production period repay some part of their existing debt. Financial capitalists on the other hand, do not borrow and so they have no interest payments. Whilst we incorporate financial sector’s activities in our model, we focus more on their impact on real variables and income distribution abstracting from some very interesting and fruitful considerations. As a result, there is no treatment of banking activities and services that until recently tended to expand rapidly and now constitute an increasingly significant part of either firms’ production costs or workers’ expenses while at the same time they are an important source of revenue for financial capitalists like fees and securitization activities.

In the basic model, we assume a closed economy without any state intervention. The only institution that can intervene is the Central Bank that sets the rate of interest and provides the necessary reserves for the financial sector when needed in pursuing its ultimate responsibility of ensuring the liquidity of the system. Nonetheless, it will not appear explicitly. By doing so, we imply two things. The rate of interest is exogenously given and the Central Bank when needed intervenes as a lender of last resort. This activity assures that industrial capitalists and workers will always have access to the credit demanded yet as we shall argue in more detail later, extreme scenarios can occur where workers get so deeply indebted, generating instability that might lead to interest payment suspension.3

2. STRUCTURE OF THE MODEL

The economy produces a single good with two factors of production, homogeneous labour (L) and capital stock (K). A fixed proportions production function is assumed and the production coefficients are assumed constant. Labour is abundant due to the hypothesis of the existence of the “reserve labour army” and grows at an exogenously given rate. Hence, output Y is constrained by the amount of the capital stock of the economy K. Firms, in the short run function with excess capacity. Finally, the stock of capital (K) at a point in time is taken to be fixed and there is no depreciation of capital for simplicity.

Then the issue arises of the correlation of forces in the class struggle context that will determine whether the Central Bank will take action to rescue financial capitalists or the Government will redistribute income from capitalist to workers.
Net National product is equal to the sum of consumption and investment and it is distributed between wages and gross profits:

\[ Y = wL + \Pi \]  

(1)

where \( Y \) is net national product, \( w \) is the exogenous wage rate and \( \Pi \) is the gross profit. Gross profits are distributed to the owners of the capitalist firm as profits of enterprise and to the lenders of the capitalist firm as interest payments. Industrial capitalists pay dividends to the stakeholders of the company and they save the rest of the profits of the enterprise i.e. the retained profits. The retention ratio (or the business propensity to save) \( s \) is assumed constant. Retained profits are saved in order to finance future investment plans. In contrast, dividends are used by their owners (members of the capitalist class) for consumption. For reasons of simplicity, also, we assume away any other source of income of financial capitalists except from interest payments\(^4\).

\[ \Pi = IndPr + iD_i \]  

(2)

Profits of Enterprise = Retained Profits + Dividends

\[ \Pi = \frac{IndPr + iD_i}{IndPr} \]  

(3)

where \( IndPr \) are the profits of enterprise, \( iD_i \) are interest payments with \( i \) denoting the rate of interest and \( D_i \) industrial capitalists’ debt that is assumed constant in the short-run, \( R \) denotes the retained profits, \( Div \) are the dividends.

The profit share for industrial capital is defined as:

\(^4\) Financial capitalists’ income, as will become explicit later, is assumed equal to the sum of interest payments accruing by industrial capitalists and workers.
\[ \sigma = \frac{Ind \ Pr}{Y} \]  

The rate of profit of enterprise is defined as:

\[ r = \frac{Ind \ Pr}{K} = \left( \frac{Ind \ Pr}{Y} \right) \left( \frac{Y}{Y'} \right) \left( \frac{Y'}{K} \right) = \sigma u \frac{1}{\nu} \]  

(5)

From Equation 6 follows that the rate profit of enterprise which is the ratio of the profit of enterprise (gross profits minus interest payments) to the capital stock \( K \) can be written as the product of the industrial profit share \( \sigma \), the endogenously determined rate of capacity utilization \( u = \frac{Y}{Y'} \), and the reciprocal of the capital-potential output ratio \( \nu = \frac{K}{Y'} \), with \( Y' \) being the potential output.

Since we abstract from changes in technology, wages and working conditions the capital-potential output ratio \( \nu = \frac{K}{Y'} \) is constant. Hence, changes in capacity utilization will be the same either measured by the output to potential output ratio \( u = \frac{Y}{Y'} \) or the output to capital stock ratio \( u = \frac{Y}{K} \) (Dutt, 2006).

National income equals the sum of the net profit income, (or profit of enterprise \( Ind\ Pr \)), the interest income \( FinI \) and the net wage income \( (wL)_n \).

\[ Y = \left[ \Pi - iD_f \right] + \left[ wL - iD_w \right] + FinIn = Ind \ Pr + FinIn + (wL)_n \]  

(6)

Obviously, interest income at any point in time is equal to the sum of interest payments of workers and of industrial capitalists (eq.7).

\[ FinI = iD_f + iD_w = iD \]  

(7)

For simplicity, and since financial capitalists are identified with banks and financial institutions, we assume that they do not consume any of their income as a class and that they save it in order to lend workers and enterprises. Considering the interest rate, we follow the post-Keynesian horizontalist monetary view and assume that the interest rate is an exogenous
variable for the accumulation process, whereas the quantities of credit are determined endogenously. Since for now we assume away inflation there is no difference between nominal and real interest rates. Interest rate is assumed to be controlled by the Central Bank. In any case, in the short run it is assumed to be fixed\(^5\) and whenever any change in the interest rate due to commercial banks initiative occurs it will be explicitly referred. We should also note that the interest rate is assumed to be the same, whether it concerns credit for consumption of durable goods or home purchases by workers or credit for investment in fixed capital.

**WORKERS**

We assume that workers borrow to finance part of their consumption. Thus, we depart from the standard Kaleckian assumption that workers spend what they earn. As a result, wage income splits into net wage income and workers interest payments which is financial capitalists income derived by workers. Thus, net wage income\((wL)_n\) is wage income \((wL)\) minus interest on debt payments \((iD_w)\).

\[
(wL)_n = wL - iD_w
\]  

(8)

Taking into account the distribution equation workers’ net wage is:

\[
(wL)_n = Y(1 - \sigma - id_w) - iD_w
\]  

(9)

Workers’ consumption is financed by their net wage income and through new borrowing. By assumption all their net wage income is consumed. So, consumption is equal to the sum of their net income \((wL - iD_w)\) and their rate of change of debt which is their amount of new borrowing \((\frac{dD_w}{dt})\). Interest payments have a negative effect on workers’ current consumption.

