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**Household debt, aggregate demand,
and instability in a Stock-Flow model**

Francesco Ruggeri



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SAPIENZA - UNIVERSITY OF ROME

P.le Aldo Moro n.5 – 00185 Roma T(+39) 0649910563

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Household debt, aggregate demand, and instability in a Stock-Flow model

Francesco Ruggeri: francesco.ruggeri@uniroma1.it

Ph.D. Sapienza Università di Roma - Dipartimento di Scienze Sociali ed Economiche.

Abstract

This paper aims to study the effect of the increase in households' debt on the economy. Starting from some empirical facts we develop a theoretical model that tries to replicate some of the dynamics in place in Anglo-Saxon economies before the financial crisis. In the model, we emphasize the role played by changing behavioural attitudes towards consumption and demand for loans by households that have led to an increase in financial instability in some advanced economies.

The model is able to show the Janus-like faces of households' debt: borrowing to finance consumption increases the level of aggregate demand and income, as in the standard Keynesian model and the multiplier-accelerator model by Samuelson, but at the same time fresh borrowing increases the level of the stock of debt. The stock of debt puts contractionary pressure on the aggregate demand because the repayment affects money balances and transfers resources from the high propensity to spend agents, to the low propensity to spend agents. The interaction of these phenomena creates a "predator-prey" type model in which fresh borrowing increases income, which feeds the ability to borrow more and consume; at the same time, the stock of accumulated debt "preys" on income due to the contractionary forces of the repayment mechanism.

Keywords: households' debt, consumption, credit supply, financial instability.

JEL Classification: E02; E12; E21; E32

1. Introduction

Since the start of the Great Moderation period, Anglo-Saxon countries and other advanced economies have experienced a dramatic increase of household debt, both in absolute terms and in terms of debt-to-income ratios. The increase in the stock of debt for the households was due to the need for middle and low-income households to borrow in order to “keep up with the Jones” and run to stand still in the face of stagnation or a reduction of their income. Debt-led consumption was very important because allowed these economies, especially the US and UK, to solve, at least temporarily, the aggregate demand problems generated by the shift of income distribution in favour of the high-income part of the population.

After the Housing Bubble’s burst in the US, consumption collapsed and households started to deleverage putting contractionary pressures on the economy. The collapse of consumption can be seen as one of the main drivers of the stagnation and the slow growth in the aftermath of the financial crisis.

In this work we want to analyse the “Anglo-Saxon capitalism” and its impact on the stability of the economy. This “type of capitalism” was at the root of Anglo-Saxon ability to grow but at the same time has increased the fragility of those economies.

Starting from the stylized facts described above, we develop a model that tries to describe the effect of an increase of household debt on the steady-state solution of the model and the ability of debt to generate fluctuations affecting the dynamics of aggregate demand. The model comprises three sectors: a firm sector, a banking sector, and the household sector. The household sector is split into two in order to detect differences in income and wealth and propensity to consume. Particular attention is given to the consumption and demand for loans as the model tries to describe the evolution of consumption and borrowing practices that occurred in the last thirty years.

Money is endogenous in the model as banks respond to the demand for credit expanding their balance sheets. The presence of endogenous money makes the model more unstable as the impact of fresh borrowing on overall spending is larger compared to standard loanable funds models.

The model is able to show the Janus-like faces of household debt: borrowing to finance consumption increase the level of aggregate demand and income, as in the standard Keynesian model and in the multiplier-accelerator model by Samuelson, but at the same time fresh borrowing increase the level of the stock of debt. The stock of debt puts contractionary pressure on the aggregate demand because the repayment affects money balances and transfers resources from high propensity to spend agents, to low propensity to spend agents.

The interaction of these phenomena creates a “predator-prey” type model in which fresh borrowing increases income, which feeds the ability to borrow more and consume; at the same time, the stock of accumulated debt “preys” on income due to the contractionary forces of the repayment mechanism.

The structure of the paper is the following: in section two we use descriptive statistics to describe the evolution of households’ debt in some advanced economies. Data shows how households’ debt has grown before the financial crisis and that after the crisis the level of debt has remained around high levels. In section three, we present some different explanations of why households’ debt has grown. In section four, we describe the Janus-like effect of debt on the economic outcomes. In section five we present a model that tries to replicate some of the dynamics we describe in the previous sections. section six concludes.

2. Descriptive statistics of the evolution of the household debt

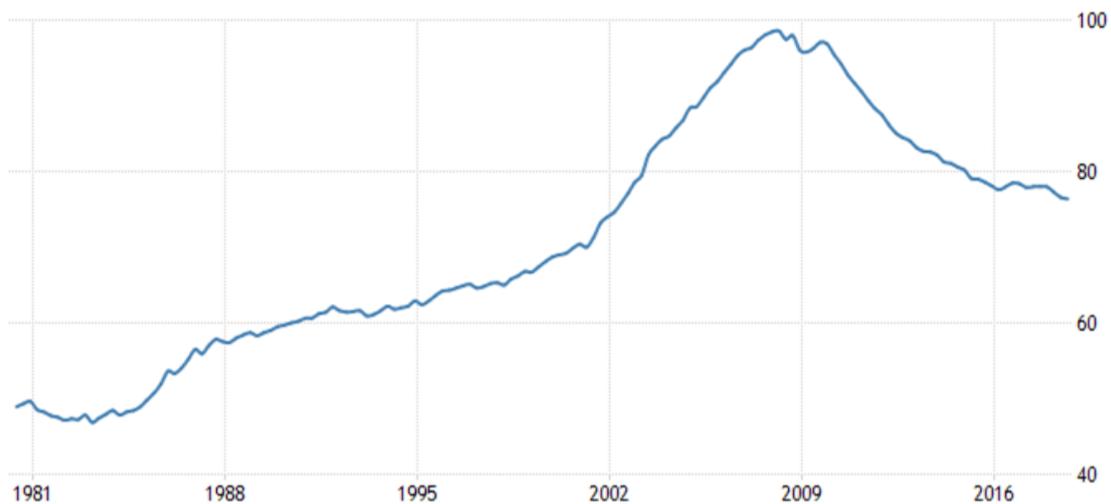
Since the beginning of the so-called Great Moderation period, the period that started in the early ‘80s and ended with the start of the Global Financial crisis, some of the most advanced economies, especially Anglo-Saxon countries, have seen the evolution of some common trends. The most important was the dramatic increase in the households’ debt. If we look at the evolution of the debt held on the balance sheets of the households sector in some Anglo-Saxon countries, we can see how it was steadily increasing during the period of the Great Moderation.

Fig. 1 shows the evolution of the households’ debt-to-GDP ratio in the USA. We can split the evolution of households’ debt into two phases: the first that goes from the early ‘80s to the late ‘90s and the second from the late ‘90s until the financial crisis. In the first phase households’ debt was growing slowly, in the second phase it ballooned, growing faster than the previous period.

After the financial crisis, households’ debt started to decline following the deleveraging process, but as shown in fig.2 in 2019 it was \$869 billion higher than 2008’s trillion peak (Federal Reserve Bank of New York’s Centre for Microeconomic Data). This does not mean that the United States are in the same situation as before the financial crises. The debt-to-disposable income ratio has declined in the last years.

