Emulation and Consumer Debt: Implications of Keeping Up with the Joneses

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Abstract

We develop a stock-flow consistent neo-Kaleckian macro model which incorporates consumption emulation and consumer debt accumulation. Income distributional dimension is also incorporated via the conflict-claims approach of inflation. Using this model, we investigate the macroeconomic effects of lower income group's consumption emulation of higher income group through borrowing. We find that emulation could expand aggregate demand and hence generate faster economic growth. Our results also indicate that consumption emulation could be a source of widening income inequality.

Key words: consumer debt, emulation, income distribution, growth
JEL classifications: E12, E44, O41

1 Introduction

Prior to the Great Recession of 2007, the US experienced consumption expansion accompanied by significant household debt accumulation. The ratio of personal outlays to disposable personal income increased from about 88 percent in the early 1980s to nearly 100 percent in 2007. Household debt outstanding as a share of GDP increased from about 45 percent in 1975 to nearly 100 percent in 2006.[1]

A possible cause for consumption expansion and household debt accumulation is consumption emulation. One's consumption behavior is strongly influenced by how others con-

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sume. Consumption emulation also tends to be upward in the sense that lower income population tries to keep up with the consumption pattern of upper income population (Bowles and Park, 2005; Cynamon and Fazzari, 2008).[2] This creates an important motivation for consumption borrowing. Furthermore, US has experienced the widening income inequality, and this has created a further environment for household borrowing for consumption (Barba and Pivetti, 2009; Foster and Magdoff, 2009; Setterfield, 2010; Kumhof and Ranciere, 2010). For example, Barba and Pivetti (2009) observe the following stylized facts of the US since 1980s from their descriptive statistical study: (i) substantial shifts in distribution away from low and middle-income classes;(ii) a large drop in the personal saving rate; (iii) massive increases in household liabilities; (iv) increases in household debt used to finance consumption in the bottom 80% of the income distribution. Based on these observations, Barba and Pivetti (2009) argue that rising household debt is largely due to the effort by low and middle-income households to maintain their relative standards of consumption in the face of persistent changes in the income distribution that have favored the higher income households.[3]

In this paper, we develop a stock-flow consistent neo-Kaleckian macro model which incorporates consumer debt and consumption emulation. Workers borrow more for consumption when they see that capitalists increase consumption. Income distribution dynamics is also introduced through the conflict claims approach of inflation. This paper will then analyze the consequence of the consumption emulation through borrowing to income distribution and economic growth. Our results show that, although consumption emulation can promote economic growth through expansion of aggregate demand, whether this generates a larger wage share of workers depends on the relative bargaining strength between workers and capitalists.

Our paper is organized as follows. Section 2 presents the basic theoretical framework and short run comparative statics are studied. Section 3 develops consumer debt dynamics and distribution dynamics. The effect of consumption emulation on income distribution and

economic growth will then be investigated. Section 4 offers some concluding comments.

2 Accounting and Behavior

2.1 Social Accounting Matrices

We begin laying out the model by providing a basic accounting framework, which closely follows Lavoie and Godley (2002). We distinguish four types of agents in this model: workers, capitalists, banks, and non-financial firms. To focus our discussion, we assume a closed economy with no government contribution to aggregate demand.

Table 1 is the balance sheet matrix for our model economy. It shows the asset and liability allocations across our four types of agent. There are four classes of assets: physical capital (K), equity (E), net loans to households (D_W), and the net bank deposits of capitalists (D_W). A column sum for a class of agent produces its net worth, while a row sum (across workers, capitalists, banks, and firms) produces the net value of a class of assets.

[Table 1 about here.]

Associated with this balance sheet matrix is the transaction flow matrix in table 2. Household real wage income ($W_r L$) can be supplemented by new borrowing ($\dot{D}_W$) to finance the sum of consumption (C_W) and interest on past borrowing (iD_W). Capitalists earn income on their net deposits (iD_W) and profits (Π), which they use for consumption (C_R), to make new deposits ($\dot{D}_W$), or to provide investment funds (S_F). In the case of firms, we distinguish between capital and current transactions. Firms can finance investment (I) with new funds provided directly by capitalists (S_F) and firms distribute all earnings to capitalists. For simplicity, the number of equity are held fixed. For the transaction matrix, we note that the sums across the rows must equal zero as a consistency condition.[4] The columns also sum to zero, reflecting budget constraints.

[Table 2 about here.]

2.2 Banks and Firms

Our specification of banking sector follows Lavoie and Godley (2002), similarly distinguishing the capital and current accounts. We refer to financial intermediaries as "banks" and non-financial businesses as "firms". Consumer loan is intermediated by the banking sector. Banks are pure intermediaries that do not generate profits. In other words, we do not distinguish between the borrowing rate and the lending rate, as in Skott and Ryoo (2008b,a) and Isaac and Kim (Forthcoming). Capitalists hold saving deposits with banks, on which they receive intermediated interest payments. Workers may receive these bank deposits as bank loans, with which they can finance consumption.