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\(^5\) The endogeneity of credit money in the economy implies that the interest rate is a monetary phenomenon determined largely by central banking policy as opposed to its determination by the real forces of surplus, as in classical writers, or productivity and thrift, as in neoclassical theory (Dutt, 1992). This theoretical approach follows the writings of Marx and Keynes (Panico, 1988). The relevance of this view with the contemporary banking system is a commonplace among many varieties of post-Keynesians. This view, for some is grounded on the fact that the banking system when reaching a sufficiently advanced stage, it may satisfy any additional demand for credit, so that that the supply of money becomes endogenous (Chick, 1986).
We denote with $C_w$ workers borrowing-induced consumption, following Dutt’s (2006) terminology. Thus,

$$C_w = Y(1 - \sigma - \eta_i) - iD_w + \frac{dD_w}{dt} \quad (10)$$

Another way of seeing this equation is by considering workers’ net borrowing i.e. $C_w - Y(1 - \sigma - \eta_i) = \frac{dD_w}{dt} - iD_w$, as the difference between workers’ new borrowing minus the interest payments which is equal to the level of consumption minus the wage income. In this sense, any positive difference between consumption and wage income must be financed by an injection of consumer credit (positive net borrowing), while any negative difference would reduce current borrowing in relation to workers’ interest payments that would be serviced by the excess wage income (savings). Of course, if consumption equals wage income, then new borrowing would equal to interest payments which means that workers will borrow exactly an amount equal to their outstanding debt obligations.

We assume that workers’ debt adjusts to new borrowing according to the following:

$$B_w = \frac{dD_w}{dt} \quad (11)$$

Workers’ desired borrowing ($B_w^d$), is determined by the following partial adjustment mechanism:

$$B_w^d = \beta_1 (w^*L - wL) + \beta_2 (\text{InPay}^* - iD_w) \quad (12)$$

in which, $\beta_1$ and $\beta_2$ are two constant adjustment coefficients that take values between zero and the unity ($0 < \beta_1, \beta_2 < 1$). These coefficients might be determined either by the workers or the bankers or both. $w^*$ is the wage target that workers set according to the socially determined standard of living or in a similar way the “conventional wage” Marglin (1984) that corresponds to the socially and historically acceptable living standard. The wage target $w^*$ is determined by social conditions and in periods of intense income inequality together with conspicuous consumption from the upper income class it tends to be higher than the real wage. This induces workers to borrow in order to reach the desired levels of consumption. By
that it is not meant that workers buy luxury goods but rather that they tend under certain circumstances to consume more than they would under ordinary conditions. There is also the possibility that some workers although they are poor it is offered to them cheap money in order to satisfy some of their basic needs. This is obviously the case of the last 10 or more years were credit was provided to the lower income workers.

This notion is similar with the terms conventional wage that we find in Marglin (1984) and the subsistence wage used by classical economists such Marx, Smith and Ricardo. Yet, even though the latter referred to the biological as well as the historical and cultural connotations of the term, we also take into account the effect of upper classes conspicuous consumption has on the composition of workers needs and the potentiality of satisfying them that credit offers.

\( \text{InPay}^* \) is the maximum level of interest payments that workers consider they can afford to pay in every period. \( \text{InPay}^* \) is a fraction of workers’ wage of the form \( \text{InPay}^* = \lambda^* w_L \), where \( \lambda^* \) is the interest burden on income which is assumed as constant and between zero and unity\(^6\). \( \lambda^* \) is considered to show workers’ maximum affordable interest payments as a percentage of their disposable income. Moreover is captures workers’ prudency in their borrowing behavior, which means that a large \( \lambda^* \) represents a careless borrower while a low a prudent one. For now we assume that it is constant, avoiding the discussion of a possible bankruptcy. Of course, we assume that even a large \( \lambda^* \) (i.e. a large amount of current income going to interest payments) is considered by the bankers as acceptable and still consider their customers creditworthy; otherwise there would be no meaning to discuss it\(^7\). Thus, equation 18 becomes:

\[\text{InPay}^* = \lambda^* w_L.\]

\(^6\) In fact, \( \lambda \) is by far below unity.

\(^7\) However, if we suppose that a large increase in wages takes place, this might create optimistic expectations and as a result an increase of \( \lambda^* \) (workers become less “prudent” according to the definition above and over borrow). By doing this, workers would be exposed to the risk of bankruptcy in the event of a sudden decrease in wages, being forced to pay interest payments they cannot afford. In Minsky’s terms this is a Ponzi-type borrowing. According to Minsky’s (1982, pp. 30) considerations, “a consumer and mortgage debt can become Ponzi-type only if actual wage income falls short of anticipated and other sources of disposable income, for example, unemployment insurance, do not fill the gap. A growing number of indebted workers should fall in this financing condition as a substantial decline in income and employment takes place”.

A situation like that would put workers into a vicious cycle of debt (“debt trap”) that will only stop either by filing for bankruptcy procedures which is very possible to be rejected or through an increase in wages that will allow them to service their debts or a substantial decrease in the interest rate together with a (hair) cut in the outstanding debt even if this sounds extremely unlikely. However, from the point of view of financial institutions
\[ B^d_w = \beta_1 (w^L - wL) + \beta_2 (\lambda^* wL - iD_w) \] (12’)

Inserting (9) into (12’) we get:

\[ B^d_w = \beta_1 (w^L - Y(1 - \sigma - id)) + \beta_2 (\lambda^* Y(1 - \sigma - id) - iD_w) \] (12’’)

Equation 18’ says that whenever current wage increases desired borrowing by workers will decrease by a rate \( \beta_1 \) due to fall in the first term of right part of the equation, but will tend to increase due to the increase in the second term \( \lambda^* wL \). Thus, the rate of decrease of desired borrowing as a result of an increase in wage is \(- (\beta_1 - \beta_2 \lambda^*)\) as shown in the rearranged equation 12’’ presented below:

\[ B^d_w = -\left(\beta_1 - \beta_2 \lambda^*\right)(1 - \sigma - \beta_2)Y - \beta_2 iD_w + \beta_1 w^L \] (12’’’)

where it is assumed that \( \beta_1 > \beta_2 \lambda^* \). If wages increase to such an extent that exceed the conventional wage, desired borrowing would decrease but \( B^d_w \) will become negative only if, ceteris paribus, the amount of this decrease exceeds the increased difference between the maximum affordable interest payment and the actual interest payment. In the opposite situation, if workers see their wages decreasing they will desire to catch up with their

it is more possible that they will stop providing credit as soon as the defaults start to spread to a larger proportion of customers. In our model this can happen through the control of \( \beta_1 \) and \( \beta_2 \).

