Debt-led growth and distributional conflicts: evidence from the US economy

Joana David Avritzer

October 2, 2019

Abstract

Post-Keynesian growth models started incorporating household wealth dynamics as an important aspect of the relationship between growth and income distribution. Following these lines, this paper suggests a model in which household consumption decision is determined by a dynamic adjustment of wealth to a targeted level. We also suggest that household's targeted level of wealth takes into account the average income that they earn over a period of ten years. We then run an empirical estimation using microlevel data for wealth and wage of US households available in the PSID (Panel Study on Income Dynamics) Database. We find that the model yields statistically significant results for most income and age groups. We also observe that the target wealth to wage ratio is not constant across groups of income and age. This ratio tends to increase with income and is actually negative for the lowest income bracket. This empirical analysis then suggests that there is evidence for claiming that household debt-financed consumption is an autonomous component of demand and can be incorporated into a demand-led growth model to explain the trajectory of the US economy in the period under analysis.

Keywords: household wealth dynamics, income distribution and growth;
JEL Classification: E11, E12, E21, O41.

1 Introduction

Following the demand-led growth literature, this paper is an attempt to incorporate household wealth dynamics into a model of growth. This paper aims to contribute to the current post-Keynesian debate on consumption functions and growth, presenting some empirical results. With that in mind, this paper is organized into three sections beyond this introduction and a conclusion.

In a first section we present a review of how household wealth dynamics has been incorporated in post-Keynesian growth models. While for neo-Kaleckian growth models, the autonomous component of demand is the investment function, which requires consumption to be determined by current income, under the Supermultiplier framework the autonomous component of demand can be household consumption financed through credit or wealth. Therefore, under neo-Kaleckian theory, household consumption needs to be always determined by current income, even if it is financed by new loans, because the rate of growth of output is determined by rate of capital accumulation.

However, the Supermultiplier literature suggests that household consumption can be the non-capacity generating autonomous component of demand that drives growth. The contributions on this side have emphasized that once we allow the possibility for consumption out of credit or wealth, we are then allowing for the possibility that consumption is no longer determined by current income alone. In the second section then we suggest a model for household consumption and wealth dynamics, where consumption decisions are explained by factor other than current income.

In a second section we suggest a model for household wealth dynamics model where consumption decision is driven by a target of the wealth to income ratio. We assume that households calculate a targeted level of wealth based on their income and then make their consumption and, therefore, savings decision based on this targeted level of wealth. We then estimate different possibilities of the targeted level of wealth for the middle income class. We start with a simple model where households just take into account their current income to calculate this target of wealth to income ratio

and then we extend our model by including an average of wages to be taken into account when calculating the target.
Finally, we find that the model which yields the most significant result is the one where we incorporate in our target an account of the income households get for a period of ten years and we then extend the empirical estimation of this last model to other income brackets. In the third and final section then we estimate the same model for different income and age and we find that the targeted ratio of wealth to wage tends to increase with income and age. Additionally, we estimate a negative target for the lowest income group which suggests that the lowest income class is actually targeting a debt to income ratio.

2 Debt-financed consumption and growth theories

2.1 An introduction to the consumption function debate

As described in Taylor (2004), the typical Keynesian consumption function assumes that consumption is a linear function of income, such that:

$$C = c_0 + c_1 Y \tag{1}$$

Where, Y is output, C is consumption, c_1 is the general marginal propensity to consume of the economy. It is also assumed that $c_1 < 1$, a condition known as Keynes' "fundamental psychological law", such that $\frac{dC}{dY} < 1$ and $\frac{dC}{dY} < \frac{C}{Y}$. However, the first problems with the Keynesian Consumption function started showing up when in the post World War II period, spending from wealth resulted in consumption behavior not following the same pattern as disposable income. Furthermore, time-series analysis seemed to show that the marginal propensity to consume would vary counter-cyclically, falling in booms and rising in slumps.(Taylor, 2004, p .162) In response to that a few early approaches to consumption behavior were developed.
First, Duesenberry (1949) suggested that household's consumption behavior is the

result of learning, custom, and habit and that consumption is somewhat inertial (Taylor, 2004, p. 163). Following Duesenberry (1949), when income rises, household consumption follows, but with a lower rate of growth. The reason for that is that as income falls households will have to reduce consumption, but they will try to retain existing standards of living, and for that reason, consumption will take longer to fall.

The second approach is known as the "life cycle" consumption model of Modigliani et al. (1954). For Modigliani the individual consumption function is driven not only by income, but also takes into account household wealth and total income expected for the household's entire life cycle. This explanation was further developed by Friedman (1957) into the permanent income hypothesis (PIH) theory. The PIH theory assumes that households rationally maximize their utility across time by taking a constant consumption across time which is given by the sum of all of the person's expected income flows divided by the length of their expected lifetime. More recently, this model has been extended to cover uncertainty and precautionary saving, leisure choice and a bequest motive (see Deaton (1992) for more details), "but its key prediction remains: consumers form intertemporal plans aimed at smoothing their standard of living (or marginal utility of wealth) across predictable income changes over their life-cycle." (Cynamon and Fazzari, 2008, p. 1)

Cynamon and Fazzari (2008) argue that this conventional theory seeks to explain the rise of American consumption in the recent stagnation period through the rational behavior of consumer who responds to changes according to this life-cycle model. However, they argue that in fact behavioral patterns based on social norms, that cannot incorporated in the life-cycle model, have contributed significantly to the household debt explosion in the US Economy. They also argue that the macroeconomic implications of these behaviors has enhanced growth and mitigated the severity of recessions, but it also raises doubt about whether recent consumption trends can be sustained. Barba and Pivetti (2008) argue that the rise in household debt given increased inequality goes against what is suggested in the Permanent Income Hypothesis theory, as it shows that households are not rational agents trying to smooth out their consumption across time, they are just trying to cope with low income and maintaining a minimum standard of living (consumption).