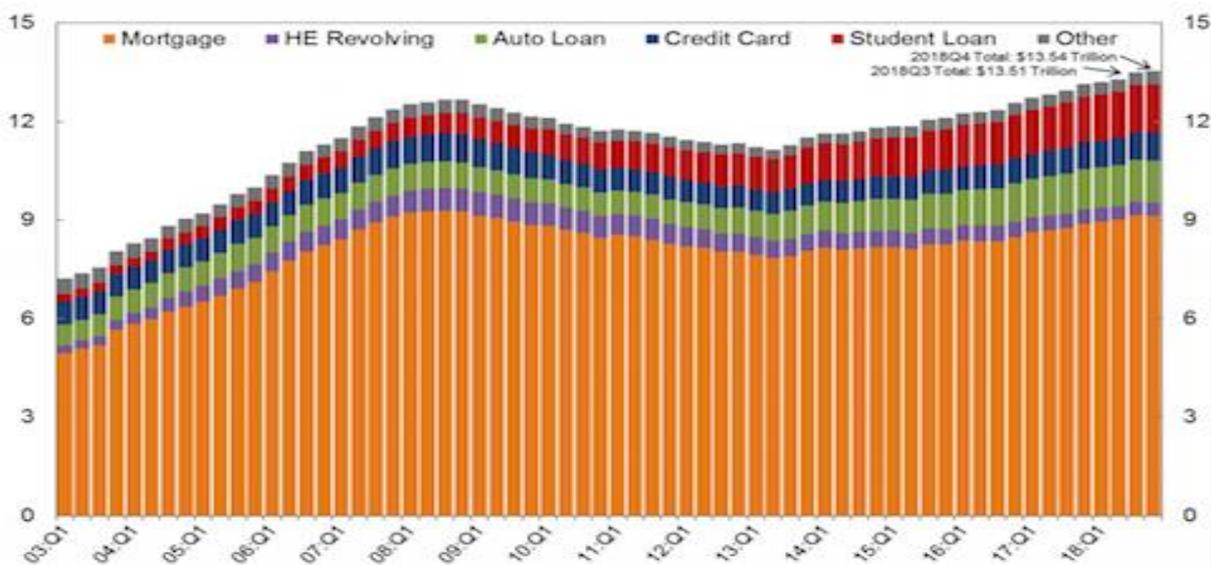
It is interesting to show how high level of debt are structural features of the US economy and this means that a decline in the disposable income can have important effect on the economy.

Fig. 1 Household debt-to-GDP ratio for the USA



Source: Bank of international settlement

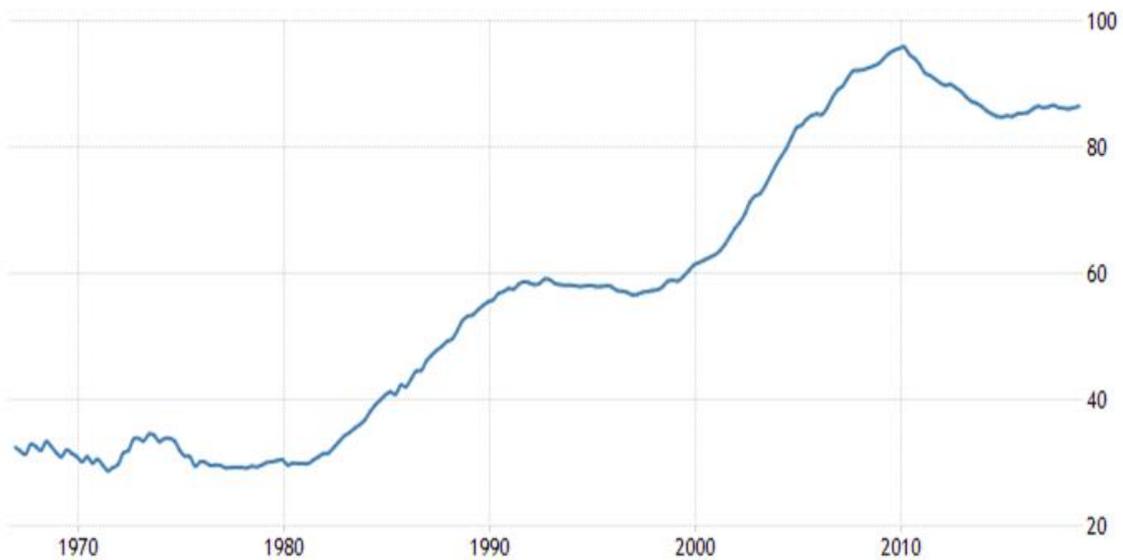
Fig.2 Total Debt Balance and its composition, trillions of dollars



Source: New York Fed Consumer Credit Panel/Equifax

The evolution of the debt for the household sector was the same for the United Kingdom, as shown by fig. 3 with a two-step process the first started in the early '80s and ended at the beginning of the '90s and the second one from the late '90s until the start of the financial crisis.

Fig. 3 Household debt-to-GDP for the UK

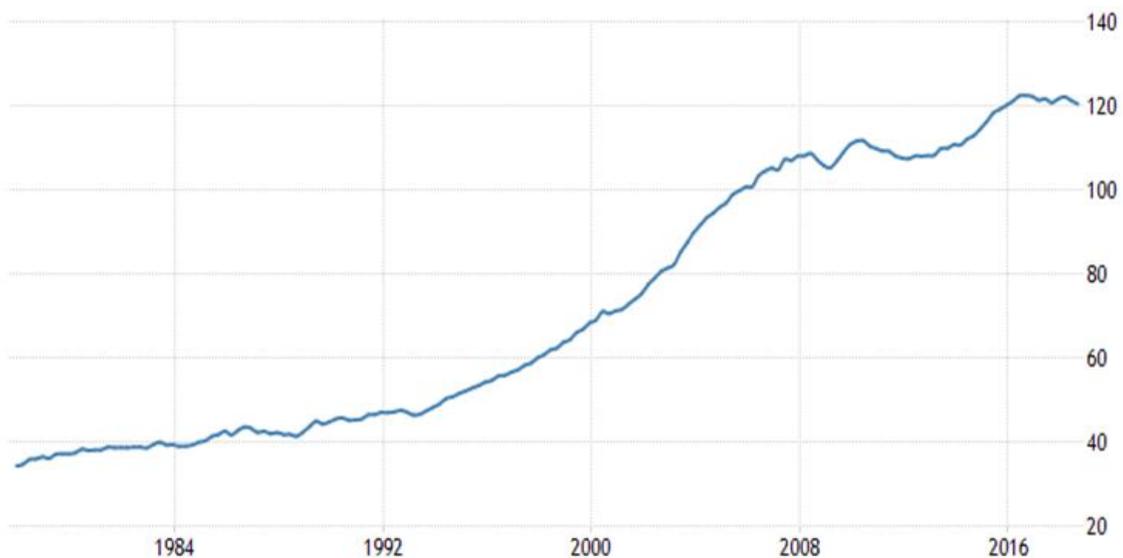


Source: Bank of international settlement

As for the USA, households' debt-to-GDP started to decline after the financial crisis, but after few years, it rised again.