Firms are characterized by their investment demand behavior and markup pricing behavior. We treat the pricing behavior of firms in standard neo-Kaleckian fashion: price is a markup over unit labor costs, reflecting an oligopolistic market structure (Harris, 1974; Asimakopulos, 1975).

$$p = (1 + \tau)wL/Y \tag{1}$$

Here $p > 0$ is the price level, $w > 0$ is the nominal wage, $\tau > 0$ is the markup rate (which represents Kalecki's degree of monopoly), and $L/Y > 0$ is the labor-output ratio (i.e., the inverse of the average product of labor). Such markup pricing behavior implies a standard expression for the gross profit share ($\pi = \Pi/Y$):

$$\pi = \frac{\tau}{1 + \tau} \tag{2}$$

Our exposition will treat τ and hence π as model parameters in the short run.

Let $r = \Pi/K$ denote the profit rate. Following Stockhammer (1999), our desired invest-

ment rate ($g_K = I/K$) responds positively to the profit rate.

$$g_K = \kappa_0 + \kappa_r r \tag{3}$$

The parameters are positive: κ_0 captures the state of business confidence[5], and κ_r captures the sensitivity of desired investment to the profit rate. The current profit rate approximates the expected rate of return, and hence induces the investment demand (Blecker, 1999; Stockhammer, 1999).

Note that the profit rate, and the accumulation rate can be expressed in terms of capacity utilization rate ($u = Y/K$). The gross profit rate is just the product of the gross profit share and the capacity utilization rate—a relationship that allows us to reduce the expression for the accumulation rate as well.

$$r = \pi u \tag{4}$$

$$g_K = \kappa_0 + \kappa_r \pi u \tag{5}$$

2.3 Workers

Workers can borrow to raise their consumption above their current income as indicated by the social accounting matrix in table 2. Therefore, the consumer may need to pay interest on outstanding consumer debt. To allow for debt financed consumption, we explicitly account for the payment of interest on consumer debt. We also include a term that captures the influence of emulation on workers' consumption behavior.

$$C_W = W_r L - iD_W + \beta C_R \tag{6}$$

The term $W_r L - iD_W$ is after-interest disposable income. The term βC_R ($\beta > 0$) captures consumption emulation.[6]

Recall that the workers' budget constraint from Table 2 requires that $\dot{D}_W = C_W + iD_W - W_r L$. Therefore, equation (6) implies the following borrowing behavior of workers.

$$\dot{D}_W = \beta C_R \tag{7}$$

Workers observe the consumption pattern of the capitalists and borrow to emulate their consumption. The larger the emulation parameter β is, the more debt financed consumption by workers.

2.3.1 Capitalists

In our model, capitalists are the recipients of interest income as well as the profit income. In contrast with workers, capitalists simply consume a fraction of their interest and profit income.

$$C_R = (1 - s_R)(\Pi + iD_W) \tag{8}$$

Here s_R is the capitalists' saving coefficient. (Equivalently, capitalist's saving is $S_R = s_R(\Pi + iD_W)$) Recall from the capitalists' column in the transaction flow matrix (table 2) that the capitalists' budget constraint implies

$$C_R = \Pi + iD_W - (\dot{D}_W + S_F) \tag{9}$$

Equations (8) and (9) imply the following supply of consumer credit:

$$\dot{D}_W = s_R(\Pi + iD_W) - S_F \tag{10}$$

2.4 Temporary Equilibrium

Commodity market equilibrium in this model has a standard representation:

$$Y = C_W + C_R + I \tag{11}$$

Substituting from the consumption equations (6) and (8) and normalizing all variables by the capital stock produces the following representation of commodity market equilibrium.

$$u = (1-\pi)u - id_W + \beta(1-s_R)(\pi u + id_W) + (1-s_R)(\pi u + id_W) + g_K \tag{12}$$

Recall that $u = Y/K$ denotes capacity utilization. Here $d_W = D_W/K$ denotes the normalized indebtedness of workers. After substituting from the investment demand equation (5) and solving for u, we find a reduced form expression for capacity utilization. We will make the standard Keynesian stability assumption that $(s_R + s_R\beta) > (\kappa_r + \beta)$.[7] (As in Hein (2006), Dutt (2006), and Charles (2008), we treat i as an exogenous policy variable.)

$$u = \frac{1}{\pi(s_R + s_R\beta - \kappa_r - \beta)}[\kappa_0 - (s_R + s_R\beta - \beta)id_W)] \tag{13}$$

Substituting (13) into (4) and (5), we produce reduced forms for the profit rate, and the accumulation rate.

$$r = \frac{1}{(s_R + s_R\beta - \kappa_r - \beta)}[\kappa_0 - (s_R + s_R\beta - \beta)id_W)] \tag{14}$$

$$g_K = \frac{1}{(s_R + s_R\beta - \kappa_r - \beta)}[(\kappa_0 - i\kappa_r d_W)(s_R + s_R\beta - \beta)] \tag{15}$$

2.4.1 Comparative Statics

This section presents the comparative static analysis of temporary equilibrium. Table 3 summarizes the results.

[Table 3 about here.]

Consider first the effect of an increase in i. This affects the economy through a consumer debt channel. For any positive level of consumer debt, a higher interest rate increases capitalists' income and correspondingly reduces workers' after-interest disposable income. The net effect is lower effective demand, since workers have a higher marginal propensity to consume than rentiers.