It is worth noting that according to reports on consumer’s bankruptcy the main reported cause of bankruptcy is shocks to income and expenses. Sullivan, Warren, and Westbrook (2000) report that 67.5% of US households that enter into bankruptcy procedures claimed the main cause of their bankruptcy to be job loss, while 22.1% cited family issues such as divorce and 19.3% blamed medical expenses. Some find a 46% reporting a medical reason or substantial medical debt (Jacoby et al., 2000), while others conclude that medical debt accounts for roughly 30% (Domowitz, 1999). The later should be considered as a consequence of the privatization of the health care system and more generally to the rolling back of the welfare state including education, housing etc. n any case, these processes are blamed for large delays and a tendency to put a lot of strict requirements for the debtors to meet that the later are likely to fail.

8 If \( \beta_1 \) and \( \beta_2 \) are equal the fact that the latter is multiplied with \( \lambda^* \) which is \( 0 < \lambda^* < 1 \) means that \( \beta_1 > \beta_2 \lambda^* \).

9 This of course allows \( \beta_1 \) (responsiveness of workers’ decision on the borrowing amount to changes in the level of interest payments) to be greater than \( \beta_2 \) (responsiveness of workers’ decision on the borrowing amount to changes in the level of wages). This is in line with the empirical work that finds that the level of interest payments affects the amount of borrowing much more that changes in income do (Karlan, 2005; Karlan and Zinman, 2007).
consumption levels achieved at the conventional wage level and as a result they will increase their borrowing. On the other hand this loss of wage will also decrease the level of interest payments they can afford, decreasing by that their borrowing needs. However, due to the restriction $\beta_1 > \beta_2 \lambda^*$ the positive effect on borrowing will prevail.

The other variable that concerns us is the interest rate and the conventional wage. According to equation 18 whenever interest payments as a result of an increase in interest rate exceed the maximum affordable by workers interest payment borrowing decreases by a rate of $\beta_2$. The opposite happens of the interest rate falls. As far as the variable of conventional wage $w^*$ is concerned, an increase in $w^*$ ceteris paribus will have a positive effect on borrowing because it increases the difference between itself and the current wage.

Since we have determined how workers borrow we can now assume that in equilibrium desired borrowing is equal to actual borrowing, i.e. $B_w = B_w^d$, and thus to rewrite the consumption function of workers, $C_w = Y(1-\sigma-id) - iD_w + \frac{dD_w}{dt}$, as:

$$C_w = Y(1-\sigma-id) - iD_w + \beta_1 \left( w^*L - Y(1-\sigma-id) \right) + \beta_2 \left( \lambda^*Y(1-\sigma-id) - iD_w \right)$$ (13)

which can also be written as:

$$C_w = (1 - \beta_1 + \beta_2 \lambda^*) (1-\sigma-id)Y - (1 + \beta_2) iD_w + \beta_2 w^*L$$ (13')

Where the term $(1 - \beta_1 + \beta_2 \lambda^*)$ is a value between zero and unity since $0 < \beta_1 - \beta_2 \lambda^* < 1$. An increase in wages will have a positive effect on consumption yet this effect is less than what might have been if they were not indebted, i.e. workers wage levels were such that they wouldn’t have to borrow. On the other hand, a rise in the rate of interest implies that consumption will contract by a rate of $(1 + \beta_2)$ which is the combination of the direct outcome on disposable income $(wL - iD_w)$ and the indirect effect of reducing desired borrowing by workers.
INDUSTRIAL CAPITALISTS

Gross profits are distributed to the owners of the capitalist firm, as profits of enterprise $\text{Ind Pr}$ and the lenders of the capitalist firm as interest payments $iD_i$, where $i$ denotes the rate of interest and $D_i$ industrial capitalists’ debt that is assumed constant in the short-run.

$$\Pi = \text{Ind Pr} + iD_i$$  \hspace{1cm} (2)

Industrial capitalists pay dividends to the stakeholders of the company and they save the rest of the profits of the enterprise i.e. the retained profits.

Profits of Enterprise = Retained Profits + Dividends

Retained profits (Capitalist Savings) = $s\times$ Profits of Enterprise \hspace{1cm} (2’)

The retention ratio (or the business propensity to save) $s$ is assumed constant. Retained profits are saved in order to finance future investment plans. In contrast, dividends are used by their owners (members of the capitalist class) for consumption.

$$\Pi = \frac{\text{Ind Pr} + Div }{\text{Ind Pr}} + iD_i = s\text{Ind Pr} + (1-s)\text{Ind Pr} + iD_i$$  \hspace{1cm} (3’)

Industrial capitalists’ consumption function is given by:

$$C_c = (1-s)\text{Ind Pr}$$  \hspace{1cm} (14)

where $R$ denotes the retained profits, $Div$ are the dividends and $C_c$ is industrial capitalists’ consumption. $s$ is the exogenous retention ratio.
Our attention is now directed to how industrial capitalists decide to invest. Investment demand in the short run is assumed fixed and we denote the investment (accumulation) rate, that is the growth rate of $K$, as:

$$\frac{I}{K} = g$$

(15)

where $I$ is gross and net investment since we ignore depreciation. However, in the long run we assume that industrial capitalists adjust their actual investment rate to their desired rate of investment using the formula below:

$$\frac{dg}{dt} = \Lambda \left( g^d - g \right)$$

(16)

In this model, in order to avoid the time lags introduced by Kalecki and Steindl in the formulation of the investment function that lead to a mixed difference – differential equations system we follow the method developed by Gandolfo (1980) and used by Dutt (1992b, 1995, 2005, 2006) and Jarsulic (1988). According to this method, the distributed lag equations in discrete time can be extended to continuous time which is analogous to the partial adjustment equation in continuous time and can be interpreted as the adjustment of the actual rate of accumulation $g$ to the desired accumulation rate $g^d$ with a speed given by the coefficient $\Lambda$ which is assumed to be equal to or less to unity ($\Lambda \leq 1$).

The desired level of industrial capitalists’ borrowing is given by the following relationship:

$$B_i = \beta_i \left[ \Pi - iD_i \right] = \beta_i Ind Pr$$

(17)

Industrial capitalists’ level of borrowing is a fraction of the enterprise profits. For simplicity we abstract from any financing costs arising from capital market frictions such as asymmetric information etc. The only cost involved is interest. The ratio $\beta_i$ can be taken as a proxy of the leverage ratio which takes positive values $\beta_i > 0$. It can be seen as the ratio of the amount of borrowing that a capitalist can take relative to its profits, in other words the ratio of external funds to internal funds. This ratio can be determined either by bank lending practices or by