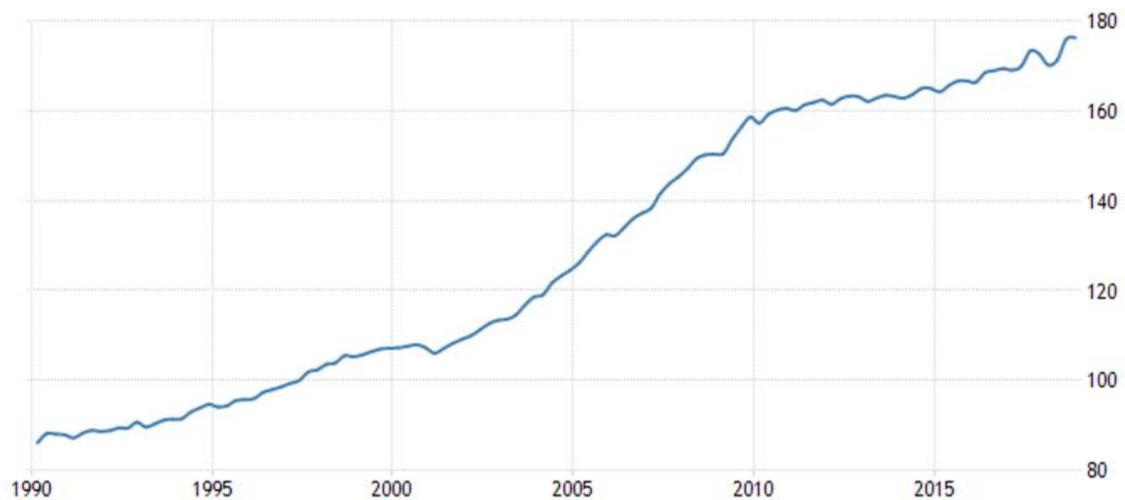
Looking at two other Anglo-Saxon countries, Canada and Australia, we can see a similar dynamic.

Fig. 4 Household debt-to-GDP for Australia



Source: Bank of international settlement

Fig. 5 Household debt-to-GDP for Canada

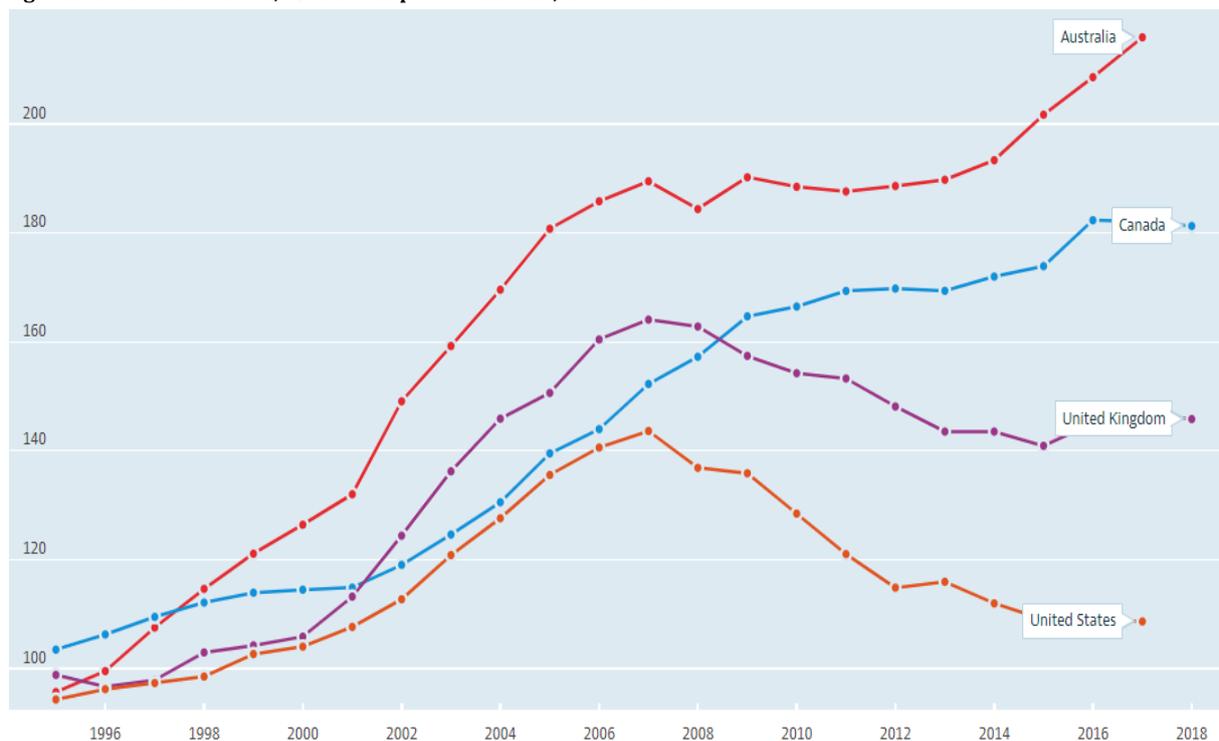


Source: Bank of international settlement

The difference is that households' debt never really declines for both Australia and Canada. It started to increase from the early 90s in both countries and in Australia, after a brief decline during the financial crisis it rose again after few years. In Canada, the trend continued to be positive even during the financial crisis.

If we look at the debt-to-disposable income ratio for these four countries, we can see the same pattern.

fig. 6 Household debt Total, % of net disposable income, 1995 - 2018



Source: OECD National Accounts Statistics: National Accounts

Debt ratios rose rapidly in all the countries, the divergence began when UK and US started to deleverage after the financial crisis while Australia and Canada, albeit at a slower pace, continued with the debt accumulation

3. Different explanations of the increase in borrowing

Over the time several different theories have been suggested to explain this dramatic increase in the households' borrowing; although none of them seem sufficient to describe exhaustively this phenomenon, they can be used together to understand the evolution of the dynamics we are studying.

The "conventional" view of households' borrowing and expenditure is based on the Life-Cycle Hypothesis (LCH). For the LCH utility maximizing households accumulated debt in order to smooth consumption over an infinite time horizon, because of this behaviour consumption follows a random walk (Kim, Setterfield & Mei 2014). Alternative explanations are based on Duesenberry's relative-income hypothesis (see for example Duesenberry (1949)), in his work, he hypothesizes that household consumption decisions are significantly affected by the income and consumption pattern of the rest of the economy, especially of the high-income part of the households' sector.

Several empirical studies support the relative-income hypothesis: Luttmer (2005) and Alpizar et al (2005) show how individuals' well-being is crucially correlated with relative consumption as well as the absolute level of consumption. Even economist that usually used the permanent-income-hypothesis have started to incorporate the notion of relative income in their models. Dybvig (1995) shows how utility maximizing households experience addiction effects, the result is that consumption rises in response to increases in income are greater than falls in consumption related to reduction of income. Cuadrado and Van Long (2011) shows ho individual utility can be dependent on the utility of a specific reference group, so individual consumption is affected by the reference group's income and consumption.

Some authors have suggested that the increase in household debt was not only due to the increase in inequality, but also -at least in the case of the United States- to the increase in the trade deficit and to a conservative fiscal stance of the government. Households' debt, and more in general private debt, was the only source of funding in an environment of a basically restrictive fiscal policy and a chronic deficit with the rest of the world. Wynne Godley in 1999 described the evolution of the US economy as dangerous because the restrictive fiscal policy conducted by the government in the previous seven years has coincided with sluggish export demand, in that environment rapid growth could only come from a rise in private sector spending relative to income. Godley's projections for US economy were critical since the *Congressional Budget Office* was projecting a rise in

budget surplus for other 10 years and at the same time net export was too weak in order to sustain demand. A prolonged fiscal surplus and external deficit could not be offset for a long period of time by an “increasingly extravagant private spending” driven by an excess of expenditure over income. A reverse in private sector behaviour, with a return of the relationship between spending and income, would have generated a prolonged recession with a large rise in unemployment. Godley added that since economic growth had become so dependent on rising private borrowing the real economy was at the mercy of the stock market to an unusual extent.¹

While would be more accurate to take into account the external and the government sector in the rest of the work we limit our analysis to considering the relation between income inequality, changing households’ attitudes and households’ debt in a closed economy with no public sector.

In the next two sections we will present some literature based on the Duesenberry’s approach in order to explain the rise in the stock of debt in the balance sheets of the households’ sector during the great moderation period.