An increase in the emulation parameter β allows workers to increase their consumption spending through borrowing. The resulting increase in effective demand increases capacity utilization,[8] which in turn increases the profit rate and thereby the rate of accumulation. An increase in the level of consumer indebtedness (d_W) has the opposite effects. Higher consumer debt implies higher interest payments for workers and more income for capitalists. Since workers have the higher propensity to consume, this reduces total consumption. The result is lower capacity utilization, profit, and investment rates.

An increase in the profit share (π) redistributes income away from workers, reducing consumption demand. This decline in effective demand reduces capacity utilization in proportion.[9] This proportional decline in capacity utilization leaves profit and investment rate unchanged.

3 Dynamics

In this section, dynamics of consumer debt is described. We also incorporate distribution dynamics via the conflicting claims approach to inflation.

3.1 Dynamics of Consumer Debt

From the definition of d_W, we see that

$$\dot{d}_W = \beta(1 - s_R)(\pi u + i d_W) - g_K d_W \tag{16}$$

So we can use our reduced form for g_K (equation (15)) to determine the reduced form for $\dot{d}_W$.

$$\dot{d}_W = \frac{-1}{(s_R + s_R\beta - \kappa_r - \beta)}[(\kappa_0 - i\kappa_r d_W)(d_W s_R + (1 + d_W)(-1 + s_R)\beta)] \tag{17}$$

This equation of motion yields the following set of steady state values of d_W:

$$d_{W1} = \frac{\beta - s_R\beta}{s_R + s_R\beta - \beta} \tag{18}$$

$$d_{W2} = \frac{\kappa_0}{i\kappa_R} \tag{19}$$

The second solution (d_{W2}) is not an economically meaningful solution since capacity utilization rate would be negative with the solution.[10]

The stability for the equilibrium point is examined as:

$$\frac{\partial \dot{d_W}}{\partial d_W} \mid_{d_{W1}} = -\frac{\kappa_0 s_R + (\kappa_0 + i\kappa_r)(s_R - 1)\beta}{s_R + s_R\beta - \kappa_r - \beta} \tag{20}$$

High enough value of animal spirit ensures that d_{W1} is an economically meaningful and stable equilibrium.[11] Figure 1 depicts the dynamics of consumer debt. It is also easy to see from equation (18) that emulation will generate a higher indebtness for workers. An increase in emulation propensity will induce workers to borrow more to keep up with capitalists' consumption.

[Figure 1 about here.]

3.2 Inflation and Distribution Dynamics

Distribution dynamics is incorporated into the model via the conflicting claims approach to inflation. We will first adopt specification of endogenous wage share target of workers. Second, the case of endogenous profit share target of firms is studied. Lastly, we endogenize

both the wage share target of workers and profit share target of firms. In each case, we examine the impact of consumption emulation to income distribution and economic growth.

3.2.1 Endogenous Wage Share Target of Workers

Wage share is defined as $\psi = wL/pY$. Logarithmically differentiating this definition of wage share with respect to time, we have:

$$\widehat{\psi} = \widehat{w} - \widehat{p} + \widehat{b} \tag{21}$$

where b is the inverse of the labor productivity.[12] It is assumed that, in this medium run dynamics, there is no technological progress, so $b = 0$. To describe the movement of wage and price, we adopt the conflicting claims approach to inflation and income distribution. The origin of this approach is found in Weintraub (1958), and Rowthorn (1977). Our approach here is similar to Cassetti (2003).

We assume that workers have a specific wage share target. Workers respond to the gap between the desired wage share and current wage share. This behavior is captured by the following wage inflation equation:

$$\widehat{w} = \phi(\psi_W^d - \psi) \tag{22}$$

where ψ_W^d denotes the target wage share of the workers, and ϕ is the speed of adjustment parameters. Since ϕ measures how fast labor unions react to a discrepancy between the actual and desired, this parameter can be thought of as a measure of workers' bargaining strength. Note that, with the constant labor productivity, wage share and real wage move in the same direction, and the target real wage is equivalent to the target wage share. With identity, $\psi = 1 - \pi$, the above wage inflation equation is equivalent to:

$$\widehat{w} = \phi(\psi_W^d - \psi) = \phi[(1 - \pi_W^d) - (1 - \pi)] = \phi(\pi - \pi_W^d) \tag{23}$$

where π_W^d is the workers' desired level of profit share of firms, which corresponds to the workers' target wage share.

Firms also respond to the gap between the actual and target profit share, and this can be captured by the following equation:

$$\widehat{p} = \varphi(\pi_F^d - \pi) \tag{24}$$

where π_F^d denotes the target profit share of the firms, and φ is the speed of adjustment parameters. Since φ measures how fast firms react to a discrepancy between the actual and desired, this parameter can be thought of as a measure of firms' bargaining strength. With the constant labor productivity, profit share and real profit move in the same direction, and the target real profit is equivalent to the target profit share. For the first examination, the target profit share of the firms is assumed to be constant.