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10 The rate of growth of the economy is measured by the rate of growth of capital given by $g_K = \frac{\Delta K}{K} = \frac{I}{K}$

which is equal to $g_Y = \frac{\Delta Y}{Y}$ if we assume away technological variations.
capitalists’ decisions (Dutt, 2006). In the first case, firms are subject to the limit of their borrowing capacity (credit line) according to the bank’s policy against borrowers’ credibility. The latter, concerns the borrower’s attitude towards external financing depending on its current profitability in conjunction with his/her investment plans. This approach allows for a consideration of $\beta_i$ as the propensity of capitalists to borrow. Equation 17 says that there is a positive relationship between firm’s borrowing and gross profits, but a negative one with interest payments which sets an upper limit to the amount of borrowing. This relation represents Kalecki’s (1937) principle of increasing risk\(^{11}\) that diminished internal means of finance for real investment purposes reduce access to external means of finance in imperfectly competitive capital markets. This argument implies that internal and external finance are complements rather than substitutes as mainstream economics assume. In other words, firms have to achieve a certain level of profitability in order to contract new loans, so that both the firm and the bankers can secure their financial positions.

$$I_d = \Pi - iD, \quad \frac{dD}{dt} = Ind Pr + \frac{dD}{dt}$$

Equation 18 reflects classical economists’ argument that it is the difference between the profits and the interest i.e. the profit of enterprise which plays a central role for investment. Thus, investment is assumed to depend positively on gross profits and negatively on interest payments (which is equivalent to say that profits of enterprise and investment are positively related). New borrowing $\frac{dD}{dt}$ of course has a positive impact on investment.

$$I_d = Ind Pr + \beta_i \left( Ind Pr \right) = \left(1 + \beta_i \right) Ind Pr$$

(19)

If we write the desired investment function in terms of the volume of capital stock $K$ we have:

$$g_d = \left(1 + \beta_i \right) r$$

(20)

where $g_d = \frac{I}{K}$ is the desired rate of investment (or capital accumulation).

3. THE SHORT-RUN MODEL

\(^{11}\) To be more precise, Kalecki’s “principle of increasing risk” as far as access to credit is concerned, implies that the creditor “imposes on his calculation the burden of increasing risk charging the successive portions of credit above a certain amount with rising rate of interest” (Kalecki, 1937). In this model, interest rate is assumed exogenously fixed by the central bank while there is no assumption related to extra interest or any other financial charges due to risk of default.
In the short-run we assume that firms function with excess capacity so that the level of output adjusts in response to aggregate demand. It is also assumed that the levels of debt, capital stock and investment are given. So, short run equilibrium is given by:

\[ Y = C + I \]  

(21)

Substituting in equation 21 equation 13’ and 14 we get:

\[ Y = (1 - \beta_i + \beta_2 \lambda^*)Y(1 - \sigma - id_j) - (1 + \beta_2)iD_w + \beta_1 w^* L + (1 - s)\sigma Y + I \]  

(22)

The rate of capacity utilization\(^{12}\) \(u\) is measured by the ratio of output \((Y)\) to capital stock \((K)\), i.e. \(u = \frac{Y}{K}\). Thus, by dividing Equation 22 by \(K\) we get:

\[ u = (1 - \beta_i + \beta_2 \lambda^*)(1 - \sigma - id_j)u - (1 + \beta_2)i\delta_w + \beta_1 w^* l + (1 - s)\sigma u + g \]  

(23)

where \(\delta_w = \frac{D_w}{K}\) is the stock of worker’s debt to capital stock ratio and \(\frac{L}{K} = l\) the fixed technological coefficient of labor to capital ratio. If we solve for \(u\) we take the short run equilibrium value of capacity utilization \(u^*\):

\[ u^* = \frac{g + \beta_1 w^* l - (1 + \beta_2)i\delta_w}{1 - (1 - \beta_i + \beta_2 \lambda^*)(1 - \sigma - id_j) - (1 - s)\sigma} \]  

(24)

It is essential to note here that industrial capitalists are not allowed to borrow in the short-run for investment purposes. Hence in the short run their stock of debt is fixed. However, their debt obligations are taken into account because of their past borrowing. By assuming so, we follow Hein (2006) and Lavoie (1995, pp. 164-173) and take the debt-capital ratio of industrial capitalists as constant in the short-run, which becomes a variable to be endogenously determined in the long run. Yet, consumers’ debt is obviously changing in the short-run since they are allowed to borrow.

\(^{12}\) As we have already mentioned, since we abstract from changes in technology, wages and working conditions the capital-potential output ratio \(v = \frac{K}{Y^u}\) is constant. Hence, changes in capacity utilization will be the same either measured by the output to potential output ratio \(u = \frac{Y}{Y^u}\) or the output to capital stock ratio \(u = \frac{Y}{K}\) (Dutt, 2006).
Assuming that output (and capacity utilization) adjusts in response to the demand for goods, the stability of the short-run equilibrium requires that the denominator in (24) (i.e. 

$$1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_x) - (1 - s)\sigma$$

) is positive. To ensure that we always have a positive $$u^*$$, we require that the numerator in equation (24) $$g + \beta_1 w^* l - (1 + \beta_2) i \delta_u$$ is also positive i.e. $$g > (1 + \beta_2) i \delta_u - \beta_1 w^* l$$. Moreover, the goods market stability condition that requires the saving rate to respond more elastically to changes in the capacity utilization than investment rate is must also be satisfied by the denominator in (24). The saving rate $$g^*$$ which relates total saving to the capital stock, is determined as follows:

\[ g^* = \frac{S}{K} = \frac{\sum_{\text{Industrial Capitalists' Savings}} u + \left(\beta_1 - \beta_2 \lambda^*\right)\left(1 - \sigma - id_x\right) u + \beta_1 i \delta_u - \beta_1 w^* l + \sum_{\text{Workers' Dis-saving}} u + \sum_{\text{Financial Capitalists' Savings}} u}{\text{Industrial Capitalists' Savings}} \]  

(25)

where $$s\sigma u$$ are industrial capitalist’s savings, while the rest is the dissaving – borrowing-function of workers (12’’’) divided by K i.e. $$\frac{B_s}{K} = -(\beta_1 - \beta_2 \lambda^*)(1 - \sigma - id_x) u - \beta_2 i \delta_u + \beta_1 w^* l$$. The response of the saving rate to changes in capacity utilization is:

\[ \frac{dg^*}{du} = s \sigma + (\beta_1 - \beta_2 \lambda^*)(1 - \sigma - id_x) + id_x \]  

(26)

And if the rate of accumulation is:

\[ g_a = (\gamma_r + b) \sigma u \]  

(27)

and the response of the rate of accumulation to changes in capacity utilization is:

\[ \frac{dg_a}{du} = (\gamma_r + b) \sigma \]  

(28)

the stability condition in the goods market $$\frac{dg^*}{du} > \frac{dg_a}{du}$$ is satisfied as long as