3.1 Changing institutions and attitudes

One possible explanation for the rise in the household debt can be based by looking at the evolution of factors like financial institution, financial and consumption practices and households’ attitude.

As pointed out by Cynamon and Fazzari (2008), until the early 1980 the use of credit by households was limited to mortgages to finance “housing investment” or to credit line to finance “consumption” of cars.

Since the late ‘70s, the attitudes towards borrowing started to change rapidly with the share of consumer debt, composed primarily of credit card balances, increased up until 1998. The number of U.S. households with at least one credit card grew from 16 percent to 68 percent. During the Great Moderation period attitudes towards borrowing started to change: while in the ‘60s and ‘70s was common to borrow for a home with 20 percent down at a fixed-rate and few people would re-finance their mortgages for a car or other expenditures, in the ‘80s, with the rise of home equity loans, households started to borrow against their home to finance non-housing consumption. In the ‘90s with other innovations in the mortgage market that have reduced the cost for cash-out refinancing this process continued. These actions were the outcomes of changes in available product, but also of an evolution of what was considered a “responsible” behaviour by households.

¹ Nikiforos (2016) also described how households’ saving, and borrowing, must adjust in order to maintain high level of employment in an environment of fiscal consolidation, trade deficits and income inequality. As Nikiforos explained: the increase in income inequality, a current account deficit and fiscal consolidation by the government lead necessarily to a decrease in the saving rate of the household sector. This process can turn to be unsustainable because it leads to an increase in the debt-to-income ratio that can be maintained only by asset bubble.

This increase in the willingness of borrowing by households was facilitated by the evolution of the banking and financial sector. The spread of new financial practices like the emergence of the “cash-out” refinancing option encouraged households to convert their “home equity” into cash, ready to be spent, rather than reducing the monthly debt service payments.²

Another point made by Cynamon and Fazzari is that the dramatic rise in household debt corresponds to the period in which the baby-boom generation became the dominant force in the U.S. and in other Anglo-Saxon countries³. While households’ decisions from the World War 2 were shaped by the “memory” of the challenges of the Great Depression that created an aversion on consumer debt, baby boomers have been much more willing to borrow aggressively since the memory of the great depression have vanished.

This evolution was due to the “social components” of the spending and financing decisions. When households decide how much to consume and how to finance their expenditure, they look at what is considered the norm in terms of the level of consumption and of financial practices.

As Frank pointed out: *“[t]he things we feel we ‘need’ depend on the kinds of things that others have, and our needs thus grow when we find ourselves in the presence of others who have more than we do. Yet when all of us spend more, the new, higher spending level simply becomes the norm.”* (Frank 1997, p. 1840)

Since we are constantly surrounded by our social context, what the others decide to do constantly shape our decisions. Choices by a family in isolation can have a conservative financial path, but the presence of neighbours and the social pressures coming through the media can drive consumption and demand for loans higher.

As pointed out by many sociologists and marketing managers spending ambitions are not just determined by immediate neighbourhoods but are also influenced by social media. The target of marketing is usually middle-high income households. Targeting this kind of households, media spreads higher consumption and debt norms to all the households. In this way, consumption and financial norms evolve endogenously in periods of economic stability.

Yun K. Kim & Mark Setterfield & Yuan Mei (2014) in their theoretical work find some interesting results regarding the borrowing behaviour of households in the US. Their results show that households’ borrowing behaviour is governed by consumption norms based on past consumption and the behaviour of the reference group.

In another work, Yun K. Kim et al. have analyzed consumption spending by US households since the 1950s. Their focus is on the behaviour of consumption in the short run, by

² As Debelle (2004) pointed out, home equity extraction by households has been facilitated and strengthened by the increasing availability of financial product and the reduction of transaction costs.

³ This is in line with the Minskyan ideas of the evolution of attitudes towards financial practice during periods of economic tranquillity.

covering two different periods. The results show a structural change in consumer behaviour. As the authors show in the paper, during the period between 1952-2011 current income is significant in the consumption function while consumer borrowing is insignificant. During the subperiod of 1980-2011 current income is less important and consumer borrowing is highly significant. The authors detected a structural break in the early '80s in the financial behaviour of households. In the subperiod between 1980-2011 households' consumption, saving and demand for loans cannot be explained by the life-cycle hypothesis.

3.2 Keeping up with the Joneses and Trickle-down consumption

Another explanation of the increase of borrowing and consumption practices, which is correlated to the changing norms and institutions described above, is given by Bertrand and Morse (2016) and Christen and Morgan (2005); in their works, they link the dynamic of the distribution of income to the evolution of consumption norms and financial practices.

Christen and Morgan (2005) try to explain how households with lower income use debt in order to keep up their consumption level relatively to households with large income. For the authors the channels between income inequality and households' indebtedness works through the need of consumer to maintain or increase their social position. As many economist and marketers have understood consumption of some particular goods is realized not just for its functional utility but also its social meaning.

Bertrand and Morse (2016) introduce the concept of "*Trickle-down consumption*" and in their study shown how since the early 1980s inequality has risen even within geographic markets. In this situation, low-income households have been "*increasingly exposed to increasingly rich coresident*".⁴ For the authors, the growth in local inequality has been associated with a change in consumption of the lower part of the income distribution. They show how non-rich households start to consume a large part of their income when they are exposed to higher income and consumption by neighbours' households with higher level of income.

The basic idea in these approaches is that, given the fact that social references matter when it comes to deciding how much to consume, a shift in the distribution of income can increase consumption norms for who is left behind.

⁴ M. Bertrand & Adair Morse, 2016. "Trickle-Down Consumption," *The Review of Economics and Statistics*, MIT Press, vol. 98(5), pages 863-879, December.

It is important to note that some recent empirical works have cast some doubts about the effect of the emulation dynamic and in general of income inequality on household borrowing.

Glenn Lauren Moore & Engelbert Stockhammer (2018) using a panel of 13 OECD countries over the 1993-2001 period have investigated the determinants of household debt testing econometrically different hypothesis. Their results show that real residential house price is the most important variable of household indebtedness both in long and short run.⁵

While some of the recent empirical literature shows a modest effect of income inequality on household debt, we believe that in order to understand households' expenditure decisions we must take into account the social components of agents' behaviour. If the social contest shapes households' attitudes towards how much to consume, income distribution will play an important role in borrowing decisions. In the model presented in this work we will try to study how the willingness of households to close the gap between their spending and the average spending in the economy can generate an increase in the stock of debt in their balance sheets when the banking sector decides to accommodate the demand for loans. In the next section we will focus on the impact of household debt on the economy from a theoretical point of view.

4. The two faces of debt

Economic theory has increased its interest in the impact of "inside debt" on the economic outcomes since the financial crisis. After the collapse of the Lehman Brothers, a large number of articles, both theoretical and empirical, have started to focus on how private debt can generate fluctuations in economic activity.

Following Palley (2009), we can divide the focus on private debt into two branches. On one side, there is the Post-Keynesian literature that focuses on the aggregate demand impact of debt. On the other side, the New-Keynesian approach is more focused on the aggregate supply impact of debt. The approaches emphasize two channels by which debt has an impact on economic outcomes. One channel is close to the work of Minsky, the so-called "balance-sheet congestion" mechanism which has been adopted mostly by both the New Keynesian (see Bernanke, Gertler, and Gilchrist 1999) and Keynesian literature. The other channel is the "debt-service transfer" mechanism that is emphasized mostly by the post-Keynesian literature.