Post-keynesian growth models have often assumed a consumption function similar to the originally proposed Keynesian consumption function and focused on the investment component of demand. However, a recent literature has started incorporating household debt-financed consumption as an important component of aggregate demand[1] and, therefore, growth. In these models, household indebtedness will either come from autonomous consumption expenditure, such as suggested by Pariboni (2016) under the supermultiplier model, or from an endogenous consumption, such as suggested by Dutt (2005, 2006) and Setterfield and Kim (2016, 2017, 2018) and others under the neo-Kaleckian approach.

2.2 The neo-Kaleckian growth model and household debt-dynamics

Under the neo-Kaleckian approach household debt dynamics has been incorporated through the definition of a workers' consumption function that allows them to consume beyond their income as they accumulate debt. However, since the neo-Kaleckian approach assumes an exogenous investment function, this accumulation of debt must always become, for some reason or another, determined by current income. Following these lines Dutt (2005, 2006) suggests that worker's consumption, C_W, and capitalists consumption, C_Π, is given by the following two equations:

$$\begin{aligned} C_W &= (1-\pi)Y - iD + \tfrac{dD}{dt}; \\ C_\Pi &= (1-s_\pi)(\pi Y + iD) \end{aligned} \tag{2}$$

Where Y is income, i is the interest rate, π is profit share, s_π is the fraction of income that capitalists save and D is the stock of debt. It is also assumed that household

[1] Palley (1994) first suggested a debt-financed consumption function and analyzed the effect of that for the short run aggregate demand.

accumulate a stock of debt, $\dot{D} = B$, given by a desired level of new borrowing, B_d, which is then determined by current income:

$$\tfrac{dD}{dt} = B = B_d = \beta[(1-\pi)Y - iD] \tag{3}$$

Where β is the borrowing to net income ratio. We can then assume that capital accumulation, $\frac{I}{K}$, follows a typical Kaleckian function as developed by Bhaduri and Marglin (1990), with g_d being the desired rate of capital accumulation and u the rate of capacity utilization:

$$\begin{aligned} &\tfrac{dg}{dt} = \Lambda(g_d - g); \\ &g_d = g_0 + \gamma_1 u - \gamma_2 i; \end{aligned} \tag{4}$$

Since in short run equilibrium we must have that $\frac{Y}{K} = \frac{C_W}{K} + \frac{C_\Pi}{K} + \frac{I}{K}$, we can derive a short-run solution equation for the rate of capacity utilization:

$$u = \frac{g - i\delta(s+\beta)}{s\sigma + \beta(1-\sigma)} \tag{5}$$

Where $\delta = \frac{D}{K}$ is the debt to capital ratio. Here we must notice that a required condition for $u > 0$ is that $g > i\delta(s+\beta)$. Finally, for the long run analysis we can derive[2] the dynamic system:

$$\begin{aligned} \tfrac{d\delta}{dt} &= f_1(\delta, g); \\ \tfrac{dg}{dt} &= f_2(\delta, g); \end{aligned} \tag{6}$$

It can then be shown that the system converges to steady state with $\frac{d\delta}{dt} = 0$ and $\frac{dg}{dt} = 0$ as long as $g > i\delta(s+\beta)$. Another attempt of incorporating household debt-financed consumption into a neo-Kaleckian framework has been done by Setterfield and Kim (2016, 2017, 2018). In their model total income, Y, is divided into:

$$Y = W_P N + W_S \alpha N + \Pi \tag{7}$$

[2]From $\hat{\delta} = \hat{D} - \hat{K} = \frac{B_d}{D} - g$ we arrive at $\frac{d\delta}{dt} = \frac{\beta\{(1-\sigma)[g - i\delta(s+\beta)] - i\delta\Gamma\} - g\delta\Gamma}{\Gamma}$ and from $\frac{dg}{dt} = \Lambda(g^d - g)$ we arrive at $\frac{dg}{dt} = \Lambda\{\gamma_0 + \gamma_1(1/\Gamma)[g - (s+\beta)i\delta] - g\}$, where $\Gamma = s\sigma + \beta(1-\sigma)$.

Where W_P is the real wage of production workers, N is the number of production workers employed, W_S is the real wage of supervisory workers, $\alpha < 1$ denotes the necessary ratio of managers to production workers and Π denotes total profits. It is further assumed that $W_S = \phi W_P$, supervisor work get a constant portion of production workers. Additionally, total consumption, C, is given by:

$$\begin{aligned}
&C = C_W + C_R + \dot{D};\\
&\dot{D} = \beta(C^T - C_W), \quad \beta > 0;\\
&C^T = \eta C_R - \omega_s, \quad \omega_s = t\Pi; C_W = c_W W_P N;\\
&C_R = c_\pi[\phi\alpha W_P N + (1-t)\Pi + iD_R]
\end{aligned} \tag{8}$$

Where C_W is consumption by working households, C_R is the consumption by rentier households and $\dot{D}$ is the borrowing by working households to finance additional consumption. Household borrowing is then determined by a targeted level of consumption, C^T, which, in its turn, is determined by η, the emulation (keeping up with the Joneses) effect, minus the ω_s, social wages (social welfare system). Finally, $D_R = D - D_W$ is the part of worker's debt that is owned by the rentiers and D_W is the part that is owned by other workers.