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13 Actually, we already know that $$0 < (1 - \beta_1 + \beta_2 \lambda^*) < 1$$, so given that $$(1 - \sigma - id_x)$$ is between zero and unity if we want to have a positive wage share, it follows that $$1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_x) - (1 - s)\sigma$$ is also between zero and unity. It is more straightforward if we use the following formulation $$s \sigma + (\beta_1 - \beta_2 \lambda^*)(1 - \sigma - id_x) + id_x$$ that comes out after some manipulations. Obviously, all terms are positive.
\[ s\sigma + (\beta_1 - \beta_2 \lambda^*) (1 - \sigma - id_i) + id_i > (1 + b)\sigma \]  

(29)

Since the constraints are set, we will now examine the effects of changes in the parameters of the model on the short-run equilibrium level of the rate of capacity utilization \((u^*)\). We focus on changes in \(\delta_w, d_i, g, \beta_1, \beta_2, w^*, \lambda^*, \sigma, s\) and \(i\). Through partial derivation of equation 23 we have for the variables that positively affect the rate of capacity utilization the following expressions (note that \(0 < 1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_i) - (1 - s)\sigma < 1\), and \(\frac{L}{K} = 1\)):

\[
\frac{\partial u}{\partial g} = \frac{1}{1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_i) - (1 - s)\sigma} > 0
\]

(30)

\[
\frac{\partial u}{\partial w^*} = \frac{\beta_1 d}{1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_i) - (1 - s)\sigma} > 0
\]

(31)

\[
\frac{\partial u}{\partial \lambda^*} = \frac{\beta_2 u(1 - \sigma - id_i)}{1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_i) - (1 - s)\sigma} > 0
\]

(32)

Similarly, it follows for the variables that decrease the rate of capacity utilization that:

\[
\frac{\partial u}{\partial d_i} = \frac{-(1 - \beta_1 + \beta_2 \lambda^*)ui}{1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_i) - (1 - s)\sigma} < 0
\]

(33)

\[
\frac{\partial u}{\partial \delta_w} = \frac{-(1 + \beta_2)i}{1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_i) - (1 - s)\sigma} < 0
\]

(34)

\[
\frac{\partial u}{\partial i} = -\frac{(1 - \beta_1 + \beta_2 \lambda^*)ud_i + (1 + \beta_2)\delta_w}{1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_i) - (1 - s)\sigma} < 0
\]

(35)

\[
\frac{\partial u}{\partial s} = -\frac{u\sigma}{1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_i) - (1 - s)\sigma} < 0
\]

(36)

While the following have an ambiguous impact:

\[
\frac{\partial u}{\partial \sigma} = -\frac{(s - \beta_1 + \beta_2 \lambda^*)u}{1 - (1 - \beta_1 + \beta_2 \lambda^*)(1 - \sigma - id_i) - (1 - s)\sigma} \geq 0, (s - \beta_1 + \beta_2 \lambda^*) \geq 0
\]

(37)
\[
\frac{\partial u}{\partial \beta_1} = \frac{wl-w^*l}{1-(1-\beta_1 + \beta_2 \lambda^*)(1-\sigma-id_f)-(1-s)\sigma} \geq 0 \quad w^*l \leq wl
\]

From the above partial derivatives we notice that as expected for a demand-driven model investment rate, \( g \), the conventional wage \( w^* \) and the interest burden on income \( \lambda^* \) have a positive effect on capacity utilization. On the other hand, workers debt to capital stock ratio, \( \delta_w \), industrial capitalists’ debt as a share of income \( d_f \), the interest rate \( i \) and industrial capitalists propensity to save (or retention ratio) \( s \) (Paradox of Thrift) have a negative impact on capacity utilization. However, the two parameters \( \beta_1 \) and \( \beta_2 \) and the profit share \( \sigma \) may have either positive or negative impact on capacity utilization. For \( \beta_1 \) depends on whether current wages are greater or lesser than the conventional wages while for \( \beta_2 \) it depends on whether the maximum affordable part of wages that goes to interest payments is greater or lesser than the actual interest payment made by workers. Finally, for \( \sigma \) it depends on whether the propensity to save is grater that the parameters that express the sensitivity of workers borrowing to changes in wages. Since, the former usually is close to unity it is most likely the impact of the share of profit of enterprise on capacity utilization to be negative.

An increase in worker’s debt-capital ratio, \( \delta_w \), has a contractionary effect on \( u \) because it redistributes income from workers to financial capitalists, who do not consume or invest, so they do not contribute to aggregate demand. This happens with two ways: first, workers debt has a negative direct effect on consumption since it curtails worker’s net wages through the increase of workers’ interest payments and second a negative indirect effect on consumption since it curtails worker’s borrowing. A similar effect on capacity utilization has a rise in the rate of interest. It reduces the degree of capacity utilization because it redistributes income from borrowers to lenders since it reduces the net wage and the profit income of borrowers. This happens through, ceteris paribus, the direct effect on consumption and the indirect effect through the fall in the desired level of borrowing to finance consumption. Net profits are curtailed too by an increase in the rate of interest because it increases interest payments, however they do not result in a fall in investment since the latter is assumed constant in the short-run but has a distributional outcome toward financial capitalists’ income.
A higher share of industrial capitalist’s debt to output $d_i$ would reduce the profits of enterprise because the amount of distributed dividends will decrease and thus capitalists’ consumption resulting to a fall in capacity utilization. However the fall in the profits of enterprise will not affect capacity utilization through the investment rate which is assumed fixed. However, there is the possibility that capitalists may be induced to reduce wages in order to sustain their profit share if their interest burden becomes too heavy. In this event, wages would fall making workers to increase the amount of borrowing and by that their debt obligations. In the long run we will see that this is a highly unsustainable process.

A fall (increase) in industrial capitalist’s propensity to save (or retention ratio) has a negative (positive) impact on capacity utilization reflecting the Paradox of the thrift. This happens because part of retained profits that are saved to finance future investment plans are directed to current consumption resulting to an increase in aggregate demand and capacity utilization.

It is worth noting here, that in the short-run although changes in the capacity utilization have no effect in the rate of accumulation and hence the growth of the economy, they do affect income distribution. Thus, increases in $u$ might not be translated into investment yet the increase in profits is gathered and by that increasing the share of profits of enterprise. This is so because with the stock of capital ($K$) constant, industrial profits increase and temporarily the profit share increases. Yet, in the long run as $K$ will start to expand the profit share will return to its initial level.

The Long-run Model

In order to study the dynamics of the model we have to reduce the above equations into a two-dimensional system of differential equations. We are interested on the dynamics of the state variables, $g$ and $\delta_w$. In the long run $D_i$, $K$ and $g$ are changing. However, before starting the detailed analysis of the implications of the model, it is useful to present the relevant equations here.