In the "balance-sheet congestion" mechanism, the effect of debt on the economic cycle works through the interaction between lenders and borrowers (Palley 1994). The main idea is that accumulation of debt during the business cycle leads to the deterioration of

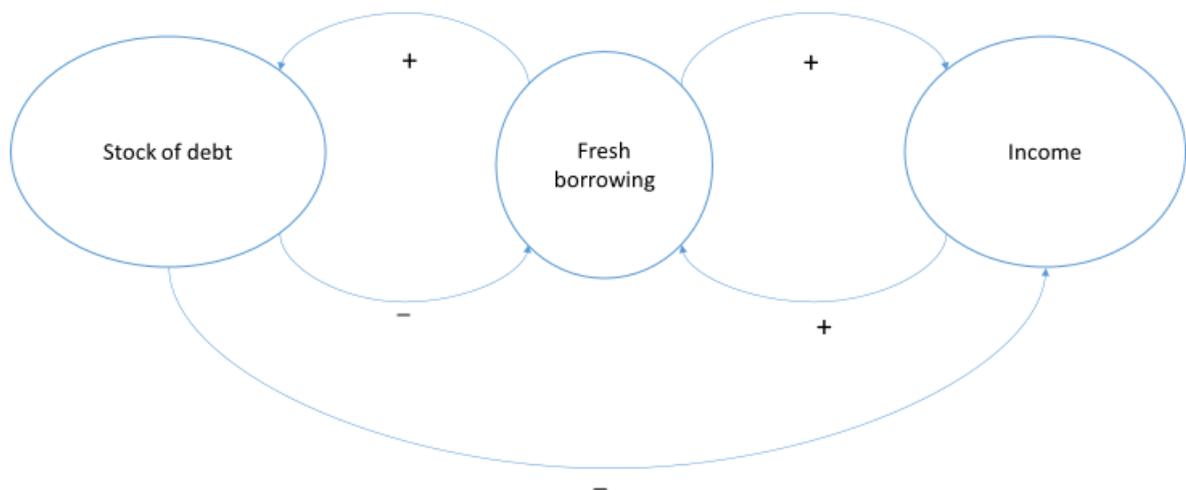
⁵ In another work by Engelbert Stockhammer and Rafael Wildauer the authors investigate the explanatory power of rising income inequality, growing property prices, low interest rates and credit market deregulation as causes of rising household debt from a panel of 13 OECD countries from 1980 to 2011. The results of the works show that: over the period going from 1995 to 2007 real residential property prices is the most important predictor of household indebtedness in OECD countries. They also find little evidences on a robust relationship between income inequality and household debt.

the quality of borrowers' balance sheets and increasing their debt obligations, this leads to a lower ability to borrow in order to finance expenditure (Kiyotaki and Moore 1997). This mechanism is often used to analyse the dynamics of firms' investment. Minsky emphasizes the impact of debt on the ability of firms to finance investment. Accumulation of debt on firms' balance sheets leads to the inability to borrow more to finance investments. New Keynesians emphasize the supply side part of this process since lower investment decreases the capital stock of the economy and the equilibrium output. The Keynesian approach emphasizes the demand side part of the process. It says that lower investments decrease aggregate demand and lowers the equilibrium output (Palley 2009). Both these interpretations are able to replicate the Minskyan notion of financial fragility.⁶

The post-Keynesian literature emphasizes the “debt-service transfer” mechanism by which debt affects economic outcomes. This channel is close to the Kaldorian analysis of the impact of income distribution on aggregate demand. For Kaldor, borrowers have a higher marginal propensity to consume than creditors. So, initially debt has an expansionary impact on the economy because of the stimulus on aggregate demand coming from borrowers, but the stock of accumulated debt in the balance sheets of borrowers become a burden since it implies a transfer of resources from the high propensity to consume borrowers to lower propensity to consume lenders.

Therefore, the interaction between borrowers and lenders in the borrowing and payback phases drives the cycle. These two impacts of borrowing on economic activity can be described by a “predator-prey” dynamic as Palley shows in his working paper (2009).

Figure 7



⁶ In Minsky's vision the business cycle is often characterized by a period of tranquillity during which economic agents (especially banker and entrepreneurs) become more “optimistic” since their expectations about future cash flows are continuously confirmed. This optimism in the real sectors translates in an increase in investment, financed by borrowing, and in the financial sector by an increasing willingness of banks and financial operators to borrow and lend and easing their lending standard. This evolution of the real and financial behaviour can create a progressive deterioration of the balance sheets of various agents increasing the financial fragility of the economy.

This predator-prey dynamic works through the “Janus-like faces of debt”. As figure 7 in the right-hand side shows: fresh borrowing increases income because it increases aggregate demand; at the same time, if income increases the ability of agents to borrow more increases too.⁷ This first dynamics is a simple “flow-flow” concept, the new flow of credit rises the flow of income and this generates a positive feedback loop that has an expansionary impact on the economy. Therefore, fresh borrowing has a first positive impact on the economy.

On the left-hand side, the figure shows the contractionary part of the dynamic: fresh borrowing increases the stock of debt in the balance sheet of the borrowers; the increase of the stock of debt lowers income in two ways; first, it decreases the ability of borrowers to continue to borrow in order to finance expenditure. This is due to the “balance sheet congestion” mechanism (see Bhaduri 2011). The second contractionary impact is the “debt-service transfer” mechanism that transfers income from “high propensity to spend agent” to “low propensity to spend agent” decreasing the overall expenditure in the economy (Palley 2009).

We can describe this process as a predator-prey dynamic or as a “stock-flow” dynamics: fresh borrowing feeds income, a greater income feeds the ability to borrow more, at the same time the accumulated stock of debt preys on income and on the ability to borrow. This interaction generates a dynamic very similar to a simple business cycle completely driven by aggregate demand and credit supply dynamics.

In the next section we will present a theoretical model that describes some of the stylized facts presented above.

5. The model

The model described in this section is partially based on the Godley and Lavoie book, *the work of Sawyer and Passarella* and very similar to the work of Kapeller and Schutz. The model contains also some of the insights presented by Palley in his works on inside debt.

The model aims to describe the dynamic in place in Anglo-Saxon countries before the financial crisis of and its effect on the stability of the economy. This dynamic was at the root of Anglo-Saxon ability to grow but at the same time has increased the fragility of those economies.

The economy described in the model is composed of three sectors: households, firms, and banks. The households’ sector is split in two in order to have two classes of households: workers households, who receive a wage from firms, managers and rentiers households,

⁷ This is very similar to the standard Keynesian model and the multiplier-accelerator model developed by Samuelson (as pointed out by Palley 1994).

that receive a wage for their managerial work and dividends from banks and firms.

The transaction-flow matrix for the economy is described in tables 1

		Firms			Banks	Σ
		Rentiers	Workers	Current	Capital	
Consumption		- C_r	- C_w	+ C_t		0
Investment				+ I	- I	0
Wages		+ w_r	+ w_w	- w_t		0
Firms profits		+ Π_d		- Π	+ Π_r	0
Banks profits		+ Π_b			- Π_b	0
Interest on	Deposits	+ $i_d \cdot D_{R(t-1)}$	+ $i_d \cdot D_{W(t-1)}$		- $i_d \cdot D_{d(t-1)}$	0
	Loans	- $i_L \cdot L_{R(t-1)}$	- $i_L \cdot L_{W(t-1)}$	- $i_L \cdot L_{f(t-1)}$	+ $i_L \cdot L_{s(t-1)}$	0
Change in the	Deposits	- ΔD_r	- ΔD_w		+ ΔD_t	0
stocks of	Loans	+ ΔL_r	+ ΔL_w		+ ΔL_f	- ΔL_t
Σ		0	0	0	0	0

The transaction flow matrix describes all the transaction made in the economy with the relative changes in the stock variables.