Given the equations above, it is then possible to solve the model for $Y = C_W + C_R + \dot{D} + G + I$ and find short-run or temporary equilibria. However, Setterfield and Kim (2018) emphasize that this is only a short-run equilibrium because it is assumed a constant net debt to capital ratio, $d_R = \frac{D_R}{K}$. "This net debt capital ratio will, however, vary endogenously over time, as workers accumulate debt and the economy grows."(Setterfield and Kim, 2018, p. 10) It then becomes important to understand these debt dynamics and their implications for growth, which is done, following Setterfield and Kim (2016, 2018), by analyzing the long run steady state behavior of $d_R = \frac{D_R}{K}$.

$$\begin{aligned} \dot{d}_R = & \ \frac{\dot{D}_R}{K} - g_K d_R \\ \Rightarrow \quad \dot{d}_R = & \ [(\beta\eta c_\pi - t[\beta + \beta\eta c_\pi])\pi - (1 - \beta\eta\phi\alpha c_\pi - (1-\beta)c_W)\omega_p]u \\ & +[(1+\beta\eta c_\pi)i - g_K]d_R \end{aligned} \tag{9}$$

As $\dot{d}_R = 0$ results in a quadratic equation, it is possible to derive two steady state equilibria. Finally, it is then possible to make a discussion on the relationship between steady state d_R and d_{Rmax}[3], which is the ratio of maximum amount of debt that households can service to their income, and discuss the actual feasibility of the steady state for households.

Palley (2010) and Pariboni (2016) emphasize that both models above require that $\frac{B}{D} = \frac{I}{K}$, i.e.: that the stock of capital and the stock of debt grow at the same rate. This means that the pace of total consumption (induced plus credit financed) must be determined by the rate of accumulation. In Dutt (2005, 2006) this is done through the assumption that the desired level of borrowing B_d is determined by current income, as $B_d = b[(1-\sigma)Y - rD]$. In this way the demand for loans grow in line with income and output and condition $\frac{B}{D} = \frac{I}{K}$ is satisfied. In the model of Setterfield and Kim (2016, 2017, 2018) we must also have that the rate of accumulation determines the rate of growth of aggregate demand. This is done through assuming an endogenous consumption target.

Hein (2012) suggests a model similar to the ones mentioned above, but in which the new credit going to workers depends on rentiers' income and savings as indicated by:

$$B = \theta S^{\Pi} = \theta(1 - c_\pi)(\pi Y + iD) \tag{10}$$

[3]In this model savings by households is given by $S_W = (1 - c_W)W_P N - iD_R$. This means that worker's maximum feasible debt servicing payment, iD_{Rmax}, must satisfy $d_{Rmax} = \frac{(1-c_W)\omega_P u}{i}$

In Hein (2012) household worker's consumption, C_W is then determined by their wage income and by the credit they receive from rentiers such that:

$$C_W = W + B - iD = (1 - \pi)Y + B - iD \tag{11}$$

Where B is the flow of new loans that household take to consume and D is their total stock of debt. Additionally, it is assumed that rentier's consumption is determined by their total income, consisting of distributed profits of firms (πY) plus the interest payments from workers households (iD) and their propensity to consume (c_π), such that:

$$C_R = c_\pi(\pi Y + iD) \tag{12}$$

Therefore, in Hein (2012) the credit going to workers does not depend on workers' net income, as in Dutt (2005; 2006), but on rentiers' income and saving, as in Setterfield and Kim (2016, 2017, 2018). This allows Hein (2012) to focus on the issue of long-run stability of workers' debt-capital ratios in a similar way to how it is done in Setterfield and Kim (2018).

However, as emphasized by Pariboni (2016) , in the neo-Kaleckian approach the pattern of the demand for loans must in the end be shaped by the accumulation rate. Therefore, the former component plays only an ancillary role in determining aggregate demand growth. Pariboni (2016) argue that it appears reasonable to maintain that debt-led growth processes can be better explained looking at the autonomous pattern of credit-financed consumption, its effects on the rate of growth of output and its macroeconomic consequences, even though the neo-Kaleckian model does not provide a fully satisfactory tool to perform this task.

2.3 Household consumption as the autonomous component of demand

Debt-financed consumption can also be incorporated into a model of demand-led growth following the Supermultiplier approach, as developed by Serrano (1995), Cesaratto (2015) and Freitas and Serrano (2015). This approach has also been incorporated in a neo-Kaleckian framework by Lavoie (2016) and Allain (2014), as a possible solution to the issue of Harrodian instability described in Skott (2010). Following these contributions, Pariboni (2016) suggest a Supermultiplier growth model where the autonomous component of demand households credit-financed consumption. Under this approach if we consider that the components of aggregate demand are consumption, investment and government expenditure, then $Y_t = C_t + I_t + G_t$. We can then assume that consumption is split into an induced component and an autonomous component such that:

$$C_t = c(1-\tau)Y_t + C_t^a + E_t \tag{13}$$

Where c is the marginal propensity to consume, τ is the tax rate, C_t^a is worker's autonomous consumption financed out of endogenous credit money and E_t is capitalists' autonomous consumption expenditure. Consequently we can sum all the autonomous expenditures which are neither financed by income nor affect the production capacity of the capitalist sector as:

$$Z_t = E_t + C_t^a + G_t \tag{14}$$

In this model, we must have that:

$$\begin{aligned} I_t &= h_t Y_t; \\ with \quad \dot{h} &= h_t \gamma (u_t - u_n) \end{aligned} \tag{15}$$

Such that output is always determined by the autonomous component of demand:

$$Y_t = \frac{Z_t}{s - h_t} \tag{16}$$

with $s = 1 - c(1-\tau)$. This means that, under steady state, as $u_t = u_n$, $\dot{h} = \dot{u} = 0$, the rate of growth is given by the rate of growth of the autonomous component of demand:

$$g^* = g_Z \tag{17}$$

Pariboni (2016) then suggests that if we assume that:

$$\begin{aligned}
&C_t^w = c_w[(1-\Pi)Y_t - (r+\phi)D_t] + B_t;\\
&C_t^\Pi = c_\Pi \pi Y_t;\\
&C_t^a = B_t - c_w(r+\phi)D_t;\\
&\Rightarrow Y_t = Y_t[c_w(1-\Pi) + c_\Pi \Pi + h_t] + C_t^a
\end{aligned} \tag{18}$$

such that $Z_t = C_t^a$, i.e., that the autonomous component of demand is household debt-financed consumption, then we have that $g^* = g^{C^a}$, where g^{C^a} is the exogenously given rate of growth of debt-financed consumption."[T]his result implies that, given enough time, demand and output will tend to evolve at the rate of growth of the autonomous components of demand; in this case, workers' autonomous consumption." (Pariboni, 2016, p. 224)

