DIPARTIMENTO DI
ECONOMIA POLITICA
E STATISTICA
— DEPS

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QUADERNI DEPS 929/2025

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September 2025

UNIVERSITÀ
DI SIENA
1240

Working Paper Series of the Department of Economics and Statistics of the University of Siena
Piazza San Francesco 7-8, 53100, Siena | Italy
deps.unisi.it

ISSN: 17209668

A Stock-Flow Consistent Model of Emulation, Debt and Personal Income Inequality

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Abstract

Divergent trends in income and consumption inequality - with the first increasing substantially more than the latter - are an established stylized fact for the US economy of the last decades. The same time span experienced also a steady increase in household debt, plausibly not independently from the patterns in income distribution and consumption just mentioned. In this article we develop a stock-flow model that tries to replicate some of these dynamics. We emphasize the role played by changing behavioural attitudes towards consumption and demand for loans by households, by introducing an emulation mechanism that links a given quintile's households desired consumption with the realized consumption of the immediately superior quintile. Furthermore, we leverage the data availability for consumption, income and wealth for quintiles of income distribution to estimate empirically those attitudes. The model, albeit simple and essential in its nature, is able to show the Janus-like faces of households' debt and emphasizes the predator-prey-like dynamics implied by a debt-let process, in which fresh borrowing increases aggregate demand and output, which feeds the ability to borrow and consume more; at the same time, the stock of accumulated debt "preys" on income due to the contractionary forces of the repayment mechanism. Through a simple and stylized representation of the multiple interactions between income distribution, consumption and debt, we also formalize and highlight how the benefits of a process of debt-led growth are asymmetrically distributed and reinforce the same detrimental tendencies in income distribution that led to the emergence of debt as a necessary engine of growth.

JEL Codes: E12, E21, D31

Keywords: Stock-Flow Consistent Model; Personal Income Inequality; Emulation; Debt

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1. Introduction

The last decades witnessed a sharp increase in household debt, especially in but not limited to Anglo-Saxon countries, both in absolute and in debt-to-income ratios terms. Particularly from the onset of the Great Recession, the issue has come to the forefront of economic debates (Piketty and Saez, 2014; Frank et al, 2014; Ranaldi and Milanović, 2022; Botta et al., 2021) and has been widely discussed in the literature. Part of it mulled over origins and causes of growing private indebtedness, while several other contributions explored consequences and implications of this phenomenon.
Among the most popular explanations of growing indebtedness, there lies an argument which links it with trends in income distribution and income inequality observable in most advanced economies: in the face of stagnating incomes for middle and low-income households, the attempt to "keep up with the Jones" and maintain ingrained consumption habits - but also to satisfy basic needs no longer guaranteed by a shrinking State - led those same households to borrow at an increasing rate.
On the other hand, when looking at the outcomes of this process, a trade-off has been made explicit in some literature (Christen and Morgan, 2005; Frank et al, 2014; Bertrand and Morse, 2016): short-run gains - consisting in a partial and temporary relief to the aggregate demand-generation problems implied by shifts in income distribution in favour of high-income and low-propensity to consume segments of the population - went hand in hand with long-run, structural financial instability, which eventually proved unsustainable.

Starting from some empirical facts, in this article we develop a stock-flow consistent model that tries to replicate some of the dynamics in place (mostly) in Anglo-Saxon economies during the 20 years leading to the Great Recession. In the model, we emphasize the role played by changing behavioural attitudes towards consumption and demand for loans by households, by introducing an emulation mechanism that links a given quintile's households desired consumption with the realized consumption of the immediately superior quintile. Furthermore, we leverage the data availability for consumption, income and wealth for quintiles of income distribution to estimate empirically those attitudes. The model, albeit simple and essential in its nature, is able to show the Janus-like faces of households' debt: borrowing to finance consumption increases the level of aggregate demand and output, but at the same time fresh borrowing increases the level of the stock of debt. The stock of debt exerts a contractionary pressure on aggregate demand, because repayment affects money balances and transfers resources from high propensity to spend agents to low propensity to spend ones. The interaction of these phenomena, hence, creates a sort of "predator-prey" type dynamics, in which fresh borrowing increases income, which feeds the ability to borrow and consume more; at the same time, the stock of accumulated debt "preys" on income due to the contractionary forces of the repayment mechanism. Interestingly, our model - and the simulations based on it - is capable of mimicking a feature that has characterized the US economy in the last decades, namely a divergence in the patterns of income and consumption inequality. As it has been recently emphasized and restated by Meyer and Sullivan (2023), the substantial increase in the former has been matched by a much milder rise in the latter. Throughout this article, we propose an analytical explanation for this, based on lower quintiles households' emulative behavior cum indebtedness, which we believe can tell at least a part of the full story.

Our model has obvious limitations: for example, the behaviour of the financial sector is highly simplified. Nevertheless, the stylized theoretical construction we develop provides a novel perspective on the interactions between income distribution, consumption, and debt, moving beyond existing contributions. In particular, we formalize and highlight how the benefits of debt-led growth are asymmetrically distributed, reinforcing the same regressive tendencies in income distribution that made debt a necessary engine of growth in the first place. Crucially, unlike much of the previous literature, our analysis is empirically calibrated to U.S. data, which allows us to bridge theoretical insights with observed macroeconomic dynamics. In this way, we add explanatory power to ongoing debates on the link between inequality, household borrowing, and macroeconomic instability.

The paper is structured as follows: section 2 shows some stylized facts about the dynamics of debt, consumption, income and wealth inequality in the US, to provide a snapshot of the real-world trends that motivated this work. Section 3 offers a concise review of the literature, while section 4 introduces our model. In section 5 we discuss the calibration of our model and perform some simulations. Section 6 presents some scenario analysis as Section 7 concludes.

2. Stylized Facts

A heavily skewed distribution of income and wealth is a structural and well-known feature of the US economy, extensively scrutinized and discussed in the literature. A few stylized facts help capture the essence of the phenomenon. For example, by looking at disposable income and net wealth shares by quintiles, it can be noted that the bottom 20% of the distribution consistently gets, over the last three decades, only around 5% of the total, while the top quintile has been able to appropriate about half of total disposable income and a growing share of total net wealth, which sits at 70% according to the latest available data.

Figure 1. Disposable income shares by quintiles

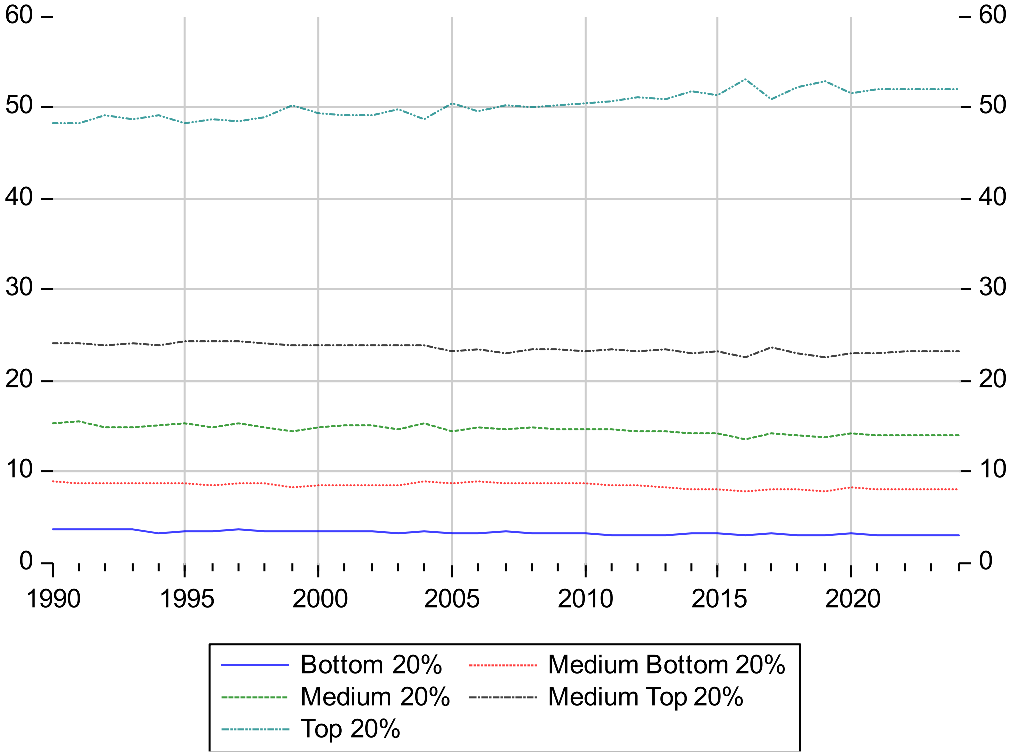
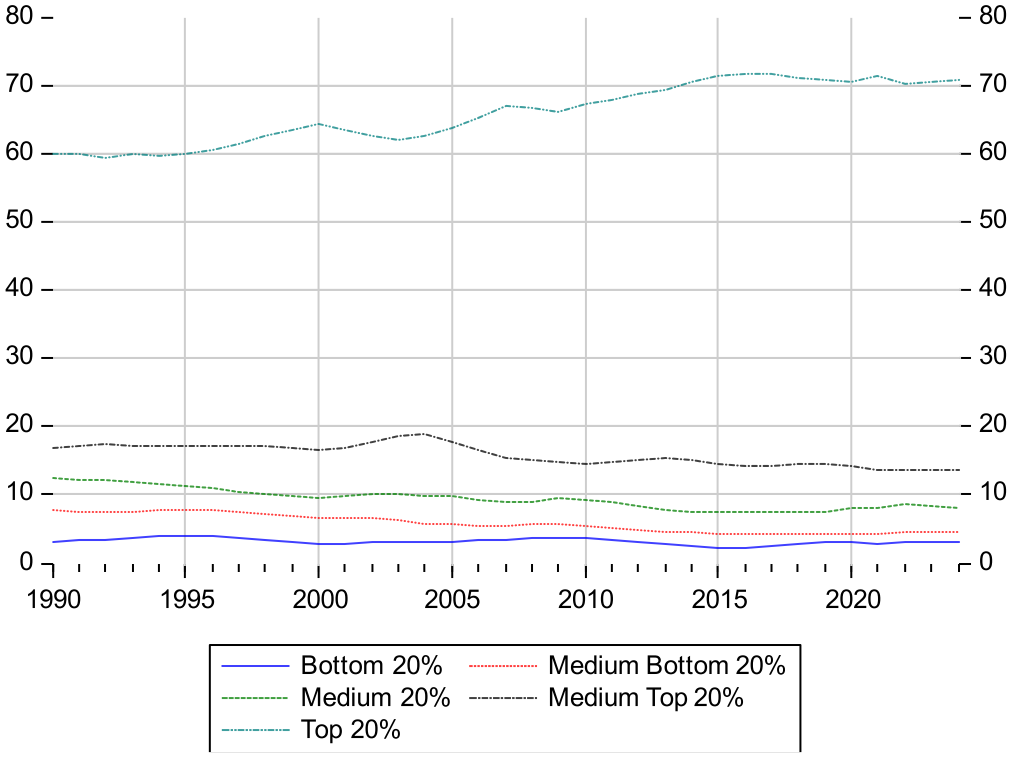