Following Lavoie (1992) and Cassetti (2003), we assume that workers' bargaining power depends on the growth rate of employment.[13] Since there is no technological progress, this implies that the workers' bargaining power depends on the accumulation rate. Using a simple linear function form, this can be written as:

$$\pi_W^d = \upsilon_0 - \upsilon_1 g_K \tag{25}$$

where υ_0 and υ_1 are positive parameters. υ_0 represents an autonomous effect on π_W^d and υ_1 is the rate that π_W^d is revised when accumulation rate (and hence employment rate) changes (Cassetti, 2003). A stronger bargaining power of the workers then can be reflected in a higher value of υ_1.

Substituting equations (13) and (25) into equation (23), the wage inflation equation can be written as:

$$\widehat{w} = \phi[1 - \upsilon_0 - \psi + \frac{\upsilon_1}{(s_R + s_R\beta - \kappa_r - \beta)}[(\kappa_0 - i\kappa_r d_W)(s_R + s_R\beta - \beta)]] \tag{26}$$

Then, with the identity $\psi = 1 - \pi$, the equation of motion for the wage share can be derived by substituting equations (26) and (24) into equation (21).

$$\dot{\psi} = \psi\phi[1 - \upsilon_0 - \psi + \frac{\upsilon_1}{(s_R + s_R\beta - \kappa_r - \beta)}[(\kappa_0 - i\kappa_r d_W)(s_R + s_R\beta - \beta)]] - \psi\varphi(\psi - {\psi_F}^d) \quad (27)$$

[Figure 2 about here.]

The figure 2 depicts the inflation dynamics.[14] The intercept term for wage inflation term ($\widehat{w}_0$) is given by the following expression.

$$\widehat{w}_0 = \phi[1 - \upsilon_0 + \frac{\upsilon_1}{(s_R + s_R\beta - \kappa_r - \beta)}[(\kappa_0 - i\kappa_r d_W)(s_R + s_R\beta - \beta)]] \quad (28)$$

It is easy to see that wage share dynamics is stable under the assumption that wage inflation dynamics is evaluated at the stable steady state level of d_W (or at least in the stable region of d_W). If wage share is higher than the steady state, price inflation is higher than wage inflation and wage share shrinks. If wage share is lower than the steady state, wage inflation is higher than price inflation, and wage share increases toward its' steady state level.

By setting the equation of motion for the wage share to zero and setting d_W equal to its stable steady state level, we can find the steady state level of wage share. The steady state level of growth rate can also be found by setting d_W equal to its stable steady state level in equation (15).

$$\psi^{ss} = -\frac{(s_R + s_R\beta - \beta)[(-1 + \upsilon_0 - \kappa_0\upsilon_1)\phi - \varphi\psi_F^d] + \kappa_r[(1 - \upsilon_0 - i(-1 + s_R)\beta\upsilon_1)\phi + \varphi\psi_F^d]}{(\phi + \varphi)(s_R + s_R\beta - \kappa_r - \beta)} \quad (29)$$

$$g_K^{ss} = \frac{\kappa_0 s_R + (\kappa_0 + i\kappa_r)(s_R - 1)\beta}{s_R + s_R\beta - \kappa_r - \beta} \quad (30)$$

Table 4 reports the medium-run comparatives statistics results.[15] Consumption emulation has a positive effect on wage share and economic growth. An increase in consumption

emulation generates a higher consumption expenditure (through borrowing) and faster economic growth. This induces more security in workers' employment and their demand for a higher wage. This in turn generates a higher wage share.

[Table 4 about here.]

3.2.2 Endogenous Profit Share Target of Firms

Here, we consider the case of endogenous profit share target of firms. Following Lavoie (1992), we assume that firms' desired profit share depends on the rate of accumulation. The target profit share of firms could then be described by the following simple linear function:

$$\pi_F^d = \mu_0 + \mu_1 g_K \tag{31}$$

where μ_0 and μ_1 are positive parameters. μ_0 represents an autonomous effect on π_F^d and μ_1 is the rate at which π_F^d is revised when accumulation rate changes. A stronger bargaining power of the firms then can be reflected in a higher value of μ_1. Workers have a specific target of wage share, and such a target is given. The behavior of wage inflation is given by the equation (22).

The equation of motion for the wage share is derived similarly to the previous section.

$$\dot{\psi} = \psi\phi(\psi_W^d - \psi) - \psi\varphi[-1 + \mu_0 + \psi + \frac{\mu_1}{(s_R + s_R\beta - \kappa_r - \beta)}[(\kappa_0 - i\kappa_r d_W)(s_R + s_R\beta - \beta)]] \tag{32}$$

The figure 3 depicts the inflation dynamics. The intercept term for price inflation term ($\widehat{p}_0$) is given by the following equation.

$$\widehat{p}_0 = \varphi[-1 + \mu_0 + \frac{\mu_1}{(s_R + s_R\beta - \kappa_r - \beta)}[(\kappa_0 - i\kappa_r d_W)(s_R + s_R\beta - \beta)]] \tag{33}$$

[Figure 3 about here.]