Consequently, under the Supermultiplier approach a non-capacity generating autonomous component of demand is suggested as the solution to the Harrodian instability problem. In the approach described above it is some portion of personal consumption expenditure that is designated as the non-capacity generating semi-autonomous expenditures. That these expenditures represent financial dissaving, and are significantly financed through debt, ties in with the endogenous money approach and the credit-creating powers of banks (Fiebiger and Lavoie, 2019, p. 250). Barba and Pivetti (2008) have also analised the macroeconomic implication of increasing household level of indebtedness from a demand-led growth perspective. In their view "household indebtedness should be seen principally as a response to stagnant real wages and retrenchments in the welfare state, i.e. as the counterpart of enduring changes in income distribution." (Barba and Pivetti, 2008, p. 114). Additionally, they also argue that the key issue concerns the sustainability of this process. Even though it has been shown that household debt-financed consumption can help sustain demand and activity, the real challenge concerns the feasibility of containing the long-run shortcomings of a growing stock of household debt.

Also following these lines, Brochier and Silva (2018) suggest a stock flow consistent Supermultiplier model where the non-capacity creating autonomous component of demand is households' consumption out of wealth. "Consumption out of wealth represents the autonomous expenditure component. Despite being autonomous (in relation to current income), it is endogenous to the model, since it depends on household wealth, so we can analise its dynamic through household wealth dynamics." (Brochier and Silva, 2018, p. 423). As was emphasized by Caminati and Sordi (2017) the autonomous character of expenditure is that it is not determined by current output. To the extent that we are considering the possibility of household consumption being influenced by the stock of wealth accumulation, then it is more appropriate to label it a "semi-autonomous" component of demand.

3 A model for household consumption and wealth dynamics

Following the recent contributions of the post-Keynesian growth theory literature mentioned above, we suggest in this paper a model in which household consumption decision is determined by a targeted level of wealth given household wages. More precisely, following the lines of Dutt (2005), we assume here that households consumption decision targets a certain level of wealth, which is assumed to be a direct function of their income, multiplied by the targeted ratio on wealth to income. However, we will assume that the income that household take into account when deciding on a target for wealth, is not necessarily just the income that they had in the period in which they are taking their consumption decision. We will allow for this target to be affected by other previous income as well as expectations towards future income. First, we define: i) $H[t]$ as total household wealth at time t; ii) $Y[t]$ as total household income at time t; iii) $w[t]$ as household income from wages at time t; iv) $S[t]$ as total household savings at time t; and v) $C[t]$ is total household consumption at time

t. Second, we assume that household decision to save is determined by a targeted wealth to wage ratio:

$$S[t] = \beta(\sigma w[t] - H[t]) \tag{19}$$

Where σ is the targeted ratio of wealth to wage income and β is a measure of the sensibility of the savings function. In other words, households make savings decision trying to decrease the difference between actual wealth and its targeted level, which in this model is then given by: $H^T[t] = \sigma w[t]$. Additionally, we assume that household income is given by the income they get from wages plus the return on investments:

$$Y[t] = w[t] + rH[t] \tag{20}$$

Finally, we know that the flow of household income that is not saved is consumed:

$$C[t] = Y[t] - S[t] \tag{21}$$

Consequently, since change in wealth, or wealth dynamics, is given by households savings decision:

$$\frac{d}{dt}H[t] = S[t] \tag{22}$$

We can then conclude from equations 19 and 22 that:

$$\dot{H}[t] = \beta(\sigma w[t] - H[t]) \tag{23}$$

As we have defined the target of wealth to be $H^T[t] = \sigma w[t]$, we can see that the equation above can then be rewritten as:

$$\dot{H}[t] = \beta H^T[t] - \beta H[t] \tag{24}$$

Therefore, what we actually have in the equation above is that wealth is constantly adjusting to a targeted level. This targeted level can be the wage at time t, such that $H^T[t] = \sigma w[t]$, or it can take the form of $H^T[t] = \sigma\bar{w}$, where $\bar{w} = \frac{\sum_{i=1}^{K} w_{t-K}}{K}$ can be an average of past wage incomes. In order to establish what are the wages taken into account when households are determining their target we will use empirical estimations in the next section. However, before moving to the empirical estimation, it is still important to emphasize that as the data is discrete and not continuous the best representation of what we will try to estimate is actually:

$$\Delta H_t = \beta_0 H_t^T + \beta_1 H_t \tag{25}$$

In order to estimate equation 25 we used data on wealth and wage income from the Panel Study of Income Dynamics (PSID) data. The PSDI is a panel household survey data that began in 1968 with a nationally representative sample of over 18,000 individuals living in 5,000 families in the United States.

Our empirical approach was to first choose the best model that describes the dynamics for the middle income class and then extend the estimation to other income classes. In order to do so we decided to subset the data in group of households by age of head and income brackets. With that in mind, the variables that were taken from the PSID website for each household were: i) age of head; ii) total family income; iii) wealth with equity, which is an imputed value; iv) wages and salaries of head; v) family and person identification number from 1968, in order to allow for continuity of observations.

Even though the PSID Survey is done every year since 1968 we decided to use the PSID - Family Level after 1999 following the usual procedure in the empirical literature that works with PSID Data. The reason for that is there is a change in the estimation of wealth after 1999 to a new methodology that is still used today. A histogram and some descriptive statistics of the used variables can be found in Appendix A.