C_R is the consumption of the Rentiers, C_w is the consumption of the Workers. C_t is the total consumption going to the firms when transactions in the goods market are made, which is simply the sum of $C_R + C_w$. Consumption is an expenditure for the households and a receipt for the firms. w_R and w_w are the “wage” earned by the Rentiers (the managerial wage) and by the Workers. w_t is the sum of the two wages. Π_d is the portion of profits distributed to the Rentiers’ sector by the firms. Π is the total amount of profits, Π_r is the amount of profits retained by the firms. i_d is the interest paid by the banking sector on the stock of deposits. i_L is the interest charged by the banking sector on the stock of loans.

We look at a simple economy with a limited number of assets and liabilities. The only financial assets and liabilities of the economy are made up of banks’ deposits and banks’ loans. The equity market is not explicitly modelled, but we assume that Rentiers 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 wages received by workers and managers and profits of banks and firms.

$$1) Y = w_w + w_R + \pi_f + \pi_B$$

From the expenditure side, aggregate output is made of consumption by both the classes of households and by the investment of the firms.

$$2) Y = C_w + C_R + I$$

Equations 3 and 4 describe the wages of workers and rentiers.

$$3) w_w = \varphi Y \quad \varphi < 1$$

$$4) w_R > w_w$$

5.1) The banking sector

As we have said above the only financial assets and financial liabilities of our economy are deposits and loans issued by the banks. The banking sector is the core sector of our economy: every transaction takes place using bank money (deposits) created by the banks every time someone asks for a loan. Every transaction that takes place between sectors, between households and firms, is recorded by a change in the balance sheet of the banking sector.

The creation of money in the economy is endogenous. Following the post-Keynesian literature on how money enters into circulation in the economy, our banking sector is able to create deposits simply by expanding its balance sheet. The quantity of bank deposits in the economy follows the demand for loans made by households and firms in order to finance their expenditure; it expands when banks lend, creating a deposit for the borrowers, and declines when borrowers pay back their loans. In this context, the quantity of loans made by banks is decoupled by the level of saving in the economy since banks do not lend previously accumulated funds.

The idea of endogenous money has been accepted, in the last years, by institutions like the Bank of England and by the Bank of International Settlement.⁸

As Claudio Borio from the Bank of International Settlement stressed out:

“More importantly, the banking system does not simply transfer real resources, more or less efficiently, from one sector to another; it generates (nominal) purchasing power. Deposits are not endowments that precede loan formation; it is loans that create deposits... Working with better representations of monetary economies should help cast further light on the aggregate and sectoral distortions that arise in the real economy when credit creation becomes unanchored, poorly pinned down by loose perceptions of value and risks. Only then will it be possible to fully understand the role that monetary policy plays in the macroeconomy. And in all probability, this will require us to move away from the heavy

⁸ In a series of working papers (see for example Jakab and Kumhof (2018)), the Bank of England has explained that banks do not act as simple intermediaries between savers and borrowers, they do not act “lending out deposits that savers place with them, and nor do they ‘multiply up’ central bank money to create new loans and deposits.”

focus on equilibrium concepts and methods to analyse business fluctuations and to rediscover the merits of disequilibrium analysis.” (Borio, 2014, p. 188)

Jakab and Kumhof in a working paper for the Bank of England introduce an active Banking sector, able to create deposits ex-nihilo. Their results show that: “*changes in the size of bank balance sheets that are far larger, happen much faster and have much greater effects on the real economy*” when they shock the ability of borrowers to increase their amount of loans that they can receive.

We perform three experiments on the behaviour of banks: in the first experiment we assume that banks decide to increase the number of households that are eligible for a loan, but they do not look at the balance sheets of the households even if they continue to accumulate debt. In the second and third experiments, after a first increase in the number of households eligible for a loan, banks set a threshold for the leverage of the households. When households reach this threshold, banks reduce the number of loans.

The equations describing the behaviour of the banking sector are the following.

$$5) \quad SL = L_f + L_R + L_w \cdot \rho$$

Equation five describes the supply of loans by banks, as said above banks accommodate the demand for loans by economic agents expanding their balance sheets. The ability of banks to create loans is not constrained by the amount of deposits held. The supply of loans by banks, as described by equation 5, is the sum of the loans demanded by the firms, (L_f), by the rentiers, (L_R), and by the workers, (L_w).

We assumed that supply of loans to workers is not completely elastic. For Workers , supply of loans is conditional to ρ , which is an institutional parameter representing the willingness of banks to lend. Given this parameter, the loans supplied by the banking sector may not equal workers demand for loans. ρ determines how much of workers' demand for loans will be accommodated by banks. Changes in ρ can be interpreted as credit shocks in the economy. As said above, we perform three experiments: in the first one ρ is exogenously determined and doesn't change during the simulation after the shock. We will assume that ρ has a very low value in the baseline scenario and then we will see what happens to the economy with a sudden jump in the credit access of Workers. In the second and third experiment ρ is a function of the leverage of the Workers. In the two scenarios there will be a leverage ceiling to the willingness of both banks and workers supply and demand for loans.

$$6) \quad L_s = L_{s(t-1)} + SL_t$$

Equation 6 describes the evolution of the stock of loans in the balance sheets 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.

$$7) \quad D_d = D_w + D_R$$

Equation 7 describes the amount of deposit held in the banking sector, which depends on the decisions of the agents to hold deposits.

$$8) D_s = D_{s(t-1)} + (L_s - L_{s(t-1)})$$

Equation 8 describes the total stock of deposits supplied by the banks, which is equal to the previously accumulated stock ($D_{s(t-1)}$) and the new flow of credit.

$$9) \pi_b = i_L \cdot L_{s(t-1)} - i_d \cdot D_{d(t-1)}$$

Equation 9 describes the profits of the banking sector, banks charge an interest rate on the loans and pay interest on the deposits held, the profits are determined by the spread between these two interest rates. Banks' profits are entirely distributed to the Rentiers.

5.2) The firm sector

The firm sector is stylized since our focus is on the behaviour of the households and banks. Firms produce consumption and capital goods; they pay wages to workers and managers and invest in order to accumulate capital stock.

$$10) I = \omega(K^t - K_{t-1}) + \eta * K_{t-1}$$

Equation 10 describes the investment⁹ decision by firms; firms try to close the gap between the target level of capital and the level of capital accumulated ($K^t - K_{t-1}$) and to replace the quantity of capital depreciated ($\eta * K_{t-1}$). ω is the speed of adjustment of the capital stock to the target level of capital.

$$11) K^t = Yv$$

The target level of capital is proportional to the level of output in the current period.

$$12) K_t = K_{t-1} + I_{t-1} - (\eta * K_{t-1})$$

Equation 12 describes the law of motion of capital stock. ($\eta * K_{t-1}$) is the portion of capital destroyed in every period.

⁹ The investment function presented in the model is a very standard interpretation of the decisions of the firms sector as made by Godley and Lavoie in their books "Monetary Economics, an integrated approach to credit, Money, income, production and wealth". This kind of investment behavior is also close to the models used in the supermultiplier literature developed by Freitas and Serrano (2015).

$$13) \Pi = C_w + C_R + I - w_w - w_R - (i_L \cdot L_{f(t-1)})$$

Firms' profits are equal to the sum of the inflows from consumption by the households ($C_w + C_R$) and Investment (I), minus the outflows from the wages paid to workers and managers ($w_w + w_R$) and the interest on loans ($i_L \cdot L_{f(t-1)}$).

$$14) \Pi_r = \Pi \cdot \phi$$

Firms' profits are partially distributed to the rentiers and partially retained to finance investment costs. Equation 14 describes the share of undistributed profits

$$15) \Pi_d = \Pi - \Pi_r$$

Dividends to the Rentiers is equal to the total profits minus the undistributed profits.

$$16) L_f = L_{f_{t-1}} + I + \Pi_r$$

Equation 16 describes the demand for loans by firms, eq. 16 is a stock equation, and it describes the stock of loans in the current period as the sum of the previously accumulated stock of debt plus the amount of investment not covered by the internal funds.