$B_w = -(\beta_1 - \beta_2 \lambda^2)(1 - \sigma - id_i)Y - \beta_2 D_iw + \beta_i w^*L \ (\text{Workers’ borrowing per capital stock})(12''')$

$\frac{dg}{dt} = \Lambda(g^d - g) \quad \text{(dynamics of the rate of accumulation)} \quad (16)$

$g^d = (\gamma_r + b)\sigma u \quad \text{(desired rate of accumulation)} \quad (17)$
\[ u^* = \frac{g + \beta_1 w' - (1 + \beta_2) i \delta_w}{s\sigma + (\beta_1 - \beta_2 \lambda^*) (1 - \sigma - i d_i) + i d_i} \]  \quad \text{(equilibrium level of capacity utilization) (24)}

We now specify the differential equation describing the path of \( \delta_w \) (overhats denote growth rates),

\[ \hat{\delta}_w = D_w - K \]  \quad \text{(40)}

Inserting (12''') and (24) and setting \( 1 - \beta_1 + \beta_2 \lambda^* = A \) and thus \( 1 - A = \beta_1 - \beta_2 \lambda^* \) we get:

\[ \frac{d\delta_w}{dt} = -g(1 - \sigma - i d_i)(1 - A) + \delta_w \Gamma - w' \Gamma \cdot \left( -\beta_1 (1 - A) \right) \cdot \left( 1 - (1 - A)(1 - \sigma - i d_i) \right) \]

\[ - i \delta_w \left[ \beta_2 \Gamma - (1 + \beta_2)(1 - \sigma - i d_i)(1 - A) \right] \]

\[ (1 - \sigma - i d_i)(1 - A) + \delta_w \Gamma \]  \quad \text{(41)}

Which isocline is given by setting \( \frac{d\delta_w}{dt} = 0 \):

\[ g = \frac{w' \Gamma \cdot \left( 1 - \sigma - i d_i \right) \cdot \left( 1 - (1 - A)(1 - \sigma - i d_i) \right)}{(1 - \sigma - i d_i)(1 - A) + \delta_w \Gamma} \]

\[ - i \delta_w \left[ \beta_2 \Gamma - (1 + \beta_2)(1 - \sigma - i d_i)(1 - A) \right] \]

\[ (1 - \sigma - i d_i)(1 - A) + \delta_w \Gamma \]  \quad \text{(42)}

We now discuss the properties of the above isocline. First, the term \( \Gamma - (1 - A)(1 - \sigma - i d_i) \) is positive since it equals \( \Gamma - (1 - A)(1 - \sigma - i d_i) = s\sigma + i d_i \). This relation implies that savings are more sensitive to changes in capacity utilization than workers borrowing is. Remember that \( (\beta_1 - \beta_2 \lambda^*) \) is the responsiveness of workers’ borrowing to any change in their wages (12'''). This implies that the term \( \beta_1 \cdot \left( 1 - \sigma - i d_i \right) \) expresses the additional amount of borrowing by workers in each period as a result to a change in capacity utilization. Second, the term \( \beta_2 \cdot \left( 1 + \beta_2 \right) \cdot \left( 1 - \sigma - i d_i \right) \cdot \left( 1 - A \right) \) can take positive or negative values as long as it remains low because if it is positive and high it shifts the isocline vertically upwards while if it is negative it pushes the isocline down with the danger of taking negative values of rates of accumulation. Third, the term \( (1 - \sigma - i d_i)(1 - A) \) is positive since \( (1 - \sigma - i d_i) \) is the wage share while \( (1 - A) \) is also positive since \( \beta_1 > \beta_2 \lambda^* \).

The dynamic path of the rate of accumulation is specified by (16), in which we insert (18) and (24):
\[
\frac{dg}{dt} = \Lambda \left( \gamma_r + b \right) \sigma \left( \frac{g + \beta_1 \sigma w l - (1 + \beta_2) \delta_w}{\Gamma} \right) - g
\]  

(43)

which isocline is given by setting \( \frac{dg}{dt} = 0 \):

\[
g = \frac{(\gamma_r + b) \sigma w l \beta_1}{\Gamma - \sigma(\gamma_r + b)} - \frac{(\gamma_r + b) \sigma (1 + \beta_2) \delta_w}{\Gamma - \sigma(\gamma_r + b)}
\]  

(44)

Starting with the denominator \( \Gamma - \sigma(\gamma_r + b) \) we already have assumed that it must be positive for the standard macroeconomic condition to hold. The nominator of the intercept and the slope are also positive.

We should also note that the incorporation of borrowing by industrial capitalists increases the responsiveness of investment due to changes in capacity utilization making this condition this condition harder to hold. This possibility is also commented by Dutt (2006) however in his model workers borrowing was increasing with capacity utilization causing an additional pressure to savings. Nevertheless, in our model this implication is less possible because capacity utilization affects negatively workers borrowing (negative saving is reducing) but still enterprises borrowing has to be relatively low so that investment responsiveness won’t exceed savings’. A list with the various conditions and assumptions made so far is given in Table 1.1.

**Table 1-1**

<table>
<thead>
<tr>
<th>Conditions</th>
</tr>
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<tbody>
<tr>
<td>( 0 &lt; (1 - \beta_1 + \beta_1 \lambda^<em>) \leq 1 ) and ( 0 &lt; \beta_1 - \beta_2, \lambda^</em> \leq 1 ) &amp; ( 0 &lt; \beta_1, \beta_2, \lambda^* \leq 1 ) with ( \lambda^* &lt; 0.5 ) and ( \beta_1 \leq \beta_2 = 1 )</td>
</tr>
<tr>
<td>( \Gamma - \sigma(\gamma_r + b) ) &amp; ( s\sigma + (\beta_1 - \beta_2 \lambda^*)(1 - \sigma - id_i) + id_i &gt; \sigma(\gamma_r + b) )</td>
</tr>
<tr>
<td>( \Gamma - (1 - A)(1 - \sigma - id_i) &gt; 0 ) &amp; ( \Gamma - (1 - A)(1 - \sigma - id_i) = s\sigma + id_i )</td>
</tr>
<tr>
<td>( (\beta_1 - \beta_2 \lambda^<em>)(1 - \sigma - id_i) ) &amp; ( \beta_1 &gt; \beta_2 \lambda^</em> - 1 - \sigma - id_i &gt; 0 )</td>
</tr>
<tr>
<td>( \beta_2 \Gamma - (1 + \beta_2)(1 - \sigma - id_i)(1 - A) &gt; 0 ) &amp; ( 0 )</td>
</tr>
<tr>
<td>( g &gt; (1 + \beta_2)\delta_w - \beta_1 w l ) &amp; So that u &gt; 0.</td>
</tr>
</tbody>
</table>
The vertical asymptote of the $\frac{d\delta_w}{dt} = 0$ isocline rests in the second quadrant and its expression is given by $\delta_w = \frac{-(1 - \sigma_i d)(1 - A)}{\Gamma}$ while the horizontal is $g = \frac{\beta_1 \Gamma - (1 + \beta_2)(1 - \sigma_i d_i)(1 - A)}{-\Gamma} > 0$ which is over or above the horizontal axis $\delta_0'$ but pretty close to it as we previously assumed. Since our interest is focused on the interaction between workers debt and capital accumulation we will emphasize on the first quadrant and more specifically the area above the LIM line which represents the $g > (1 + \beta_2 i \delta_w - \beta_1 w^\prime l$ condition for a positive $u$.