We then divided our population observation into three groups of income: i) low income class, with income between $\$0$ and $\$40,000$; ii) middle income class, with income between $\$40,000$ and $\$120,000$; iii) high income class, with income between $\$120,000$ and $\$300,000$. We also divided our population into four groups of ages: i) ages between 25 and 35; ii) ages between 35 and 45; iii) ages between 45 and 55; and iv) ages between 55 and 65.

As mentioned before, we then estimated different models with different specifications of the wealth target for the middle income - total family income between 40,000 and 120,000 - and middle age group - the head of the household has age between 35 and 45. We decided to run the first empirical tests with this group of households because it was the biggest share of our sample. The estimation equations and our results for this group are reported in the following section.

3.1 Empirical estimations for the middle income class

Our first attempt was to estimate a model in which the target for the wealth is determined by the wage earned by the household in the previous year. If we assume that the target of wealth is then given by $H_t^T = \alpha w_{t-1}$, where α is our targeted wealth to wage ratio, our estimation equation is given by:

$$\Delta Wealth_{i,t+2} = \beta_0 * Wages_{i,t-1} + \beta_1 * Wealth_{i,t} \tag{26}$$

Where $\Delta Wealth_{t+2} = Wealth_{t+2} - Wealth_t$. We then estimated the model above for $t + 2$ from 2001 to 2015 and t from 1999 to 2013.

In Table 1 we can first observe that the t values for β_0 and β_1 are 3.43 and -40,

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	49423.0191	13190.2243	3.75	0.0002
$Wages_{t-1}$	0.9292	0.2710	3.43	0.0006
$Wealth_t$	-0.6417	0.0160	-40.00	0.0000

Table 1: Results from the first model

respectively. This shows that both coefficients of our model are significant and the significance of β_1 is extremely high. Furthermore, we can also see that that the estimated value for β_0 is 0.93 and for β_1 is -0.64. Comparing to the coefficients from equations 23 and 25 we then have $\beta = -\beta_1$ is our speed of adjustment and $\sigma = \frac{\beta_0}{\beta} = -\frac{\beta_0}{\beta_1}$ is our targeted wealth-wage ratio. Consequently, given the values estimated for β_0 and β_1, the estimated speed of adjustment is 0.6, and estimated σ is equal to $\frac{0.93}{0.64} = 1.5$. It is important to mention here that what is estimated here is similar to what is suggested in Dutt (2005, 2006) where the wealth dynamics becomes non-autonomous as the wealth target becomes determined by current income.

A second attempt was to consider the possibility that the target for the wealth was determined by a future wage. More precisely the wage that households would receive during the period of adjustment of wealth to the targeted level. In this model then the estimation equation would be of the type:

$$\Delta Wealth_{i,t+2} = \beta_0 * Wages_{i,t+1} + \beta_1 * Wealth_{i,t} \tag{27}$$

In this second model the results are not as robust as the first model. First of all,

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	70742.3272	15530.3665	4.56	0.0000
$Wages_{t+1}$	0.3728	0.3079	1.21	0.2261
$Wealth_t$	-0.6361	0.0160	-39.83	0.0000

Table 2: Results from the second model

we get t values of 1.21 and -39.83 for β_0 and β_1, respectively. This shows that the coefficient estimated for β_0 is not significant and that, therefore, the second model is not as good as first model. Secondly, we get that the estimated value for β_0 is 0.37 and for β_1 is -0.64. In this model then the speed of adjustment is again around 0.6, but the targeted ratio is 0.6. In order to try to improve our first two models we decided to incorporate fixed effects in the estimation equation, by estimating the following equation:

$$\begin{aligned} \Delta Wealth_{i,t+2} &= \beta_0 * Wages_{i,t-1} + \beta_1 * Wealth_{i,t} \\ &+ D_{13} + D_{11} + D_{09} + D_{07} + D_{05} + D_{03} + D_{01} \end{aligned} \tag{28}$$

Where D_{01} ,..., D_{13} are dummy variables controlling for time, such that D_{13} is equal to 1 for $t = 2013$ and 0 otherwise, D_{11} is equal to 1 when $t = 2011$ and 0 otherwise, and so on until $D_{01} = 1$ for $t = 2001$ and 0 otherwise. In the results of the third

	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	64960.1706	21034.5050	3.09	0.0020
$Wages_{t-1}$	1.0181	0.2720	3.74	0.0002
$Wealth_t$	-0.6444	0.0161	-40.11	0.0000
D_{13}	-56642.2207	27103.7018	-2.09	0.0367
D_{11}	-48352.8515	27374.8400	-1.77	0.0774
D_{09}	-43901.9420	27527.4552	-1.59	0.1108
D_{07}	-37943.0277	27114.9427	-1.40	0.1618
D_{05}	21159.9342	27236.4434	0.78	0.4373
D_{03}	21513.3221	26988.5555	0.80	0.4254
D_{01}	-12739.4260	26307.3730	-0.48	0.6282

Table 3: Results from the third model

model presented in Table 3, we have again very significant results for β_0 and β_1, with t values equal to 3.74 and -40.11, respectively. It is interesting to observe, however, that the t values for most of the dummies are not significant and their inclusion does not seem to make much difference in the significance of our model. Additionally, in this model the estimated value for β_0 is 1.02 and for β_1 is -0.64. Therefore, the speed of adjustment is around 0.6 and the targeted ratio is again around 1.6.