It is again clear that wage share dynamics is stable under the assumption that price inflation dynamics is evaluated at the stable steady state level of d_W. By setting the equation of motion for wage share to zero and setting the d_W equal to its stable steady state level, we can find the steady state level of wage share.

$$\psi^{ss} = -\frac{(s_R + s_R\beta - \beta)[(-1 + \mu_0 + \kappa_0\mu_1)\varphi - \phi\psi_W^d] + \kappa_r[(1 - \mu_0 + i(-1 + s_R)\beta\mu_1)\varphi + \phi\psi_W^d]}{(\phi + \varphi)(s_R + s_R\beta - \kappa_r - \beta)} \tag{34}$$

Table 5 reports the medium-run comparative statistics results on the steady state wage share and growth rate. Contrary to the previous specification, consumption emulation has a negative effect on the wage share. An increase in consumption emulation generates a higher consumption expenditure through borrowing and hence faster economic growth. This induces firms to desire higher profitability, so they increase the price at a faster rate. This creates a higher profit share (and a lower wage share).

[Table 5 about here.]

3.2.3 Endogenous Share Targets of Workers and Firms

In this section, we consider both the endogenous target wage and profit shares of workers and firms. Using both equations (25) and (31), the equation of motion for wage share is derived as:

$$\begin{aligned} \dot{\psi} &= \psi\phi[1 - \upsilon_0 - \psi + \frac{\upsilon_1}{(s_R + s_R\beta - \kappa_r - \beta)}[(\kappa_0 - i\kappa_r d_W)(s_R + s_R\beta - \beta)]] \\ &\quad -\psi\varphi[-1 + \mu_0 + \psi + \frac{\mu_1}{(s_R + s_R\beta - \kappa_r - \beta)}[(\kappa_0 - i\kappa_r d_W)(s_R + s_R\beta - \beta)]] \end{aligned} \tag{35}$$

Figure 4 depicts the inflation dynamics, and the intercept terms for wage and price inflation terms ($\widehat{w}_0$ and $\widehat{p}_0$) are given by equations (28) and (33). The steady state level of wage share

is calculated as the following expression:

$$\psi^{ss} = -\frac{\kappa_r[1-\nu_0-i(-1+s_R)\beta\nu_1\phi+\varphi-\mu_0\varphi+i(-1+s_R)\beta\nu_1])\varphi}{(\phi+\varphi)(s_R+s_R\beta-\kappa_r-\beta)} - \frac{(s_R+s_R\beta-\beta)[(-1+\nu_0+\kappa_0\nu_1)\phi+(-1+\mu_0+\kappa_0\mu_1)\varphi]}{(\phi+\varphi)(s_R+s_R\beta-\kappa_r-\beta)} \tag{36}$$

[Figure 4 about here.]

Table 6 reports the medium-run comparatives statistics results. Contrary to the previous specification, consumption emulation has an ambiguous effect on wage share. An increase in consumption emulation generates a higher consumption expenditure through borrowing and hence faster economic growth. This induces firms to desire higher profitability, so they increase the price at a faster rate. At the same time, workers feel more secure in their employment as they observe growth rate of employment increases. Therefore, they demand a higher wage, generating a faster wage inflation. Whether the real wage and hence wage share increases depends on the relative bargaining strength of both workers and firms. (This is captured by the term $(\mu_1\varphi - \upsilon_1\phi)$ in subsection C.3 of appendix C.) In other words, if workers' bargaining power is stronger relative to firms, emulation has a positive effect on wage share. However if firms' bargaining power is stronger relative to workers, emulation has a negative effect on wage share.

[Table 6 about here.]

4 Conclusion

This paper has studied macroeconomic implications of consumption emulation via a stock-flow consistent neo-Kaleckian model of growth and distribution. Workers' borrowing is induced by their desire to emulate capitalists' consumption. Consumption emulation, in this model, promotes economic growth via expansion of consumption expenditure. Whether this

consumption emulation favors workers or not in terms of income distribution depends on the relative bargaining strength of workers and capitalists. If workers have a relatively weaker bargaining power than firms, consumption emulation will decrease real wage and shrink wage share. If workers have a relatively stronger bargaining power, the opposite results will occur. This result points out that consumption emulation with a weaker bargaining power of workers could be a source of widening income inequality.

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Notes

[1]Personal outlays, disposable personal income, and GDP data are available from Bureau of Economic Analysis. Household debt data is available from the Flow of Funds accounts of the United States, published by the Federal Reserve.

[2]Bowles and Park (2005) show there is a positive relationship between work hours and income inequality using the data of ten advanced economies (including the US), and suggest that this correlation is due to the desire of those less well off to emulate the consumption standard of rich (Veblen effect). Cynamon and Fazzari (2008) and Schor (1998) point out an important role of media in this upward consumption emulation. Marketing for new products often target upper middle income class. However, marketing frequently takes place in mass media and this expands the consumption reference group of lower income class.

[3]Krueger and Perri (2006) examined the empirical relationship between income inequality and consumption inequality in the US. Using data from the Consumer Expenditure Survey, the authors document that rising income inequality was *not* accompanied by rising consumption inequality during the period 1980-2003. For example, they observe that the standard deviation of log consumption rose only by half as much as that of income between 1980 and 2003. Iacoviello (2008) attempted to explain the link between household debt and income inequality using a calibrated dynamic general equilibrium model. His simulation study suggests that the rise in income inequality in the 1980s and 1990s can account for the increase in household debt, the large widening of wealth inequality, and the relative stability of consumption inequality. The key mechanism for this result is the expansion of credit from the rich to the poor.