Given the above conditions the paths of $g$ and $\delta_w$ are shown in the diagram 1 below. There are two equilibrium points A and B. A corresponds to a positive but low rate of accumulation with high debt to capital ratios of workers while B corresponds to positive and high rate of accumulation but low levels of debt.

Diagram 1: Dynamics of workers’ debt-capital ratio and the rate of accumulation

Equations (42) and (44) define the first order, non-linear, autonomous system of differential equations representing the economy. The local stability properties of the equilibrium points are determined by the Jacobian of the system. For stability the Jacobian Matrix must have a positive determinant and its trace must be negative. The determinant is the following:
Def\{J\} = \begin{bmatrix}
-g - i\beta_1 - \frac{(A-1)(1-\sigma - i\delta)(1 + \beta_2)}{\Gamma} & -\delta_1 + \frac{(A-1)(1-\sigma - i\delta)}{\Gamma} \\
\frac{(\gamma_2 + b)i\Lambda(1 + \beta_2)}{\Gamma} & \Lambda(-1 + (b + \gamma_2)i)\sigma \end{bmatrix} \tag{45}

Inserting the equilibrium point A we take:

\text{Def}\{\delta_1, g_1\} = -\frac{\sqrt{\Lambda\Lambda}}{\Gamma} < 0 \tag{46}

It derives that the A is unstable (saddle point) since the determinant of the Jacobian at point A is negative and the trace is negative or positive.

\text{Def}\{\delta_2, g_2\} = \frac{\sqrt{\Lambda\Lambda}}{\Gamma} > 0 \tag{47}

The determinant is positive so we examine the trace of the Jacobian Matrix at point B and we get:

\text{tr}\{J(\delta_2, g_2)\} = -\left(\frac{\Gamma - (\gamma_2 + b)i\sigma}{\Gamma}\right)\Lambda - i\beta_2 - g_2 + \frac{(1 - A)(1 + \beta_2)(1 - \sigma - i\delta)i}{\Gamma} \tag{48}

The stability of the equilibrium point B depends on the sign of the trace of the Jacobian matrix. The first three terms have a negative sign while they are positive (\(g_2\) is positive and high since we know equilibrium point B rests in the first quadrant) but the fourth is positive. Thus we have to assume that the latter is lesser than the first three terms for the equilibrium point B to be asymptotically stable.

Consequently, since B is stable, the economy will converge at B either monotonically or by oscillating around it. On the other hand, point A is unstable, implying that increasing workers’ debt to capital ratio leads to contraction the rate of accumulation driving the economy to negative values of growth and capacity utilization.

The solution of the system is illustrated in Diagram 2, where the solution paths are revealed by the direction field, indicating quite clearly that equilibrium point B is locally asymptotically stable and A unstable (saddle point).
We first examine the area close to equilibrium point A. It is clear that no matter in which of the sectors in the neighborhood of A the system begins, all the forces pushes the system away from A. This happens even if a trajectory crosses from one sector into another. Starting from a point close point B, for instance at the south-west of B, the actual investment rate is less than the desired rate. This implies that enterprises tend to raise their investment rate. Aggregate demand, output and capacity utilization increase in consequence. Initially, this leads workers to decrease the amounts of borrowing decelerating their debt burden and thus interest payments. This fall will induce workers to borrow more and thus increase their debt to capital ratio. Mathematically this happens because \( \delta_2 > \delta_1 - \delta_2 \lambda \). We should note that as actual investment rate increases and as a consequence the stock of capital increases, the debt to capital stock ratio falls even faster and by that desired borrowing. Eventually the rate of investment will reach the desired rate and it will exceed it. At a point in the North-East of B, the actual investment rate is higher than the desired rate, implying that enterprises tend to reduce their investment rate. Aggregate demand, output and capacity utilization fall in consequence. Initially workers will tend to borrow however the acceleration in the debt burden and the increase in interest payments will lead them to reduce their desired borrowing.

On the other hand, if we start from a point to the left and below A, in the proximity of A, the actual investment rate is less than the desired rate. This implies that enterprises tend to raise their investment rate. Aggregate demand and output increase in consequence. This implies that workers’ borrowing will decrease and debt accumulation will slow down together with the interest payments. Therefore, since, we have assumed that borrowing responds more elastically to changes in interest payments than output does borrowing will begin to increase
driving workers debt again to higher levels entering the sector below the LIM line where the level of capacity utilization becomes negative. For an initial point above A the effect of the huge debt burden is very strong. The latter combined with the decreasing actual investment (so fall in capital stock) makes the negative impact of interest payments even stronger.

We can now examine the impact of changes in the parameters of the model by considering the effects of such changes on the position of the long-run equilibrium. We will examine changes in $\gamma_r$, the rate of interest $i$, the adjustment coefficients of workers’ borrowing with respect to wages and interest payments, $\beta_1$ and $\beta_2$ respectively, the retention ratio $s$, the leverage ratio of enterprises $b$ and the profit share $\sigma$.

An increase in $\gamma_r$ (the coefficient that shows the responsiveness of investment to changes in the profit of enterprise) will affect only the desired investment function shifting upwards the $\frac{dg}{dt} = 0$ isocline, leaving the $\frac{d\delta}{dt} = 0$ isocline unaffected (Diagram 3). Point A removes slightly upwards but point B has a clear increase (B’). This change implies that other thing equal if industrial capitalists are induced to invest a larger proportion of their profits of enterprise they can achieve higher levels of growth together with lower levels of workers debt to capital stock ratio. Hence, growth and income distribution get more favorable for workers.

![Diagram 3: Increase in $\gamma_r$ (0.8 from 0.7)]

An increase in the rate of interest shifts has a slight downward effect on the $\frac{d\delta}{dt} = 0$ isocline (there is a small shift however not visible in the diagram) while it shifts the $\frac{dg}{dt} = 0$ isocline
around itself making it steeper (Diagram 4). B’ remains at the same position but A’ corresponds to a lower level of workers debt to capital stock ratio and higher level of growth. Growth rises slightly but income distribution becomes worse since income from workers is transferred to financial capitalists.