Another attempt was to use a target for wealth that would be determined by the average of wage received by households over a period of ten years. This resulted in an estimation equation of the type:

$$\begin{gathered}\Delta Wealth_{i,t+2} = \beta_0 * Wealth^T_{i,t} + \beta_1 * Wealth_{i,t} + D_{13} + D_{11} + D_{09} + D_{07}; \\ Wealth^T_{i,t} = \frac{\sum_{k=1}^{5} Wage_{i,t+2-k}}{5}\end{gathered} \tag{29}$$

The results presented for the fourth model are again quite significant, even for the t values of the dummy variables. In this model we also have that the estimated value for β_0 is 1.62 and for β_1 is -0.65. In this case, the estimated value for the

	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	67965.5720	27256.0552	2.49	0.0127
$Wealth^T$	1.6241	0.4554	3.57	0.0004
$Wealth_t$	-0.6547	0.0192	-34.01	0.0000
D_{13}	-82707.0402	30489.4867	-2.71	0.0067
D_{11}	-74525.5575	30779.4568	-2.42	0.0155
D_{09}	-66453.9517	30844.5822	-2.15	0.0313
D_{07}	-58701.8708	30391.0857	-1.93	0.0535

Table 4: Results from the fourth model

speed of adjustment is around 0.7 and for the targeted ratio is 2.5. As a final model of estimation we use a wealth target that would account partially for the wage that households get during the period of adjustment. This implies in estimating an equation of the type:

$$\begin{gathered} \Delta Wealth_{i,t+2} = \beta_0 * Wealth^T_{i,t} + \beta_1 * Wealth_{i,t} + D_{13} + D_{11} + D_{09} + D_{07}; \\ Wealth^T_{it} = \frac{\sum_{k=1}^{5} Wage_{i,t+4-k}}{5} \end{gathered} \tag{30}$$

This is the model that has produced the most significant results for the coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	-16245.6228	23242.0727	-0.70	0.4846
$Wealth^T$	3.7759	0.3867	9.77	0.0000
$Wealth_t$	-0.7657	0.0157	-48.85	0.0000
D_{13}	-81862.6009	25949.9195	-3.15	0.0016
D_{11}	-100613.8785	26173.1498	-3.84	0.0001
D_{09}	-40694.1562	26276.5198	-1.55	0.1215
D_{07}	-18378.2951	25896.9638	-0.71	0.4780

Table 5: Results from the fifth model

estimated for β_0 and β_1, which are 9.77 and -48.85, respectively. However, the t values are not so significant for the dummy variables. In the table below we gathered all of our results so far to compare the estimations of the five equations suggested for our model. In it we report the actual values estimated for β_0 and β_1 and the calculated values for the speed of adjustment and for the targeted ratio of wealth to wages. This compilation of the results shows us, first of all, that we have a speed of adjustment around, but always slightly higher than, 0.5. A speed of adjustment near 0.5 means that between t and $t+2$ households in average will make half of the adjustment of their wealth to its targeted value. This result means then that households are, in average, making close to half of the adjustment to the target level of wealth from period t to $t+2$.

Secondly, we can also see that the target wealth to wage ratio varies significantly across models. The highest estimated targets were obtained in the last two models, in which we estimate that middle income class households target a wealth that is around 2.5 and 5 times their annual income. Taking into account the t values obtained in

Model	β_0 (t value)	β_1 (t value)	Speed of Adjustment ($-\beta_1$) (95% Confidence Interval)	Target Ratio ($-\frac{\beta_0}{\beta 1}$)
Model 1	0.93 (3.43)	-0.64 (-40)	0.64 (0.608 ; 0.672)	1.45
Model 2	0.37 (1.21)	-0.64 (-39.83)	0.64 (0.608 ; 0.672)	0.59
Model 3	1.02 (3.74)	-0.64 (-40.11)	0.64 (0.608 ; 0.672)	1.59
Model 4	1.62 (3.57)	-0.65 (-34.01)	0.65 (0.612 ; 0.688)	2.49
Model 5	3.78 (9.77)	-0.77 (-48.85)	0.77 (0.738 ; 0.802)	4.91

Table 6: Results of the five models estimated for the middle income class

the different estimations, we have decided to estimate the last two models for the different groups of income class and ages. The results are presented in the following and final section.

3.2 Estimations for different groups of age and income brackets

In the tables below we present the estimated results of the last two models for the different income and age groups:

Categories	Age of 25-35 β_0 (t-value)	Age of 25-35 β_1 (t-value)	Age of 35-45 β_0 (t-value)	Age of 35-45 β_1 (t-value)	Age 0f 45-55 β_0 (t-value)	Age 0f 45-55 β_1 (t-value)	Age of 55-65 β_0 (t-value)	Age of 55-65 β_1 (t-value)
Low Income Class	0.03 (0.26)	-0.96 (-82.26)	1.06 (5.68)	-0.83 (-70.57)	1.75 (4.31)	-0.57 (-34.73)	-0.52 (-0.13)	-0.05 (-0.32)
Middle Income Class	0.34 (1.61)	-0.88 (-54.81)	1.62 (3.57)	-0.65 (-34.01)	1.4 (4.06)	-0.47 (-26.81)	0.34 (1.61)	-0.88 (-54.81)
High Income Class	0.27 (1.02)	-0.88 (-42.06)	5.47 (4.18)	-0.22 (-3.22)	2.67 (4.10)	-0.75 (-47.75)	0.39 (0.72)	-0.18 (-7.58)

Table 7: Extended Results for the fourth model

In the table above we can see, given the t values for β_0 and β_1, that we have obtained mostly significant results for different income groups and age. It is interesting to see that the results are however more significant for the estimation of the β_1, which is estimated negative and in absolute terms smaller than one across all groups of age and income. This reflects a estimated speed of adjustment that is positive and smaller than one for all groups of income and age. As for the β_0 we have not obtained a significant estimation for all groups and its estimated value varies significantly across the different groups of age and income. A similar pattern is also observed for the extended estimation of our fifth model.