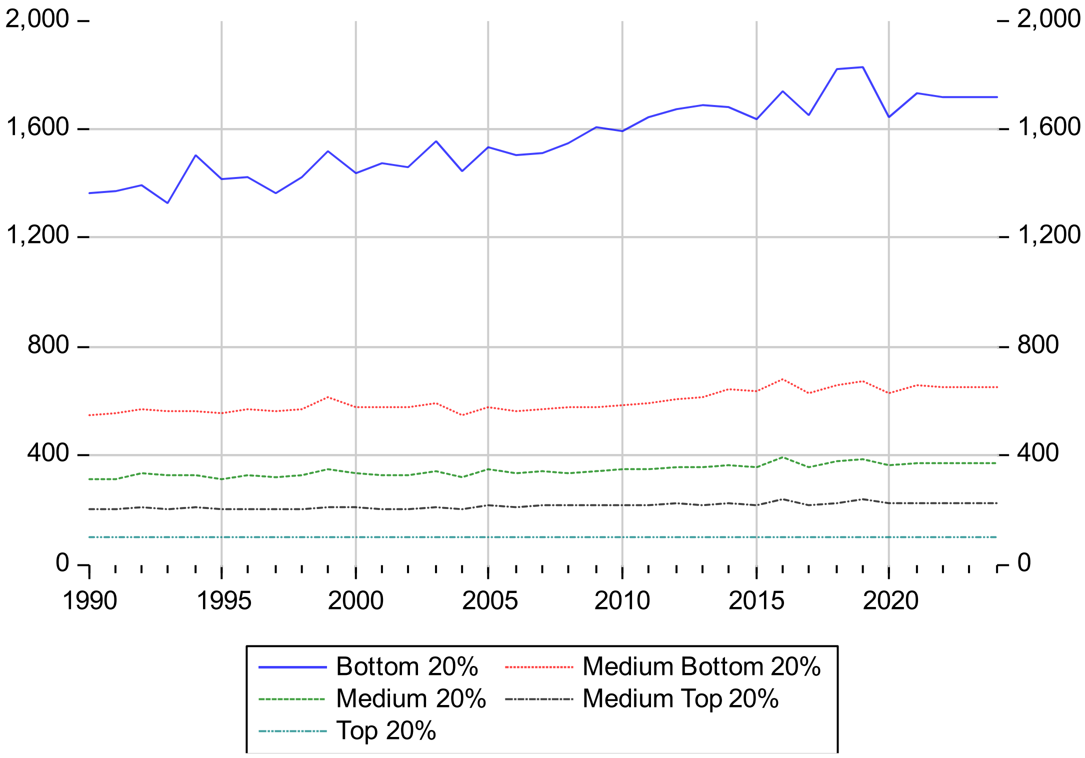
Figure 2. Net wealth shares by quintiles



Source: BLS, BEA, FRB

An alternative and complementary way of visually inspecting the same dynamics involves looking at the ratio between the disposable income of the top quintile divided by the disposable income of the other quintiles, as it is shown in fig. 3. From the latter it results that, for example, the aggregate disposable income of the top 20% has been steadily increasing with respect to that of the bottom fifth, settling in the last years at a proportion of more than 16 to 1.

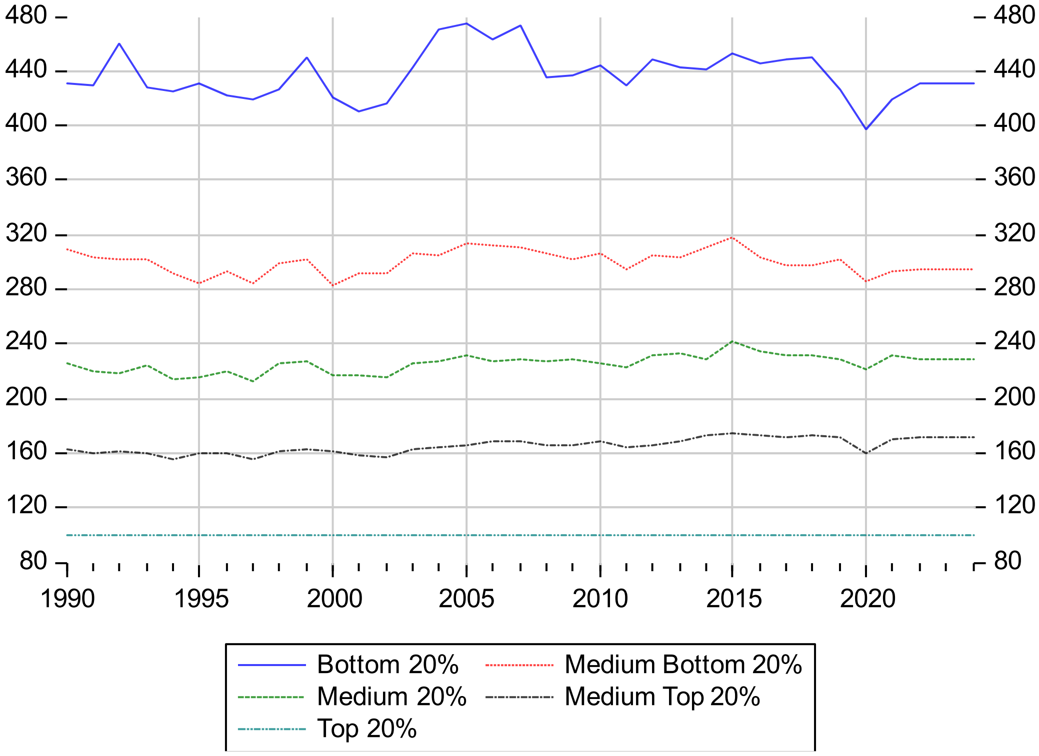
Figure 3. Disposable income Top 20%-Bottom 20% ratio by quintiles



Source: BLS, BEA, FRB

A different picture emerges, however, when repeating the same exercise with consumption instead of disposable income. As can be seen in figure 4, consumption of the top quintile compared to that of the bottom 20% displays a more stable - albeit with oscillations - pattern, at much lower levels.