5.3) Rentier Households

Rentier are composed by Managers, who receive an income from their managerial job in the firm sector, and "standard" Rentiers, who receive dividends from the banking and firm sectors.

$$17) Y_R^d = w_R + \pi_b + Div + i_d \cdot D_{R(t-1)} - i_L \cdot L_{R(t-1)} - \gamma \cdot L_{R(t-1)}$$

Equation 17 describes the disposable income for Rentiers. We assume that after Rentiers receive their income (w_R) and the dividends from banks and firms ($\pi_b + Div$) they pay back the interest ($i_L \cdot L_{R(t-1)}$) and a portion of the principal of the accumulated stock of debt ($\gamma \cdot L_{R(t-1)}$).

$$18) c_R = \alpha \cdot Y_{R(t-1)}^d + \beta \cdot W_{R(t-1)}$$

Rentiers' consumption is a function of the disposable income of the previous period ($\alpha \cdot Y_{R(t-1)}^d$), and of the accumulated stock of wealth ($\beta \cdot W_{R(t-1)}$).

$$19) W_R = W_{R(t-1)} + (Y_R^d - c_R)$$

If $c_R > Y_R^d$

$$20) L_R = (c_R - Y_R^d)$$

Equation 19 and 20 describes the evolution of the stock for wealth and the demand for loans. Wealth is equal to the previously accumulated stock, plus the new flow of savings. When $c_R > Y_R^d$ disposable income does not cover all the consumption expenditure, we assume that the demand for loans is equal to the amount of consumption not covered by the disposable income.

$$20) L_R = (c_R - Y_R^d)$$

$$21) D_R^d = W_R$$

Since deposits are the only financial assets in the economy, the amount of deposits held by households is equal to their accumulated stock of wealth.

5.4) Workers Households

Workers households' sector is composed of those who receive a wage for participating in the production process.

$$22) Y_w^d = w_w + i_d \cdot D_{w(t-1)} - i_L \cdot L_{w(t-1)} - \gamma L_{w(t-1)}$$

Equation 22 describes the disposable income of Workers. After they receive their wages (w_w) and the interest on the deposits ($i_d \cdot D_{w(t-1)}$), they pay back a portion of the principal ($\gamma \cdot L_{w(t-1)}$) and the interest ($i_L \cdot L_{w(t-1)}$) on the accumulated stock of debt.

$$23) c_w = \alpha \cdot Y_w^d + \beta \cdot W_{w(t-1)} + C_{av}$$

Equation 23 describes the consumption function of Workers. The equation is similar to the consumption function presented for the rentiers; Workers' consumption is a function of their current income ($\alpha \cdot Y_w^d$) and a portion of the inherited stock of wealth ($\beta \cdot W_{w(t-1)}$). If the propensity to consume out of disposable income is equal to one household does not accumulate wealth. In our simulations, we will assume a propensity to consume less or equal than one. The third variable in the consumption function (C_{av}) describes what is consumed on average in the economy; our idea is that, since consumption is affected not just by the level of income and wealth, but even by the social context, Workers look at what is the average level of consumption when they have to decide how much to consume.

$$24) W_w = W_{w(t-1)} + (Y_w^d - c_w)$$

If $c_w > Y_w^d$

$$25) L_w = (c_w - Y_w^d)$$

Equations 24 and 25 describe the evolution of the stock of financial wealth and the demand for loans. Financial wealth is equal to the accumulated stock of wealth in the previous period ($W_{w(t-1)}$) plus the flow of savings ($Y_w^d - c_w$). Like for Rentiers, when $c_w > Y_w^d$ and disposable income does not cover all the expenditure, workers ask for loans.

Like for Rentiers, savings by Workers translate into demand for deposits.

$$26) D_w^d = W_w$$

5.5) closure

The model has an account identity closure that ensures the stock-flow consistency of the model. In every period of the model simulations, the stock of deposits must be equal to the stock of loans.

$$27) D_s - L_s = 0$$

5.6) Simulations

In the next section we present three different scenarios in order to show some of the stylized facts described above. In the first scenario, we try to study how a credit supply shock, in an environment in which households are ready to borrow to finance additional spending, can have a long effect on the “steady-state” equilibrium of the model. In the second simulation, we will introduce a demand for loans similar to the one proposed in Palley 1994, tied with a “leverage ceiling” for the supply of loans. In the third scenario, we will introduce a “leverage ceiling” for the supply of loans by the banking sector in an environment in which Workers try to consume looking at what their neighbours are doing and Rentiers have a “minskyan” component in their consumption function. In both the second and third scenarios, we can detect a simple “predator-prey” dynamic of a debt-led expansion similar to the one described by Palley 2009.

5.7) Credit Supply shock and steady-state equilibrium

In our model, as described above, Workers consume a portion of their disposable income, a portion of their wealth and they try to bring their consumption level to what is considered the average. The ability to reach the desired level of consumption is given by the willingness of the banking sector to finance additional lending with fresh borrowing. In this scenario, we will shock the willingness of the banking sector to lend. We tied the increase in the willingness to lend of banks with an increase in the interest rate that they

charge on loans Stiglitz and Weiss (1981). The parameter that we shock is the ρ in equation 5, $SL = DL_f + DL_R + DL_w \cdot \rho$

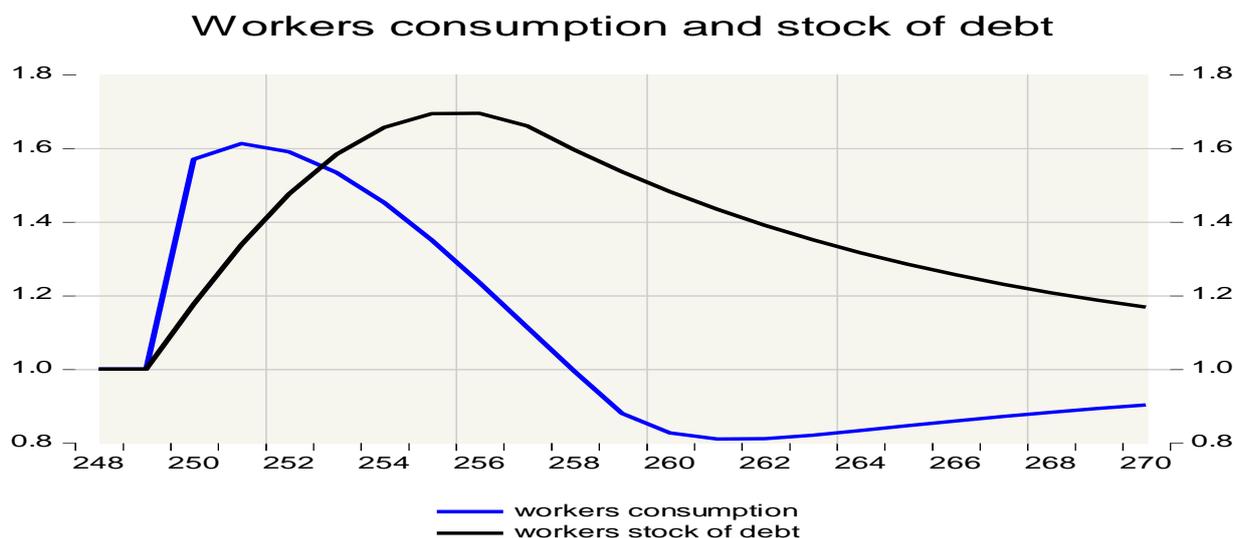
In the simulation the level of ρ is initially set to 0.2 and it jumps to 0.8 after the shock. This large increase in banks' willingness to lend is in line with the large increase in lending during the Great Moderation, especially in the period that goes from the late '90s and the beginning of the Great Recession.