From the estimated results of β_0 and β_1 presented in the tables above it is possible then to estimate the speed of adjustment and the target of wealth to wage ratio for

Categories	Age of 25-35 β_0 (t-value)	Age of 25-35 β_1 (t-value)	Age of 35-45 β_0 (t-value)	Age of 35-45 β_1 (t-value)	Age 0f 45-55 β_0 (t-value)	Age 0f 45-55 β_1 (t-value)	Age of 55-65 β_0 (t-value)	Age of 55-65 β_1 (t-value)
Low Income Class	2.3 (11.91)	-0.87 (-95.18)	3.78 (9.77)	-0.77 (-48.85)	1.94 (5.76)	-0.78 (-61.49)	1.24 (3.32)	-0.3 (-18.67)
Middle Income Class	-0.57 (-3.52)	-0.54 (-48.10)	1.2 (3.59)	-0.7 (-27.79)	1.83 (3.75)	-0.14 (-3.46)	3.32 (7.84)	-0.33 (-20.67)
High Income Class	0.28 (0.59)	-0.55 (-10.41)	1.83 (3.75)	-0.14 (-3.46)	5.42 (4.88)	-0.74 (-25.35)	1.32 (2.70)	-0.27 (-13.27)

Table 8: Extended Results for the fifth model

the different income and age groups. The results of these estimations are presented in the two tables below:

Fourth Model

Categories	Speed of Adjustment 25-35	35-45	45-55	55-65	Targeted Ratio 25-35	35-45	45-55	55-65
Low Income Class	0.96	0.83	0.57	0.05	0.03	1.28	3.07	-10.4
Middle Income Class	0.88	0.65	0.47	0.88	0.39	2.49	2.98	0.39
High Income Class	0.88	0.22	0.75	0.18	0.31	24.86	3.56	2.17

Fifth Model

Categories	Speed of Adjustment 25-35	35-45	45-55	55-65	Targeted Ratio 25-35	35-45	45-55	55-65
Low Income Class	0.54	0.7	0.14	0.33	-1.06	1.71	13.07	10.06
Middle Income Class	0.87	0.77	0.78	0.3	2.64	4.91	2.49	4.13
High Income Class	0.55	0.14	0.74	0.27	0.51	13.07	7.32	4.89

Table 9: Speed of Adjustment and Targeted Ratio for both models

In the table above we can, first of all, observe that all of the estimated speeds of adjustment are positive and below unit. This means that household in general are only able to do part of the adjustment in the two years period. Secondly, it is also interesting to observe that the targeted ratio tends, in average, to increase with age and income level.

4 Conclusion

We have suggested here a model where households are saving, and consequently consuming, so as to obtain a targeted level of wealth given their wage. In our model then, households decisions to save are such that wealth is constantly adjusting to a certain desired ratio of wealth to wage. We then ran an empirical estimation with the purpose of determining, first, what are the wages that household take into account when making their savings decision and, second, what is the estimated target of wealth to wage ratio of households and how does it vary across different income class.

Our empirical estimations show that the best results are obtained from a model that takes into account an average of wages across a ten years period time. The results get even better if we include in this average the wage that households get during the time when they are doing the adjustment to the target. We also found that this targeted ratio of wealth to wage ratio tends to increase with age and income.

This exercise suggests then that there is an empirical justification for assuming a model for household debt in which they are targeting a certain level on wealth and that this level of wealth is affected by their wage. However, this target of wealth is not directly determined by current income, but by the average of household's income over a ten years period. This then take us back to the idea of household consumption as the non-capacity generating and "semi-autonomous" component of demand, as suggested by the Supermultiplier growth model.

Finally, it is important to emphasize that the model suggested here is similar to what is suggested in Brochier and Silva (2018). However, in Brochier and Silva (2018) household's autonomous consumption is given by a consumption out of previously accumulated wealth. It does not then considers the possibility of households actually getting into debt as a way to maintain their consumption and living standards. Nonetheless, it has been suggested by part of the literature reviewed in the first section as well as the empirical work of the third section that there is basis for claiming that debt-financed consumption can actually be an important part of household autonomous consumption to be incorporated into a demand-led growth model.

References

Allain, O. (2014). Tackling the instability of growth: a kaleckian-harrodian model with an autonomous expenditure component. *Cambridge Journal of Economics 39*(5), 1351–1371.

Barba, A. and M. Pivetti (2008). Rising household debt: Its causes and macroeconomic implications—a long-period analysis. *Cambridge Journal of Economics 33*(1), 113–137.

Bhaduri, A. and S. Marglin (1990). Unemployment and the real wage: the economic basis for contesting political ideologies. *Cambridge journal of Economics 14*(4), 375–393.

Brochier, L. and A. C. M. e. Silva (2018). A supermultiplier stock-flow consistent model: the "return" of the paradoxes of thrift and costs in the long run? *Cambridge Journal of Economics 43*(2), 413–442.

Caminati, M. and S. Sordi (2017). Demand-led growth with endogenous innovation. Technical Report 764, Department of Economics, University of Siena.

Cesaratto, S. (2015). Neo-kaleckian and sraffian controversies on the theory of accumulation. *Review of Political Economy 27*(2), 154–182.

Cynamon, B. Z. and S. M. Fazzari (2008). Household debt in the consumer age: Source of growth - risk of collapse. *Capitalism and Society 3*(2), 1–30.

Deaton, A. (1992). *Understanding Consumtpion.* Oxford University Press.

Duesenberry, J. S. (1949). *Income, saving, and the theory of consumer behavior.* Harvard University Press.

Dutt, A. K. (2005). Conspicuous consumption, consumer debt and economic growth. In M. Setterfield (Ed.), *Interactions in analytical political economy.* New York: ME Sharpe Armonk.

Dutt, A. K. (2006). Maturity, stagnation and consumer debt: A steindlian approach. *Metroeconomica 57*(3), 339–364.

Fiebiger, B. and M. Lavoie (2019). Trend and business cycles with external markets: Non-capacity generating semi-autonomous expenditures and effective demand. *Metroeconomica 70*(2), 247–262.

Freitas, F. and F. Serrano (2015). Growth rate and level effects, the stability of the adjustment of capacity to demand and the sraffian supermultiplier. *Review of Political Economy 27*(3), 258–281.