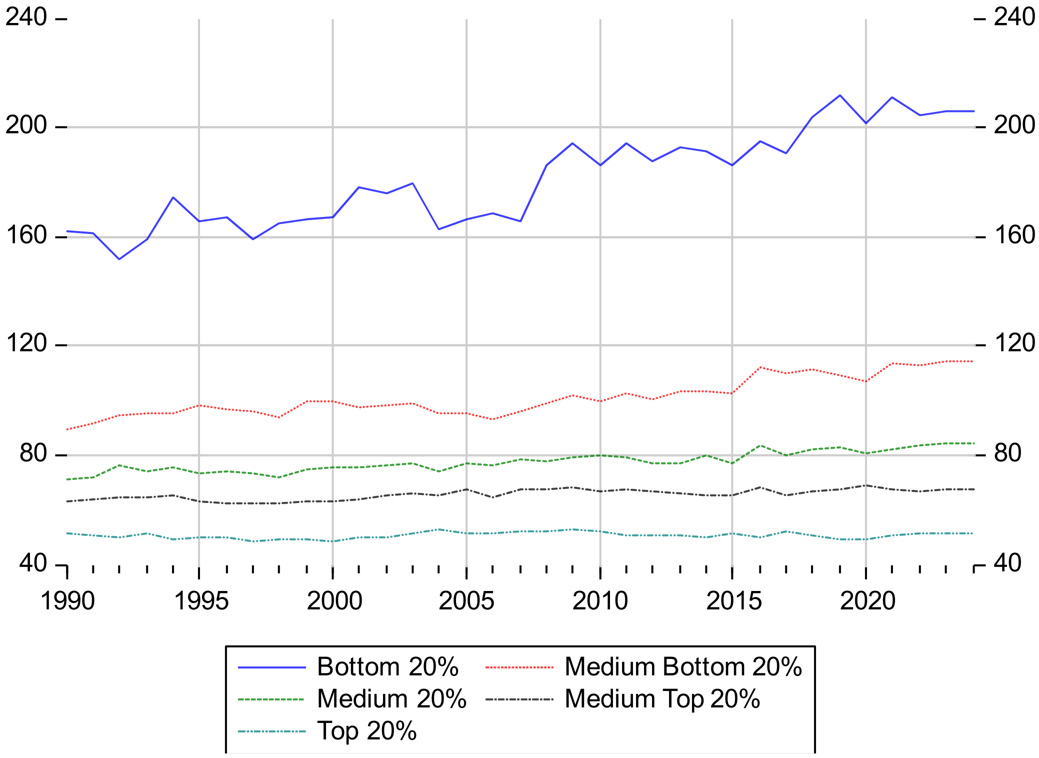
Figure 4. Consumption Top 20%-Bottom 20% ratio by quintiles



Source: BLS, BEA, FRB. Note: Index is 100 for Bottom 20%

Unsurprisingly, a mirror image of what has just been described is offered by the ratio of consumption over disposable income (see fig. 5): the lower quintile consumes more than twice its disposable income, and the ratio is lower the more we move up the distribution ladder.

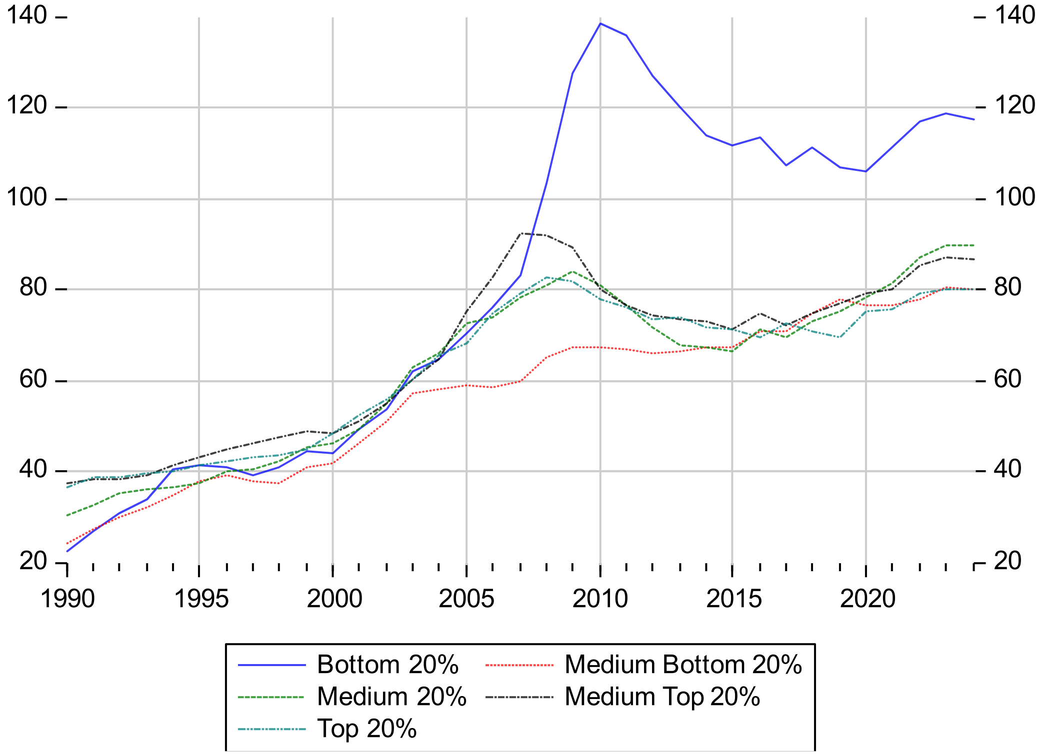
Figure 5. Consumption to disposable income ratio by quintiles



Source: BLS, BEA, FRB

No prize for guessing how households in the lowest quintile can afford similar patterns of consumption. Fig. 6 - outstanding liabilities over disposable income - shows a peak for indebtedness of the bottom 20% at the onset of the Great Recession and a subsequent slowly decreasing trend, but the magnitude is still just slightly below 120% of disposable income.

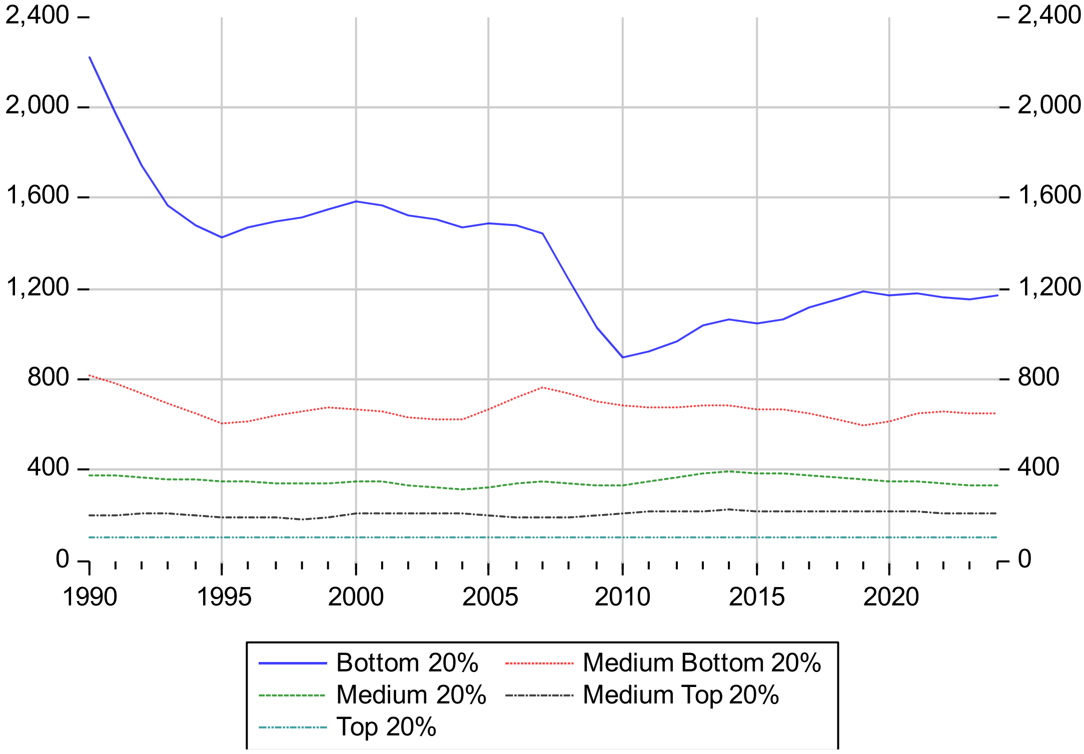
Figure 6. Debt to disposable income ratio by quintiles



Source: BLS, BEA, FRB

Additionally, outstanding liabilities of the bottom 20% have grown - over the last 35 years - at a much faster pace than those of the top 20% (see fig. 7), as can be inferred from the behaviour of the ratio between the latter and the former.

Figure 7. Debt Top 20% - Bottom 20% by quintiles



Source: BLS, BEA, FRB. Note: Index is 100 for Bottom 20%

3. Literature Review

After the Great Recession, different studies have discussed the importance of household spending decisions in generating the dynamic that shaped the financial crisis (Mian and Sufi 2017, 2018). Consistently with what has been argued extensively in the literature (see van Treeck, 2014, for an exhaustive survey of the literature), we believe that at least a portion of this process can be explained by looking at the underlying trends in income inequality we briefly hinted at in the previous section. That is not, however, the end of the story, given that shifts in income distribution could not explain - by themselves - what happened to consumption in the U.S. in the past decades. This implies the need to move on from a treatment of aggregate consumption as a "passive" variable, which is simply a function of income, wealth and their distribution.