[4]This consistency condition reflects that one agent's expenditure must be equal to another agent's income in a macroeconomy as a whole.

[5]This term is often referred to as animal spirit.

[6]A similar formation was used in Dutt (2008).

[7] Such a restriction on the marginal propensity to spend is standard in neo-Kaleckian macromodels. It is justified in terms of an implicit short run stability condition. This condition ensures that investment responds less strongly than aggregate saving to an increase in capacity utilization.

[8]This result is consistent with Dutt (2008)

[9]Our neo-Kaleckian model is wage-led or stagnationist (Bhaduri and Marglin, 1990; Blecker, 2002).

[10]The accumulation rate is zero with d_{W2}. This implies that the level of investment is zero: $I = \kappa_0 K + \kappa_r \Pi = 0$. This condition, in turn, means $\pi u = -(\kappa_0/\kappa_r)$. With a positive profit share, u must be negative with d_{W2}.

[11]With the Keynesian stability condition, it is required that $\kappa_0 > \beta i(1 - s_R)$ for u to be positive at the steady state with d_{W1}. For stability, it is required that $\kappa_0 > \frac{(\kappa_0 + i\kappa_r)(\beta - s_R\beta)}{s_R}$. This latter condition insures that d_{W1} is the lower equilibrium (the point A in the figure 1). For the rest of the paper, analysis is done assuming these conditions hold.

[12]A hat over a variable denotes a growth rate of variable.

[13]When there is an increase in the growth rate of employment, workers fear less for their job security and firms are more willing to listen to workers' demands. Then, workers could obtain a higher wage (Cassetti, 2003).

[14]This graph is based on Lavoie (1992).

[15]Results in the table assumes that $\kappa_0 > i(s_R - \kappa_r)$ and $\kappa_0 > i(1 - \kappa_r)$. See appendix C. Note that i, s_R, and κ_r are fractions, which make the term $i(s_R - \kappa_r)$ and $i(1 - \kappa_r)$ very

small. These assumptions are also adopted for the results in tables 5 and 6

A Notation

C_W	consumption by workers
C_R	consumption by capitalists
C	$C_W + C_R$ (total consumption: workers and capitalists)
I	gross private domestic investment
K	capital stock
g_K	I/K, the desired investment rate
κ_0	the state of business confidence
κ_r	the sensitivity of g_K to the profit rate
W_r	real wage
w	nominal wage
L	labor input into production (labor hired)
i	(real) interest rate
Π	firms' gross profits
π	the gross profit share (Π/Y)
r	gross profit rate (Π/K)
D_W	the debt of wage earners (consumer debt)
d_W	D_W/K ratio
S_R	the saving of capitalists
S_F	investment funds to firms
s_R	capitalists' saving rate
τ	markup rate
u	Y/K, the rate of capacity utilization
β	emulation propensity

B Tables and Figures

B.1 Tables

Table 1: Balance Sheet Matrix

	Workers	Capitalists	Firms	Banks	Sum
Capital			K		K
Deposits		D_W		$-D_W$	0
Loans	$-D_W$			D_W	0
Equities		E	$-E$		0
Net worth	NW_W	NW_R	NW_F	NW_B	K

Table 2: Transaction Flow Matrix

			Firms		Banks		
	Workers	Capitalists	Current	Capital	Current	Capital	Sum
Consumption	$-C_W$	$-C_R$	$C_W + C_R$				0
Investment			I	$-I$			0
Wages	$W_r L$		$-W_r L$				0
Firms' profits		Π	$-\Pi$				0
Deposit interest		iD_W			$-iD_W$		0
Loan interest	$-iD_W$				iD_W		0
Change in saving		$-(\dot{D}_W + S_F)$		S_F		$\dot{D}_W$	0
Change in loans	$\dot{D}_W$					$-\dot{D}_W$	0
Sum	0	0	0	0	0	0	0

Table 3: Short-Run Comparative Statics

	κ_0	π	i	d_W	β	s_R
u	$+$	$-$	$-$	$-$	$+$	$-$
r	$+$	0	$-$	$-$	$+$	$-$
g_K	$+$	0	$-$	$-$	$+$	$-$

Table 4: Steady-State Responses (Specification 1)

	κ_0	i	β	s_R
g_K^{ss}	$+$	$-$	$+$	$-$
ψ^{ss}	$+$	$-$	$+$	$-$

Table 5: Steady-State Responses (Specification 2)

	κ_0	i	β	s_R
g_K^{ss}	$+$	$-$	$+$	$-$
ψ^{ss}	$-$	$+$	$-$	$+$

Table 6: Steady-State Responses (Specification 3)

	κ_0	i	β	s_R
g_K^{ss}	$+$	$-$	$+$	$-$
ψ^{ss}	?	?	?	?