Friedman, M. (1957). A theory of the consumption function. princeton u. press. geweke, j., and m. keane (2000):"an empirical analysis of earnings dynamics among men in the psid: 1968-1989,". *Journal of Econometrics 96*, 293–356.

Hein, E. (2012). Finance-dominated capitalism, re-distribution, household debt and financial fragility in a kaleckian distribution and growth model. *PSL Quarterly Review 65*(260), 11–51.

Lavoie, M. (2016). Convergence towards the normal rate of capacity utilization in neo-kaleckian models: the role of non-capacity creating autonomous expenditures. *Metroeconomica 67*(1), 172–201.

Modigliani, F., R. Brumberg, et al. (1954). Utility analysis and the consumption function: An interpretation of cross-section data. *Post-keynesian economics 1*, 338–436.

Palley, T. (1994). Debt, aggregate demand, and the business cycle: an analysis in the spirit of kaldor and minsky. *Journal of Post-Keynesian Economics 16*(3), 371–390.

Palley, T. I. (2010). Inside debt and economic growth: a neo-kaleckian analysis. In M. Setterfield (Ed.), *Handbook of Alternative Theories of Economic Growth*. Edward Elgar. Chelteham (UK), and Northwampton,(USA).

Pariboni, R. (2016). Household consumer debt, endogenous money and growth: A supermultiplier-based analysis. *PSL Quarterly Review 69*(278), 211–233.

Serrano, F. L. (1995). *The sraffian supermultiplier*. Ph. D. thesis, University of Cambridge.

Setterfield, M. and Y. K. Kim (2016). Debt servicing, aggregate consumption, and growth. *Structural Change and Economic Dynamics 36*, 22–33.

Setterfield, M. and Y. K. Kim (2017). Household borrowing and the possibility of consumption drive, profit-led growth. *Review of Keynesian Economics 5*, 43–60.

Setterfield, M. and Y. K. Kim (2018). Varieties of capitalism, increasing income inequality and the sustainability of long-run growth. *NSSR Working Paper*.

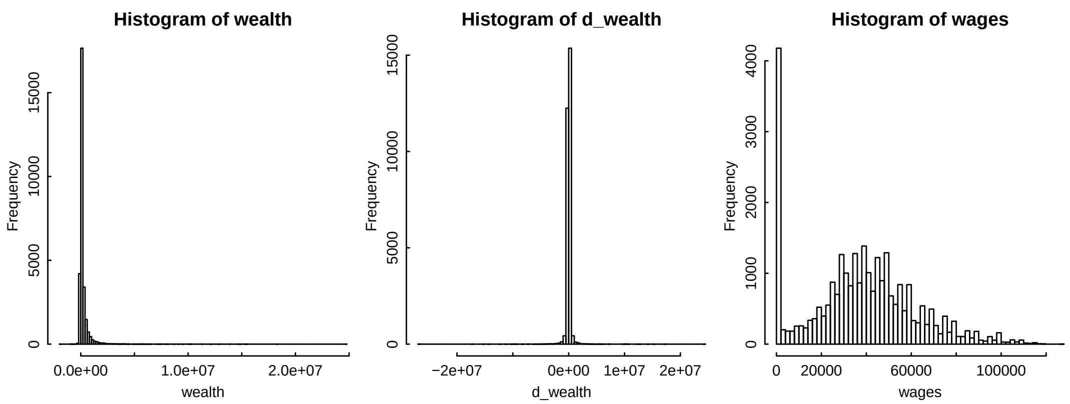
Skott, P. (2010). Growth, instability and cycles: Harrodian and kaleckian models of accumulation and income distribution. In M. Setterfield (Ed.), *Handbook of Alternative Theories of Economic Growth*, pp. 108–131. Edward Elgar Publishing.

Taylor, L. (2004). *Reconstructing macroeconomics: Structuralist proposals and critiques of the mainstream*. Harvard University Press.

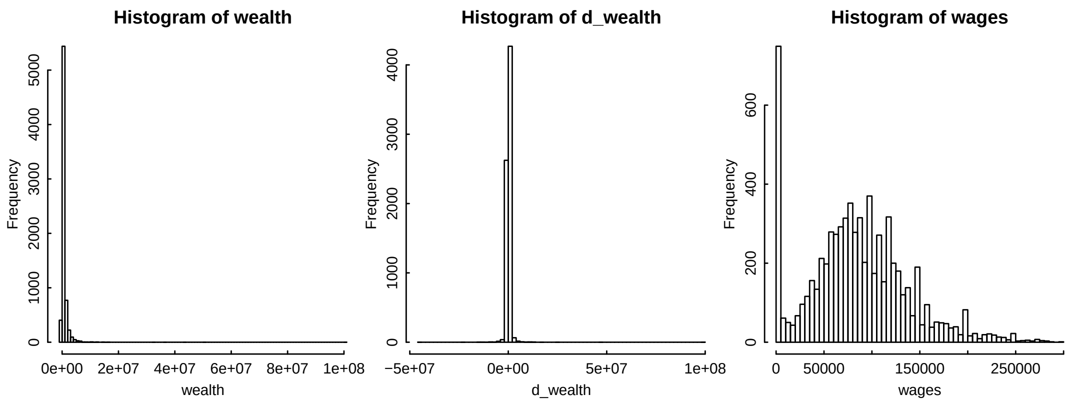
Appendix A - Descriptive Statistics of the Data

Histograms for the low income class

Histograms for the middle income class



Histograms for the high income class



Descriptive Statistics

Income	Number of Observations	Wealth		Wages	
		Mean	S.D.	Mean	S.D.
Low Income Class	28399	65876.55	665172.9	11259.11	11689.37
Middle Income Class	28992	195548.9	545909.8	38017.07	24447.27
High Income Class	7056	660424.7	1878502	86523.23	53444.12

Table 10: Descriptive Statistics of the Data