Several works analyze how household spending can be largely "independent" from income. The concept of "passive consumption function" makes sense when households face a "hard budget constraint", a situation in which households can rely just on their income and on their past savings to spend. However, if households have the option to borrow to finance their outlays, the picture is radically different. In this case, the consumption function becomes to a certain extent independent of income and can be influenced by other variables like households' willingness to borrow, the willingness to lend by the financial sector, household wealth and "peer effects".

Starting from this, we propose an explanation of the paths of consumption, saving and borrowing of the household sector in the U.S. based on a somewhat traditional, but also relatively neglected view of how economic agents make decisions.
Following the insight of Duesenberry (1949) we treat households' decisions about consumption and saving as influenced not only by their own income and wealth (and the attempt to maximize their own utility), but as shaped by other factors, such as "others'" consumption patterns. Hence, consumers purchase products not only for their functional utility but also for their social meaning. This also resonates with the concept of conspicuous consumption, as can be found in classic work of Veblen (1975) [1899], which over a century ago underlined the individuals' concerns about the social visibility of consumption and the presence of a strong propensity for status considerations. Consumption, according to this view, no longer has the simple task of satisfying an individual's material necessities, but it also becomes a signal of the adherence to both a certain social structure and a common ground of values and habits. Furthermore, in a context of extremely fragmentary information and heavy uncertainty, households' behavior would be driven by social norms, which are mostly determined by the habits and the behavior of the reference groups, in general constituted by wealthier and more successful households.

This interpretation of consumers' decisions has been discussed by several authors like Frank, Levine and Dijk (2010), Bertrand and Morse (2016), and Christen and Morgan (2005), just to mention a few of them. Frank, Levine, and Dijk (2014) use the term "expenditure cascades" to describe the behavior of agents that respond to changes in consumption patterns of those above them by changing their own consumption pattern: "Increased expenditure by some people leads others just below them on the income scale to spend more as well, in turn leading others just below the second group to spend more, and so on" (Frank et al., 2014, p. 57).

For the authors, people's evaluations of what they consume are heavily dependent on context. Modifications in one group's spending shift the frame of reference that defines consumption standards for others just below them on the income scale, leading to a ripple effect of increased expenditure down the income ladder. The very concept of expenditure cascades is rooted in Duesenberry's relative income hypothesis, which explicitly acknowledges that individuals compare their consumption to that of others. While for Duesenberry the comparison effect is general, for the authors people tend to look to those above them on the income scale rather than those below when forming their consumption standards. Therefore, when a higher-income group increases its spending on certain goods (e.g., larger houses, more expensive cars), this raises the perceived standard of what is considered adequate or normal for the group just below them in income. To keep up, or to avoid feeling deprived relative to this new standard, the second group also tends to increase their spending. This process continues, with each increase in spending by one income group influencing the spending of the group just below it, creating a cascade of expenditure throughout the economy.

Moving along similar logical lines, Bertrand and Morse (2016) introduce the concept of "Trickle-down consumption" and show how, since the early 1980s, growth in local inequality has been associated with a change in consumption of the lower part of the income distribution, as non-rich households has started to ramp up their consumption to keep up with their wealthier neighbors.

Christen and Morgan (2005) argue that income inequality creates the need for low-income households to use debt in order to keep up their consumption levels relative to wealthier households. According to the authors, instead of relying on a process of utility maximization, households tend to be driven and influenced by consumption habits of those above them in the income distribution ranking or of those who represent a particular social reference. In this context, what defines an acceptable school, housing, clothing, transportation, and other items depends on how much others spend on them, with a conspicuous consumption dynamics that creates a "positional arms race", since it establishes continuously evolving new, and more expensive, reference points. Since individuals strive to improve or maintain their social standing, consumption becomes a tool to signal the economic status to keep up with the social competition. In this context, a dynamic of persistently unequal income distribution can exacerbate this positional consumption race, with an impact on the dynamic of demand in the short and long run.

In order to provide an analytical infrastructure to the intuitions we briefly mentioned so far, we rely on stock-flow consistent modeling. The main reason is that this class of models are particularly apt to study the impact of financial variables - think of, for example, the stock of debt - on the real side of the economy (Barwell and Burrows 2014, p. 45). Stock-flow consistent (SFC) models construct an accounting framework that systematically records all relationships between sectors, flows, and stocks. Building on this structure, behavioral equations and accounting identities are introduced in such a way that consistency is ensured between the behavior of flows (such as income, consumption, and investment) and the dynamics of stocks (such as wealth and debt), making sure that every flow has a counterpart and that nothing disappears from the system[4] (Nikiforos and Zezza, 2018).

Different SFC models have been developed to describe the interaction of rising income inequality, financial development and changing attitudes towards expenditure. Kapeller and Schutz (2014) present an SFC model whereby the interaction between households' 'conspicuous consumption norms' and banks' loosening credit standards can generate instability, that is, a 'Minsky–Veblen cycle'. Detzer (2018) uses an open economy SFC model to describe how unequal income distribution and financial deregulation have shaped different growth regimes, whose interactions led to the global imbalances that preceded the Great Recession: the debt-led growth regimes, where private debt, thus the financial sector, is the main driver of the economic activity, and an export-led growth regimes, where current account surpluses spur growth. Carnevali et al. (2024) follow Detzer in describing how the interaction between these two types of economy can create financial instability. Belabed et al. (2018) use a three-country (representing the US, China, and Germany) SFC model. Both the export-led growth of the economies of China and Germany and the credit-led growth of the US economy (before the Global Financial Crisis) are generated by a bottom-up redistribution of domestic incomes. Ruggeri (2023) uses the SFC framework in a closed economy to study how the interaction between

[4] We can summarize the main tenets of stock-flow consistent modelling by relying, once again, on Nikiforos and Zezza (2018): 1. Flow consistency: Every monetary flow comes from somewhere and goes somewhere. As a result, there are no "black holes" in the system; 2. Stock consistency: The financial liabilities of an agent or sector are the financial assets of some other agent or sector; 3. Stock-flow consistency: Every flow implies the change in one or more stocks. As a result, the end-of-period stocks are obtained by cumulating the relevant flows and taking into account possible capital gains; 4. Quadruple entry: These three principles, then, imply a fourth one: that every transaction involves a quadruple entry in accounting. For example, when a household purchases a product from a firm, the accounting registers an increase in the revenues of the firm and the expenditure of the household, and at the same time a decrease in at least one asset (or increase in a liability) of the household and correspondingly an increase in at a least one asset of the firm.

two classes of households, banks and the housing market can generate fluctuations that resembles the one described by the financial accelerator. Lu (2025) develops an empirical SFC macroeconomic model for the UK to monitor the household debt dynamics under different scenarios, including the housing-credit reinforcing cycle. In a similar vein, Byrialzen and Raza (2020) build a large-scale SFC model to discuss household debt' role within the Danish economy. Szymborska (2022) shows how the composition of U.S. household balance sheets has changed over time, with wealthier households gaining more from financial asset growth while lower-income groups remain heavily indebted. Gobbi et al. (2024) highlight how unconventional monetary policies, such as quantitative easing, tend to benefit the rich by inflating asset prices, thus reinforcing existing wealth inequalities. Furthermore, ABM-SFC models incorporating household heterogeneity and social norms explore how individual behavior, shaped by peer effects and income distribution, influences macroeconomic dynamics. Cardaci (2018) and Cardaci and Saraceno (2019) show how status-driven consumption can amplify inequality and financial fragility. Fierro et al. (2023) and Botta et al. (2021) further integrate adaptive agent behavior into SFC frameworks, highlighting how social comparisons and heterogeneous expectations affect consumption, indebtedness, and economic stability. The relationship between autonomous demand and debt accumulation has been also explored in the literature. Pariboni (2016) builds a supermultiplier model to study the sustainability of debt-driven autonomous consumption, Pedrosa et al (2023) uses a SFC supermultiplier model to study how different debt-driven autonomous demand coming from the government and the household sector impact growth and financial stability. Di Bucchianico et al. (2024) build a supermultiplier model in which growth is driven by workers' debt accumulation as well as rentiers' consumption out of interest. Avritzer and Brochier (2025) build a model where debt-financed household autonomous consumption drives growth to study the stability condition of these growth dynamics.