B.2 Figures

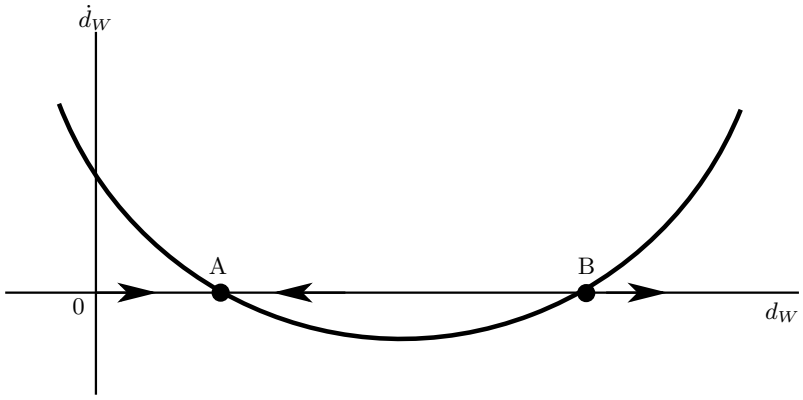

Figure 1: Univariate Dynamics of Consumer Debt

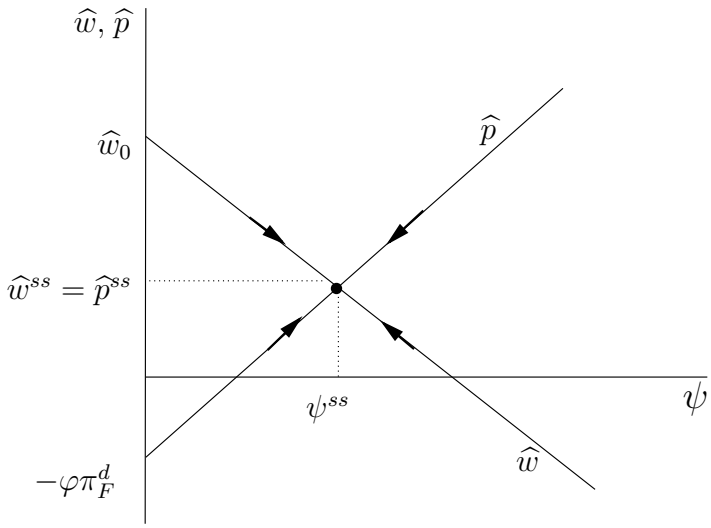

Figure 2: Inflation Dynamics: Specification 1

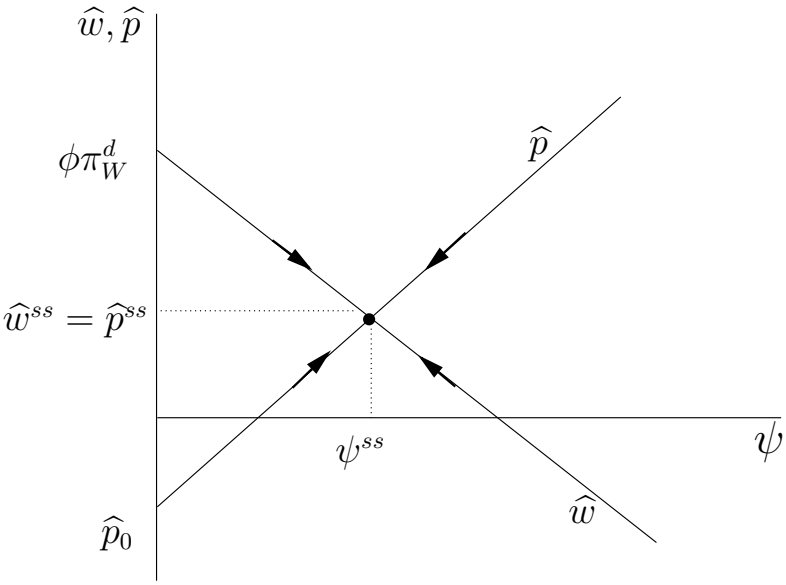

Figure 3: Inflation Dynamics: Specification 2

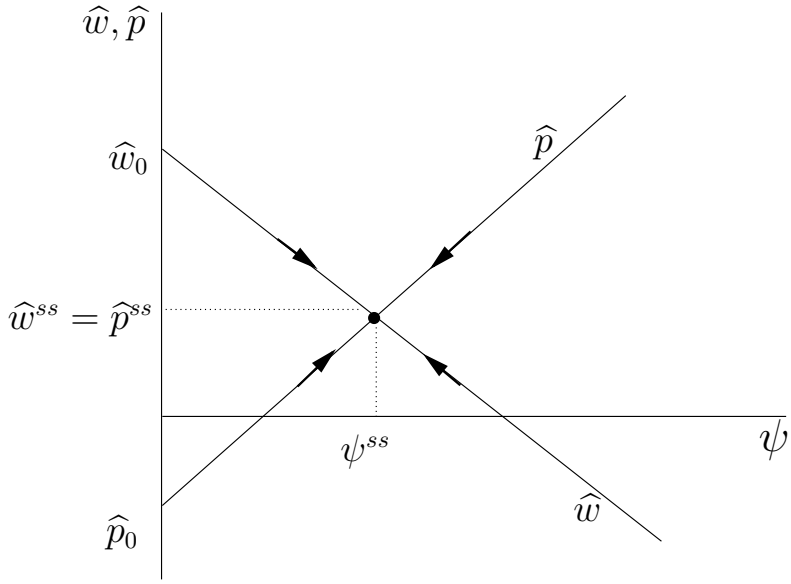

Figure 4: Inflation Dynamics: Specification 3

C Medium-Run Comparative Statics

C.1 Specification 1

$$\frac{\partial \psi^{ss}}{\partial \kappa_0} = \frac{[s_R + (-1 + s_R)\beta]\upsilon_1\phi}{(s_R + s_R\beta - \kappa_r - \beta)(\phi + \varphi)} > 0$$

$$\frac{\partial \psi^{ss}}{\partial i} = \frac{[\kappa_r(-1 + s_R)\beta\upsilon_1\phi]}{(s_R + s_R\beta - \kappa_r - \beta)(\phi + \varphi)} < 0$$

$$\frac{\partial \psi^{ss}}{\partial \beta} = -\frac{\kappa_r[\kappa_0 + i(\kappa_r - s_R)](-1 + s_R)\upsilon_1\phi}{(s_R + s_R\beta - \kappa_r - \beta)^2(\phi + \varphi)} \gtrless 0$$

$$\frac{\partial \psi^{ss}}{\partial s_R} = -\frac{\kappa_r\{\kappa_0 + [\kappa_0 + i(\kappa_r - 1)]\beta\}\upsilon_1\phi}{(s_R + s_R\beta - \kappa_r - \beta)^2(\phi + \varphi)} \gtrless 0$$

$$\frac{\partial {g_K}^{ss}}{\partial \kappa_0} = \frac{s_R(1 + \beta) - \beta}{s_R + s_R\beta - \kappa_r - \beta} > 0$$

$$\frac{\partial {g_K}^{ss}}{\partial \beta} = \frac{\kappa_r(1 - s_R)[\kappa_0 - i(s_R - \kappa_r)]}{(s_R + s_R\beta - \kappa_r - \beta)^2} > 0$$

$$\frac{\partial {g_K}^{ss}}{\partial i} = \frac{\kappa_r(s_R - 1)\beta}{s_R + s_R\beta - \kappa_r - \beta} < 0$$