![Diagram 4: Increase in the Interest Rate (i=0.08 from i=0.1)](image)

A decrease in $\beta_2$ shifts the $\frac{d\delta}{dt} = 0$ isocline slightly downwards (not very visible in the diagram) while it shifts the $\frac{dg}{dt} = 0$ isocline around itself making it more flat (Diagram 5). The new equilibrium point A’ reflects a higher $\delta_u$ and a lower $g$ (in relation to the old A), while B’ reflects a higher workers’ debt to capital stock and a lower $g$ (compared to B). At point A’, the increase in workers’ debt to capital stock ratio implies a) a less favorable distribution of income for workers and b) a decrease in capacity utilization. The fall of the rate of investment decreases capacity utilization as well.

![Diagram 5: Decrease in $\beta_2$ ($\beta_2=0.6$ from $\beta_2=1$)](image)
A decrease in $\beta_1$ (workers’ borrowing respond less to changes in wages and income) shifts both the $\frac{d\delta_w}{dt} = 0$ and $\frac{dg}{dt} = 0$ isoclines downwards (Diagram 6). The new equilibrium point A’ reflects a lower $\delta_w$ and a higher $g$ (in relation to the old A), while B’ a definitely lower $g$ yet the effect on $\delta_w$ is ambiguous depending on the volume of the change in the $\frac{dg}{dt} = 0$ isocline.

Starting with point A, the decrease in workers’ debt to capital stock ratio implies a) a more favorable distribution of income for workers in relation to financial capitalists and b) a raise in capacity utilization. The increase in the rate of investment increases capacity utilization as well. As far as the new equilibrium point B’ is concerned, the affect of the new $\delta_w$ on income distribution and capacity utilization is ambiguous, yet the fall in the rate of investment reduces capacity utilization $g$. So, at the new long-run equilibrium point A’ both income distribution and capacity utilization are getting better while in B’ the result is ambiguous.

![Diagram 6: Decrease in $\beta_1$ ($\beta_1=0.7$ from $\beta_1=1$)](image)

An increase in $b$ (enterprises leverage ratio – external to internal funds ratio) will affect only the desired investment function shifting upwards and increasing the slope of the $\frac{dg}{dt} = 0$ isocline, leaving the $\frac{d\delta_w}{dt} = 0$ isocline unaffected (Diagram 7). The new equilibrium point A’ reflects a higher $\delta_w$ and a lower $g$ (in relation to the old A), while B a higher $g$ and $\delta_w$. At point A’, the increase in workers’ debt to capital stock ratio implies a) a less favorable
distribution of income for workers in relation to financial capitalists and b) a fall in capacity utilization. The fall in the rate of investment decreases capacity utilization as well. However, as far as the new equilibrium point B’ is concerned, the higher level of negative debt (saving) to capital stock ratio a) affects positively income distribution and b) increases capacity utilization. The increase in the rate of investment increases capacity utilization as well. So, at point A’ both income distribution and capacity utilization get worse while in B’ income distribution and capacity utilization are improved.

Diagram 7: Increase in b (b=0.3 from b=0.2)

An increase in $\sigma$ (profit share) swifts upwards both the $\frac{dg}{dt} = 0$ and the $\frac{d\delta}{dt} = 0$ isoclines (Diagram 8). The new equilibrium point A’ reflects a higher $\delta_w$ and a lower $g$ (in relation to the old A), while B’ a definitely higher $g$ but an ambiguous change in $\delta_w$. So, the growth of the economy is profit led (and the paradox of cost doesn’t hold) at the area of B (stable point) while it is wage led around the point A (unstable point). At point A’, the increase in workers’ debt to capital stock ratio implies a) a less favorable distribution of income for workers in relation to financial capitalists and b) a fall in capacity utilization. The fall in the rate of investment decreases capacity utilization as well.
A decrease in $s$ (retention ratio) shifts upwards the $\frac{dg}{dt} = 0$ isocline and downwards the $\frac{d\delta}{dt} = 0$ isocline (Diagram 9). $B'$ corresponds to a higher capital accumulation (Paradox of thrift) and a favorable for workers change in income distribution as workers’ debt to capital stock ratio decreased. On the other hand, at point $A'$ capital accumulation is lower than in $A$ implying that the paradox of thrift disappears while income distribution becomes less favorable for workers since their debt to capital stock ratio increased.

**Diagram 8:** Increase in the profit share $\sigma$ ($\sigma=0.40$ from $\sigma=0.30$)

**Diagram 9:** Decrease in the retention ratio $s$ ($s=0.6$ from $s=0.8$)

**Conclusions**

The impact of debt on business cycles and economic growth has long been researched in the post-keynesian literature (Lavoie, 1995; Foley, 2003; Hein, 2006; Lima and Meirelles 2006). However, consumer debt and its role in business cycles and growth is much less investigated
in a formal way (Dutt, 2006; Palley, 1994, 1996) while there are some other attempts to incorporate it in an informal way (Cynamon and Fazzari, 2008). Dutt (2006) extends a Steindlian model of growth and income distribution to incorporate borrowing by consumers and shows that borrowing by consumers can improve growth prospects in the short-run by increasing consumer demand. However, in the longer run the effects of increasing consumer borrowing are ambiguous because, by increasing consumer debt, it redistributes income towards the rich who have a higher propensity to save, thereby possibly depressing aggregate demand and growth despite the borrowing-induced expansion. Palley (1994) in a linear multiplier accelerator model investigates the cyclical aspects of household borrowing and shows that a rise in consumer debt initially promotes consumption and aggregate demand but eventually the accumulation of debt contracts growth.

In this model an extension of Dutt’s (2006) model is attempted first by proposing a different workers’ borrowing function according to which workers borrow in order to fill the consumption gap created by stagnant real wages in contrast to Dutt’s formulation who assumes that workers borrow as their wage income increases. Workers set as a target the so-called “conventional wage” (a term used by Marglin (1984) and modified to incorporate the effect of the conspicuous consumption from the upper income classes in a context of an economy with increasing inequality). Second, industrial capitalists are also assumed to borrow in order to finance investment (which in Dutt’s model they don’t) and we rely on Kalecki’s principle of increasing risk formulation to show the negative impact of interest payments on capital accumulation.

What we find is that borrowing induced consumption has a positive impact on capacity utilization however the latter is contracted by the interest payments both by workers and industrial capitalists. However, parameters $\beta_1$ and $\beta_2$ (how workers respond to changes in income and interest payment changes, respectively) play a crucial role on workers decisions to borrow. In the long run model we find two equilibrium points where the one represents high levels of growth combined with low levels of workers’ debt to capital ratio while the other low levels of growth with high levels of workers’ debt to capital ratio. The examination of the stability of the system shows that the former is asymptotically stable, while the latter unstable and particularly drives the economy to stagnation towards negative values of capital accumulation and capacity utilization. The impact of changes in the parameters of the model
on the long–rum equilibrium points are also examined. The impact differs according to the point under examination.

References