4. Model description

Starting from the stylized facts presented in section 2, we want to discuss how the demand generation process coming from the household sector in the US can be explained by changing attitudes towards consumption, saving and the demand for credit, and how this dynamics can have an effect on financial stability and growth. In this section, we present a stylized model of an economy that is demand-led both in the short and in the long run. Our focus is, in particular, on the role played by the debt-financed consumption of a portion of the household sector in shaping the evolution over the long run of our simple economy. The latter, as described in the model, is composed of three sectors: households, firms, and banks. The households' sector is split into five quintiles of incomes. Each quintile receives four kinds of incomes, namely wages, distributed profits from both financial and non-financial corporations and interest income from their accumulated stock of assets.

Table 1

		Households					Firms		Banks	Sum
		Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Current**	**Capital**		
Consumption		$-C_{q1}$	$-C_{q2}$	$-C_{q3}$	$-C_{q4}$	$-C_{q5}$	$-C_t$			**0**
Investment							$+I$	$-I$		**0**
Wages		$+WB_{q1}$	$+WB_{q2}$	$+WB_{q3}$	$+WB_{q4}$	$+WB_{q5}$	$-WB_t$			
Firms' profits		$+\Pi_{fq1}$	$+\Pi_{fq2}$	$+\Pi_{fq3}$	$+\Pi_{fq4}$	$+\Pi_{fq5}$	$-\Pi$	$+\Pi_b$		**0**
Banks profits		$+\Pi_{bq1}$	$+\Pi_{bq2}$	$+\Pi_{bq3}$	$+\Pi_{bq4}$	$+\Pi_{bq5}$			$+\Pi_b$	**0**
Interest on	**Assets**	$+INT_{aq1}$	$+INT_{aq2}$	$+INT_{aq3}$	$+INT_{aq4}$	$+INT_{aq5}$			$-INT_a$	**0**
	Liabilities	$-INT_{lq1}$	$+INT_{lq2}$	$-INT_{lq3}$	$-INT_{lq4}$	$-INT_{lq5}$	$-INT_{lf}$		$+INT_l$	**0**
Change in the stock of	**Assets**	$-\Delta\ a_{q1}$	$-\Delta a_{q2}$	$-\Delta a_{q3}$	$-\Delta a_{q4}$	$-\Delta a_{q5}$			$+\Delta a$	**0**
	Liabilities	$+\Delta l_{q1}$	$+\Delta l_{q2}$	$+\Delta l_{q3}$	$+\Delta l_{q4}$	$+\Delta l_{q5}$	$+\Delta_{lf}$		$-\Delta l$	**0**
Sum		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Source: own elaboration

We dramatically simplified the flow of funds-side of the economy. Thus, the only financial assets and liabilities of the economy are made up of banks' deposits and loans. Moreover, households own both firms and banks and receive dividends from them. The price level is assumed constant across all periods.

Aggregate output is made, from the income side, by the sum of incomes received by all quintiles gross of undistributed profits and consumption of fixed capital (depreciation allowances).

1. $Y = \sum YD_{qx} + \ \Pi_{uf} + DA$

From the expenditure side, aggregate output is made of aggregate consumption and firms' productive investment.

2. $Y = \sum C_{qx} + I$

4.1 Households

Each quintile (qx) consumption demand is driven by disposable income and the accumulated stock of wealth, and it also has an autonomous component (C_{0qx}), as shown in (3). Consumption in excess of disposable income is financed by loans from financial intermediaries (4).

3. $C_{qx} = C_{0qx} + \alpha_{qx} YD_{qx} + \beta_{qx} W_{qxt-1}$
4. $L_{qx} = L_{qx-1} + C_{qx} - YD_q$

The four sources of income in our economy are described by equation (6). Conversely, households build up savings if disposable income is in excess of consumption demand (5).

5. $W_{qx} = W_{qx-1} + YD_{qx} - C_{qx}$
6. $YD_{qx} = WB_{qx} + INT_{Aqx} + \Pi_{fqx} + \Pi_{Bqx} - INT_{Lqx}$

Those savings are invested in the only interest-bearing asset available in the economy, namely time deposits (7). Net worth is made up of those assets net of the outstanding stock of liabilities (loans, 8).

7. $W_{qx} = D_{qx}$
8. $NW_{qx} = D_{qx} - L_{qx}$

4.2 Firms

Gross Business investment is completely induced by income (as in Serrano, 1995, Cesaratto et al., 2003, Freitas and Serrano, 2015), as shown in equation 9. Firms' profits are equal to the sum of the inflows from consumption by households (C_{qx}) and Investment (I), minus the outflows represented by the wages paid to employees (WB_{qx}) and the interest on loans (INT_{Lfqx}).

9. $I = hY + DA$
10. $\Pi_F = \sum C_{qx} + I - WB_{qx} - INT_{Lfqx}$

The investment share of output (net of depreciation) is given by (11) and it reacts to the adjustment of capacity utilization (12) towards its normal rate.[5] In absence of technical progress, potential output (13) is given by the capital stock over the capital-output ratio.

11. $h_{t+1} - h_t = h\gamma(u_t - u_n)$
12. $u = \frac{Y}{Y_{nt}}$
13. $Y_{nt} = \frac{K}{v}$

Profits are partly retained and reinvested (14) and partly distributed to each income bracket for consumption purposes (15). As a result, the stock of loans in the current period is the sum of the previously accumulated stock of debt plus the amount of investment not covered by the internal funds (16).

14. $\Pi_{uf} = \Pi_F * \theta$
15. $\sum \Pi_{fqx} = \Pi_F - \Pi_{uf}$
16. $L_f = L_{f,t-1} + I - \Pi_{uf}$
17. $K_t^I = K_{t-1}^I + I - DA$
18. $DA = \delta * K_{tt-1}^I$

Finally, firms' demand for labour depends upon labour productivity of each household (19), as the compensation for employees is given by the stock of employed households for each quintile multiplied by their wage rate (20).

[5] We borrow this treatment of investment - which depicts a simple, flexible accelerator mechanism at work - from the literature on the Supermultiplier. See Freitas and Serrano (2015).

19. $N_{qx} = \frac{Y}{pr_{qx}}$

20. $WB_{qx} = \omega_{qx} N_{qx}$

4.3 Banks

Equations 21-22 describes the evolution of the flow of loans of the banking sector, which is equal to the previously accumulated stock of loans, ($L_{s(t-1)}$) plus the new flow of credit extended to the economy (SL_t). Loans are assets in the hands of the banking sector.

21. $SL = \Delta L_f + \sum \Delta L_{qx}$

22. $L_s = L_{s(t-1)} + SL_t$

Equation 23 describes the total stock of deposits supplied by banks, which is equal to the previously accumulated stock ($D_{s(t-1)}$) plus the new flow of credit.

23. $\sum D_s = \sum D_{s(t-1)} + (L_s - L_{s(t-1)})$

Equation 24 describes the profits of the banking sector. Banks charge an interest rate on loans and pay an interest on the deposits held, with profits being determined by the spread between these two interest rates. Banks' profits are distributed to households.

24. $\Pi_b = INT_{Lf} + \sum INT_{qx} - \sum INT_{Afqx}$

Finally, Equations 25 and 26 provide the interest payments on outstanding loans for both firms and households from the previous year, reflecting the cost of servicing existing debt. In contrast, Equation 27 refers to the interest earned from time deposits.

25. $INT_{Lf} = i_L * L_{f(t-1)}$

26. $\sum INT_{qx} = \sum i_L * L_{qx(t-1)}$

27. $\sum INT_{Afqx} = \sum i_L * D_{qx(t-1)}$

4.4 Emulation

In order to simulate the consumption cascade hypothesis put forward by Frank et al. (2014), we endogenize - in our policy scenarios - autonomous consumption for all quintiles except the top one, as follows:

28. $C_{0qx} = C_{1qx} + \rho_{qx} \frac{C_{qx+1}}{YD_{qx}}$

In other words, households in each quintile lower than the top 20% would emulate the consumption of the quintiles immediately above them. We assume that this emulation will be scaled by the disposable income of the qx households.