$$\frac{\partial {g_K}^{ss}}{\partial s_R} = -\frac{\kappa_r\{\kappa_0 + [\kappa_0 + i(\kappa_r - 1)]\beta\}}{(s_R + s_R\beta - \kappa_r - \beta)^2} < 0$$

C.2 Specification 2

$$\frac{\partial \psi^{ss}}{\partial \kappa_0} = -\frac{[s_R + (-1 + s_R)\beta]\mu_1\varphi}{(s_R + s_R\beta - \kappa_r - \beta)(\phi + \varphi)} < 0$$

$$\frac{\partial \psi^{ss}}{\partial i} = -\frac{[\kappa_r(-1 + s_R)\beta\mu_1\varphi]}{(s_R + s_R\beta - \kappa_r - \beta)(\phi + \varphi)} > 0$$

$$\frac{\partial \psi^{ss}}{\partial \beta} = \frac{\kappa_r[\kappa_0 + i(\kappa_r - s_R)](-1 + s_R)\mu_1\varphi}{(s_R + s_R\beta - \kappa_r - \beta)^2(\phi + \varphi)} \gtrless 0$$

$$\frac{\partial \psi^{ss}}{\partial s_R} = \frac{\kappa_r\{\kappa_0 + [\kappa_0 + i(\kappa_r - 1)]\beta\}\mu_1\varphi}{(s_R + s_R\beta - \kappa_r - \beta)^2(\phi + \varphi)} \gtrless 0$$

C.3 Specification 3

$$\frac{\partial \psi^{ss}}{\partial \kappa_0} = -\frac{[s_R + (-1 + s_R)\beta](\mu_1\varphi - \upsilon_1\phi)}{(s_R + s_R\beta - \kappa_r - \beta)(\phi + \varphi)} \gtrless 0$$

$$\frac{\partial \psi^{ss}}{\partial i} = -\frac{[\kappa_r(-1+s_R)\beta(\mu_1\varphi - \upsilon_1\phi)]}{(s_R + s_R\beta - \kappa_r - \beta)(\phi+\varphi)} \gtrless 0$$

$$\frac{\partial \psi^{ss}}{\partial \beta} = \frac{\kappa_r[\kappa_0 + i(\kappa_r - s_R)](-1+s_R)(\mu_1\varphi - \upsilon_1\phi)}{(s_R + s_R\beta - \kappa_r - \beta)^2(\phi+\varphi)} \gtrless 0$$

$$\frac{\partial \psi^{ss}}{\partial s_R} = \frac{\kappa_r\{\kappa_0 + [\kappa_0 + i(\kappa_r - 1)]\beta\}(\mu_1\varphi - \upsilon_1\phi)}{(s_R + s_R\beta - \kappa_r - \beta)^2(\phi+\varphi)} \gtrless 0$$