5. Calibration

As pointed out in section 3, one advantage - from a theoretical standpoint - to adopt this approach consists in integrating consumption, saving and lending decisions in a consistent framework from a national accounting perspective. However, this presents the obvious limitation implied by data constraint, as long as our modeling exercise needs more disaggregation than the one usually offered by national accounts. Luckily, this tradeoff is minimal for the case of US households' data, as detailed in table 2. In particular, earnings decomposition can be achieved using both macro data such as the National Income and Product Account (NIPA) from the Bureau of Labour Statistics (BEA) (Fixler et al., 2017), and from micro data such as the Consumer Expenditure Survey (CES) conducted by the Bureau of Labour Statistics (BLS). The latter survey also presents more granular data about consumption expenditure decisions, which can be used to decompose aggregate personal consumption expenditure. Thus, we opted to use the earnings and consumption shares from these statistics to generate the vectors YD_{qx}, C_{qx} for each of our five quintiles, leveraging also the larger data coverage (see table 2). As for the data to populate the flow of funds of households and thus their aggregate share of wealth, we rely on Distributional Financial Accounts (DFA) published by the Federal Reserve Board (Batty et al., 2021). Those experimental statistics use mixed micro-macro surveys to properly allocate the share of assets and liabilities held by the various categories of the US population and are becoming widely available for a number of OECD countries as well (Van de Ven, 2017).[6] On top of that, DFA releases data at different frequencies immediately following the publications of Financial Accounts (FRB, 2025). Once we completed the construction of our sample, we carried out the estimates of the set of equations 3 and 28 for our quintiles. As standard practice in this literature (Papadimitriou et al., 2025, Zezza and Zezza, 2025), we employ Error Correction Models to estimate α_{qx}, β_{qx} and ρ_{qx}. The results from our estimates are listed in the appendix. As expected, the size of the coefficients for both α_{qx}, β_{qx} are significant with the exception of the stock of wealth for Q1, as they respect the conditions $\alpha_{qx} < \alpha_{qx+1}$, $\beta_{qx} < \beta_{qx+1}$ implying that the propensity to consume increases as we move downward in the income distribution pyramid. As for the emulation parameter, we find out that the cascade effects are stronger in the medium and bottom medium 20% of our quintiles, as it is statistically insignificant for Q4 and considerably lower for Q5. This is in line with the literature assessed in section 3, pointing out a greater relevance of emulation

[6] BLS and NIPA also provide data for the distribution of personal savings, yet DFA provides data only for assets and liabilities. Thus, it is not possible to infer directly the allocation of net savings between different assets or how net borrowing positions are financed. For the sake of our exercise, however, this information is not necessary as we do not mean to develop a fully-fledged empirical model. In other words, we are interested in calibrating our model with reasonably sound parameters, rather than attempting to calibrate and initialize a fully-fledged empirical model. This would have meant introducing at least two institutional sectors, namely the general government and the rest of the world in a typical Godley (1999) fashion. Moreover, the NIPA based measurement of consumption and incomes might not measure correctly the flows of purchasing power under the control of the household, as argued by Cynnamon and Fazzari (2017).

motives for middle class households. The remaining parameters of the model are borrowed from the relevant literature and can be found in the appendix.

Table 2: Data Sources

Variables	Source	Type of Survey	National Accounts Consistency	Sample
$\sum YD_{qx}$	**BLS (CES)**, BEA (NIPA)	**Micro**, Macro/Micro	**Yes**, No	**1984-onward**, 2000-2023
$\sum C_{qx}$	**BLS (CES)**	**Micro**	**No**	**1984-onward**
W_{qx}	**FRB (DFA)**	**Macro/Micro**	**Yes**	**1989-onward**

Source: own elaboration. In bold the data sources that were selected to perform the calibration

6. Scenario analysis

The model is simulated for 100 periods. Consistency checks for the baseline are listed in the appendix, as the main results are summarized on Table 4. We perform three scenario analyses: the first one consists of a permanent increase in the level of autonomous consumption by the bottom 20% quintile in absence of emulation dynamics (i.e., switching off eq. 28). The second scenario pulls the trigger of equation 28 in all but the top 20% households, by adding an emulation motive in their consumption decisions. Finally, scenario 3 reverts to the standard consumption function listed in equation 3, allowing for a permanent increase in the level of autonomous consumption from Q3. The results are listed in figure 8, 9 and 10 as ratios with respect to the baseline values. In scenario 1, GDP, aggregate demand components and disposable income spike upwards in the short term as they tend to increase in the long run, driven by the increase in consumption. This spike in consumption is driven by the increase in fresh borrowing by Q5 households as their demand for loans increases by 6% with respect to the baseline (later dropping to 4%). Disposable income for these households, after a short-lived spike, drift downward as it later recovers by the end of the simulation period. The remaining households, on the other hand, experience an increase in both disposable income and consumption, as they reduce their liabilities. What is the dynamic of income distribution, both from a personal and functional perspective? The share of wages on the total disposable income drops immediately following the shock, and it does not fully recover in the long run, driven by both the decreases in wage earnings from Q5 and an increase in interest payments accruing to the other quintiles, but to a larger extent to Q1, whose share of disposable income increases. It is possible to compute and observe the evolution of the traditional Gini index (for both disposable income and wealth) as well to observe the dynamic of income composition inequality, as suggested by Ranaldi and Milanovic (2020). Driven by the finance-led distribution dynamics outlined above, the Gini index for incomes increases, albeit marginally. Interestingly, a small decrease in the Gini of wealth is observed. This can be explained by the fact that Q4, Q3 and Q2 households increase their share of wealth due to the increase in autonomous consumption carried out by Q5 households, though they are far from reducing the larger portion of wealth held by Top 20%, whose share drops less than 3 basis point to later almost recover to its initial baseline. Another interesting dynamic is observed in the income factor composition (IFC), which after a short-lived positive spike drifts downward. This signals a shift in the composition of incomes, towards a greater equality of their sources among household quintiles. Ranaldi and Milanovic (2020) argues that, historically, the index appears to correlate positively with the traditional Gini, meaning that as personal income distribution worsens the sources of incomes (wage and non-wage) gets more polarized. They also point out that, in some economies, this relationship may be reversed, such as in the case of the US. Our simulation details a channel through which this process can unfold, allowing for a wage squeeze among the bottom 20% incomes and an increase in financial incomes in the remaining quintiles. Similar dynamics are set in motion in scenario 2 for what concerns aggregate demand components and disposable income, though as emulation kicks in level and growth effects turn out to be stronger than in scenario 1. Moreover, due to the presence of multiple lags in equation 28, short term responses are subject to more adjustments. This is so because, after the initial ramp up of consumption expenditure to catch up with each household group's expenditure target, the increase in disposable income for each quintile mitigates the emulation motives. Interestingly, the build up of debt for each quintile takes on heterogeneous dynamics. For instance, whilst Q1 and Q2 responses are virtually the same in scenario 1 as for disposable income, debt and consumption, Q3 households disposable income lags behind consumption, as their debt slowly builds up with respect to the baseline after an initial drop. This is consistent with the parametrization in our model and with the stylized facts reported in section 2. Bottom quintiles, however, behave quite differently; as consumption in Q5 initially increases and then fades as debt piles up (as this is the quintile experiencing the greatest increase in debt), disposable income rises only to drop below the baseline subsequently and then slowly catch up by the end of the simulation. Bottom-medium quintiles' responses are less intense , as they deliver a surprising drop in debt accumulation as disposable income increases more than consumption in the long run. This paradox can be explained by the dynamic of the cascade effect; as we mentioned earlier, Q3 households manage to emulate Q2 ones in the short term, but as debt builds up they slow down their consumption demand. As a result, Q4 emulative response for consumption is hampered by the same token. At any rate, fresh borrowing increases permanently only for Q5, as the spikes for Q3 and Q4 are short lived. The dynamics of personal and functional income distribution are in line with scenario 1, as they point out towards a negative long-run co-movement between factor income inequality and both personal and functional income inequality. Scenario 3 can be taken as a robustness exercise, to test the responses of our model following a shock similar to that in scenario 1, but this time involving autonomous consumption of Q3. This experiment presents stronger level effects for aggregate demand and incomes, though the debt burden now is carried out by the squeezed middle class, as it rises to more than 80% with respect to the baseline. Q5 eventually experiences a decrease in their stock of debt, although there is a small uptick in their net borrowing in the long run, while the increase in consumption for Q3 proves to be short lived again due to the increased stock of debt. This time, the IFC drops as the wage share decreases, as income and wealth Gini remain virtually unchanged.

It is worth emphasizing that the results of our simulations are consistent with the findings of recent empirical literature on the divergent patterns of income and consumption inequality in the United States, according to which "consumption inequality rose considerably less than income inequality over the past 5 decades" (Meyer and Sullivan, 2023, p. 280). Furthermore, as can be seen from figures

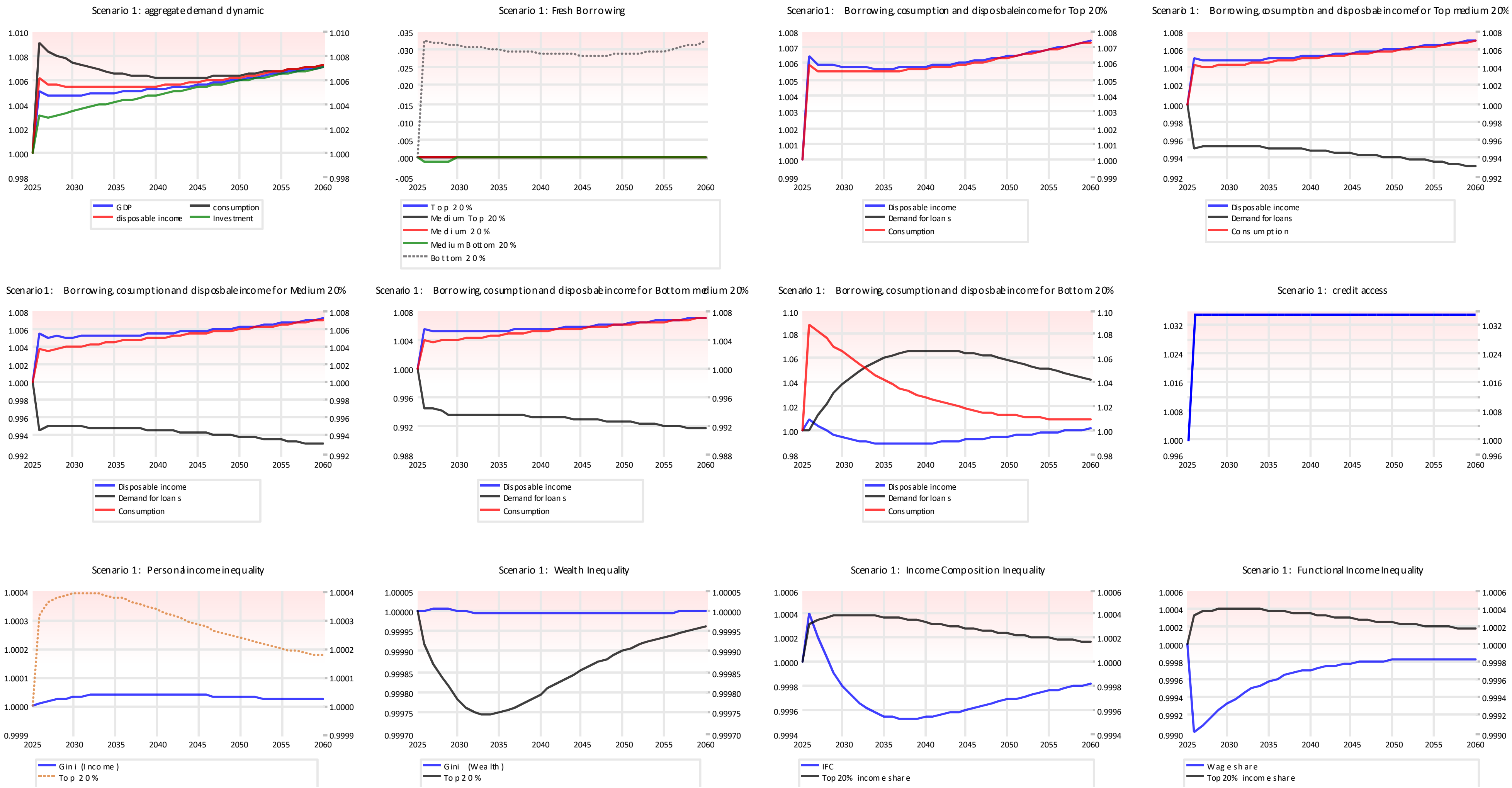
8 and 9, also in our 'abstract' economy "the difference in the levels of consumption and income inequality are particularly large for the bottom half of the distribution" (Meyer and Sullivan, 2023, p. 263), while "an increase in consumption inequality is evident only for the top" (ibid.), as our figures 8 and 9 displays.[7]

Table 4: Main results from the simulation

Scenario	**Quintile**	**Income Growth**	**Debt Accumulation**	**Distributional Effects**
1. Bottom 20% autonomous consumption (no emulation)	Q1	↑ (long run)	≈	Wage share declines; Income Gini ↑ slightly; Wealth Gini unchanged; Top 20% share ↑ (except Q1 wealth); IFC drops
	Q2	↑	↓	
	Q3	↑	↓	
	Q4	↑	↓	
	Q5	↓ (after ↑ spike)	↑↑ (6% → 4%)	
2. Emulation trigger (all but top 20%)	Q1	↑	↓	Wage share declines; Income Gini ↑ slightly; Wealth Gini ↓ marginally; Top 20% share ↑; IFC drops
	Q2	↑ (lags cons.)	↓	
	Q3	↑ (lags cons.)	↑ (slow build-up)	
	Q4	↑ (weaker)	↓	
	Q5	Initial ↑ then ↓	↑↑ (strongest)	
3. Medium 20% autonomous consumption	Q1	↑	≈	Wage share declines; Income Gini ~unchanged; Wealth Gini unchanged; Top 20% share ↑; IFC drops
	Q2	↑	↓	
	Q3	↑ (weaker)	↑↑ (up to +80%)	
	Q4	↑	↓	
	Q5	↑	↓ (slight long-run uptick)	

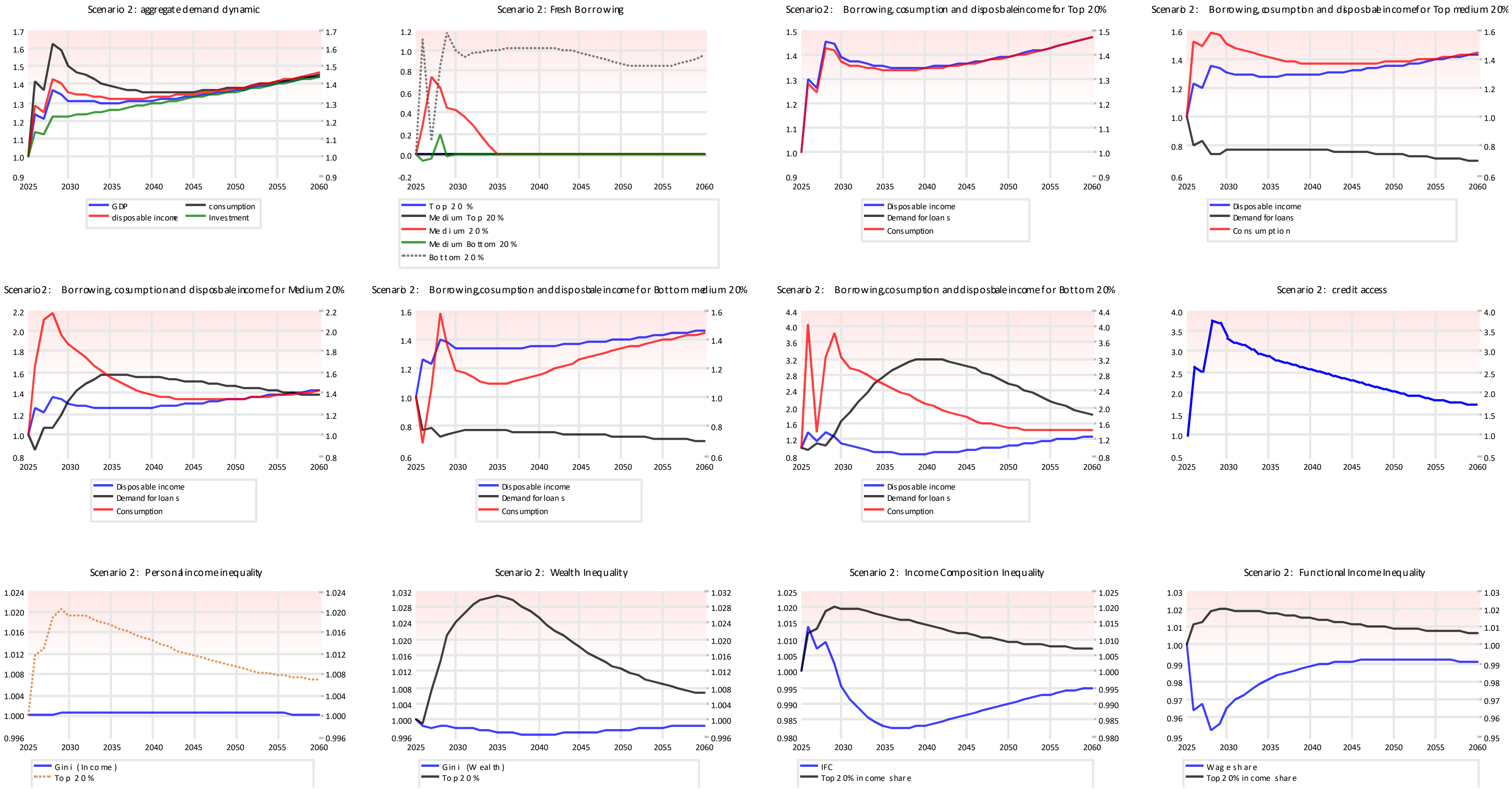
[7] Admittedly, our explanation for the limited increase in consumption inequality, which emphasizes the role of household debt, differs from Meyer and Sullivan's, who stress an ensemble of factors at play, such as falling asset prices and underreporting of government transfers. In this sense, our argument is more akin to Krueger and Perri's (2006), who identify households' consumption smoothing through access to credit as the main reason for the relatively milder increase in consumption inequality.

Figure 8: effect of an increase in autonomous consumptions of bottom 20%



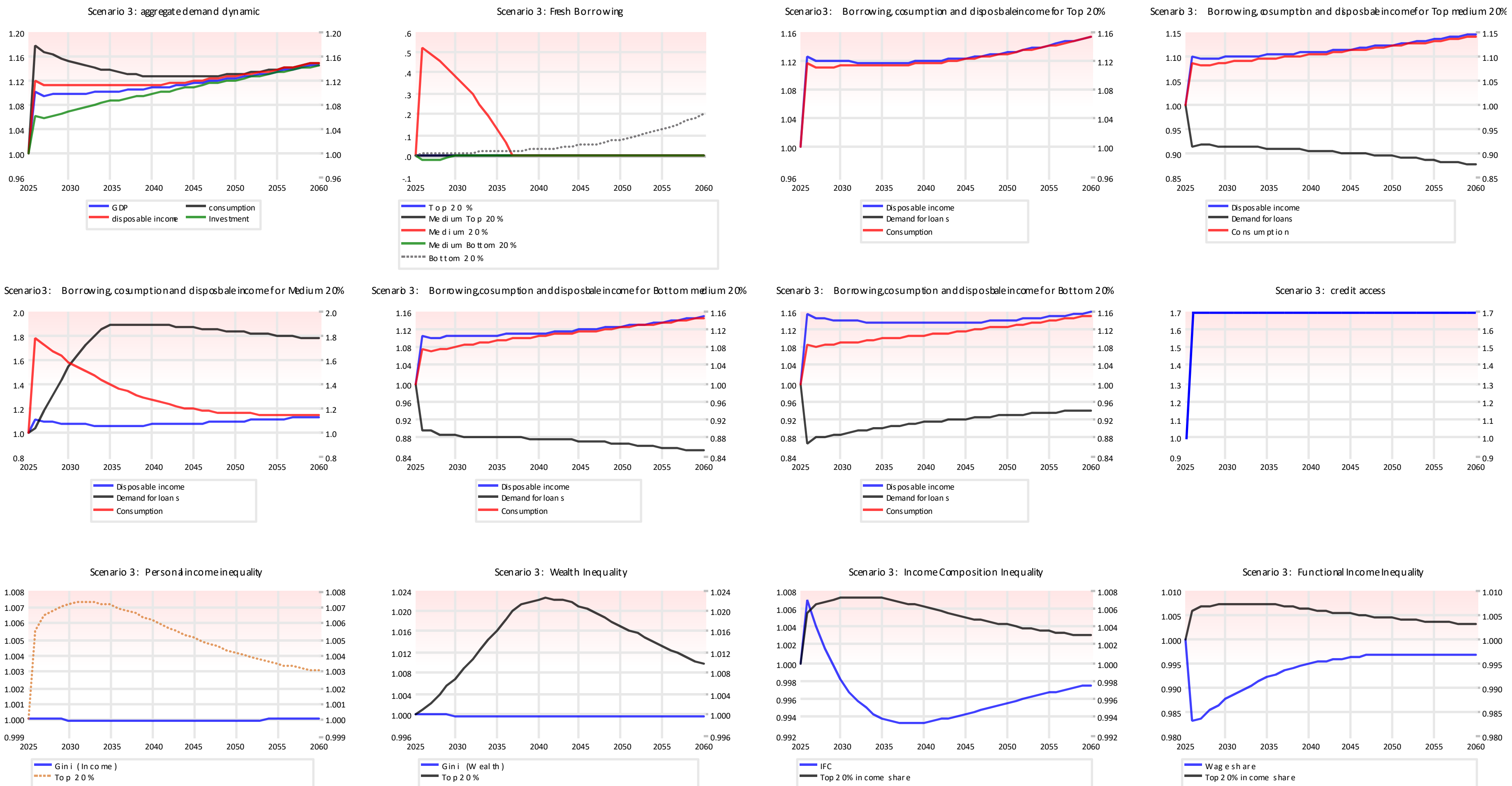
Source: own elaboration

Figure 9: effect of a trigger of consumption cascade/increase credit access



Source: own elaboration

Figure 10: effect of an increase in autonomous consumptions of medium 20%



Source: own elaboration

7. Conclusions

In this article, we proposed a stylized model of emulation-driven and debt-financed consumption, to provide an analytical interpretative tool for a feature of (albeit not exclusively) the US economy in the last decades, namely a divergence in the patterns of consumption and income inequality.
In our Stock-Flow consistent model with heterogeneous households, we emphasize the role played by emulative behaviour in shaping consumption decisions of lower quintile households, which leads - in conjunction with unequal wealth and income distribution - to the accumulation of private debt and to the emergence of financial fragilities. Indeed, while this process fuels aggregate demand and growth in the short run, it also seeds instability due to the debt servicing burden, particularly when borrowing is not matched by corresponding income gains.

Our results align with and extend the insights of the literature on expenditure cascades and trickle-down consumption: middle and lower-income households, influenced by rising consumption standards, tend to increase spending even at the cost of rising debt burdens. This leads to a fragile equilibrium, where the benefits of growth are asymmetrically distributed, and the costs of financial stress are disproportionately borne by the less affluent. By explicitly modeling this behavior within a consistent macroeconomic framework, our work also contributes to the literature that challenges the traditional separation between real and financial variables. We find that financial dynamics are deeply embedded in the structure of income distribution, consumption norms, and sectoral financial balances. Finally, we formalize and highlight how the benefits of debt-led growth are asymmetrically distributed and reinforce the same detrimental tendencies in income distribution that led to the emergence of debt as a necessary engine of growth.

Our results are in line with Barbieri Goes (2020) as we showed that detaching income from consumption growth leads to the buildup of debt. Moreover, our results are also consistent with Pasinetti (1962; 1974) as we demonstrate how moving away from classical assumptions (allowing for the existence of multiple classes, heterogenous income compositions and non-zero savings) by no means implies endangering the validity of demand-led approaches. We also argue that the relationship between factor income and functional income inequality is not unidirectional as diversified income sources do not necessarily imply a fairer distribution or sounder balance sheet.

Straightforward policy implications ensue: strategies aimed at boosting consumption via credit, without accompanying redistributive mechanisms, may yield unsustainable outcomes. On the other hand, policies promoting income equality, reducing the need for compensatory borrowing, and dampening positional consumption pressures could enhance both macroeconomic stability and household financial resilience.

8. Acknowledgements

We would like to thank Steven Fazzari, Ricardo Summa, Lucas Texeira, Ariel Dvoskin and the participants to the 22nd STOREP Conference and 6th Demand Led Workshop for their comments to earlier drafts of this paper. The usual disclaimers apply.

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Appendix-Estimates

Based on the estimates reported in Haluska et al. (2023), we set the depreciation rate δ at 8.4%. This value falls well within the standard range for macroeconomic models and is consistent with broader empirical findings on capital depreciation. The normal degree of capacity utilization, denoted u_n, is assumed to be 80%, following the same source. Given that our model's equilibrium converges toward normal utilization in the long run, this parameter helps anchor the initial conditions and steady-state dynamics. A more delicate issue concerns the parameter γ, which governs the speed of adjustment of the investment share h in response to deviations between actual and normal utilization. Direct estimates of this parameter are scarce, but Fazzari and Gonzalez (2025) offer a useful benchmark. Their work estimates an adjustment coefficient that, while not identical in structure to our γ, is conceptually analogous. Since their estimates are based on quarterly data, one option for adaptation to annual frequency is to multiply the values by four. Doing so yields a range from 0.008 to 0.068. For our purposes, adopting one of the lower-end annualized values (e.g., 0.008 or 0.02) offers a conservative yet empirically grounded choice. Alternatively, Haluska et al. (2023) suggest a higher adjustment coefficient of 0.091, referring again to a similar, if not identical, parameter. Depending on the sensitivity of the model's dynamics, this value could serve as a more aggressive benchmark. Finally, regarding the desired capital–output ratio (v), we again draw on the estimates from Fazzari and Gonzalez (2025). Depending on the frequency window used in their analysis, they report values of 3.858, 4.022, and 4.236. In our framework, v is not a parameter that drives dynamics per se, but is primarily used to determine the model's initial conditions. Assuming the system begins in a state of equilibrium, we can assign an arbitrary value to output Y, which is assumed to correspond - at the beginning of our analysis, to Y_n . Then, we can obtain the capital stock by applying equation 13. Beyond this initialization, the capital–output ratio evolves endogenously in response to the model's internal dynamics. Finally, the interest rates of both loans and deposits are set at 2%, as the profit retention rate is set at 55%.

Table 4: Estimation results

Variable	Q1	Q2	Q3	Q4	Q5
$YD_{(q_x(t-1))}$	0.47***	0.57***	0.64***	0.76***	1.51***
$W_{(q_x(t-1))}$	0.0036	0.019***	0.029***	0.060***	0.046***
$C_{(q_{x+1})}$ / $YD_{(q_x)}$	--	0.34	1.65***	1.09***	0.25***

Note: *** $p < 0.01$; Sample (adjusted): 1991 2024