The evolution in lending practices by the banking sector and other financial institutions depends on several factors. From "lack of regulation" by the public authority to loosening standards of credit due to "irrational exuberance" of the banking sector. In our opinion, the most important incentives for banks and financial institutions to increase their lending were the spreads of the securitization practices and the increasing value of some assets held by the households' sector and by the financial sector. With the securitization process, the banking sector shift from a "originate and hold" type of lending practice to "originate and distribute". The ability of banks to "get rid" of the loans on their balance sheets by a sophisticated process of "liquidity transformation" from very low liquid assets (the pools of loans stored in the balance sheets of the banking sector), to highly liquid assets (the Asset-Backed Securities or the Mortgage-Backed Securities), have increased their willingness to lower their credit standards. At the same time the increasing value of some particular class of assets, like housing, have increased both the ability of the private sector to use these assets as collateral to borrow and at the same time have increased the willingness of the banking sector to accept the entire value of these assets as collateral.

As we have already shown before, another explanation of these changes in the lending behavior of the banking sector can be the Minskyan notion of loosening of credit standard during the cycle.

Given the level of simplicity of the model that we are presenting here, we will treat this increasing willingness to extend credit as an exogenous variable. This choice will allow us to understand better what is the effect of a change in the lending practice by the financial institutions in the economy.

Fig.8



All the figures show the ratio between the “shock scenario” and the “baseline scenario”. Fig. 8 shows the effect of a credit supply shock on Workers' consumption and on the stock of debt accumulated in the Workers' balance sheets.

After the shock Workers' consumption jump, reaching its maximum after two periods, then it collapses and falls below the pre-shock level. The recovery takes time and the level of consumption does not return to its pre-shock level in the period taken in consideration. The stock of debt starts to grow after the shock with the consumption. It continues to grow for four periods, then it starts to decline. The consumption dynamics resembles what happened in some advanced countries before and after the Great Recession.

Fig. 9



Fig. 9 shows the evolution of the disposable income of Workers with the evolution of the

stock of debt. Disposable income starts to grow after the shock as the increase in consumption has an expansionary effect on the economy, increasing the level of income. When consumption starts to decline disposable income declines too. At the same time, the stock of debt grows faster than the disposable income, putting contractionary pressures on the economy.

Fig. 10

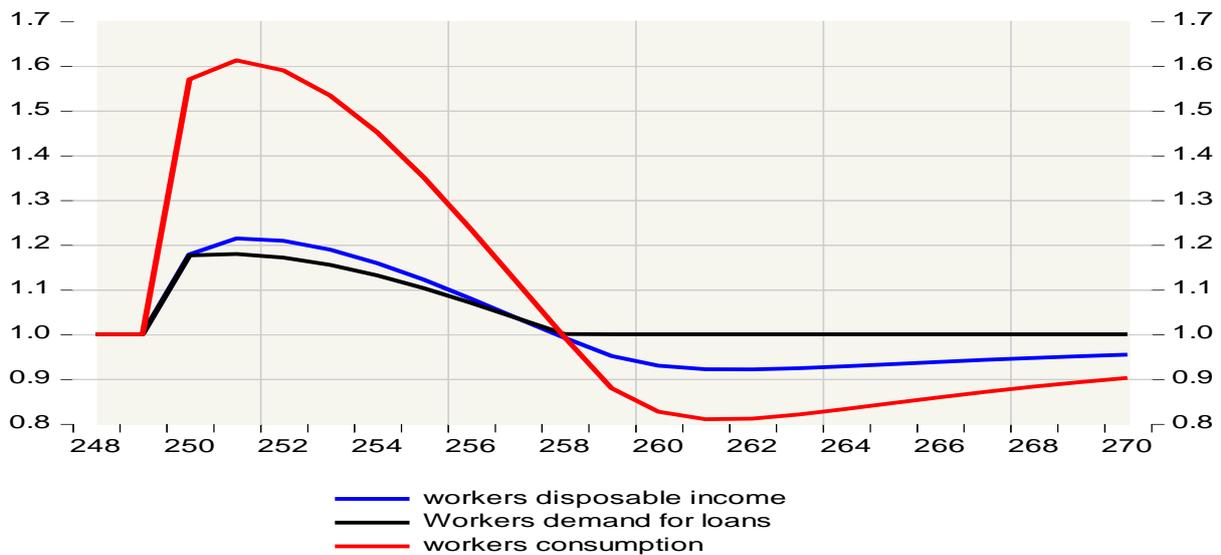


Fig 10 shows the movement of demand for loans by Workers with consumption and disposable income. After the shock the demand for loans increases following the increases in consumption, when consumption collapses it decline and returns to its pre-shock level.

Fig. 11

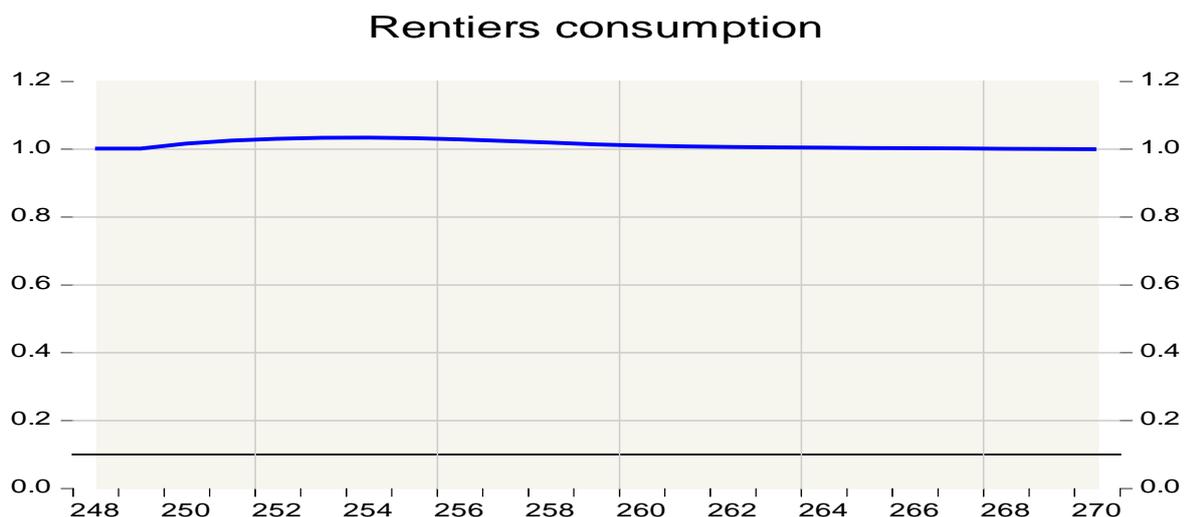


Fig. 11 shows the effect of the shock on Rentiers' consumption. Since Rentiers are "low propensity to consume agents", the expansionary effect of the credit supply shock is small. Figures 9, 10 and 11 illustrate the idea of Kaldor and Palley of the "debt service transfer mechanism". Debt repayment shifts income from high propensity to consume households to low propensity to consume agents, putting contractionary pressures on the economy.

Fig. 12

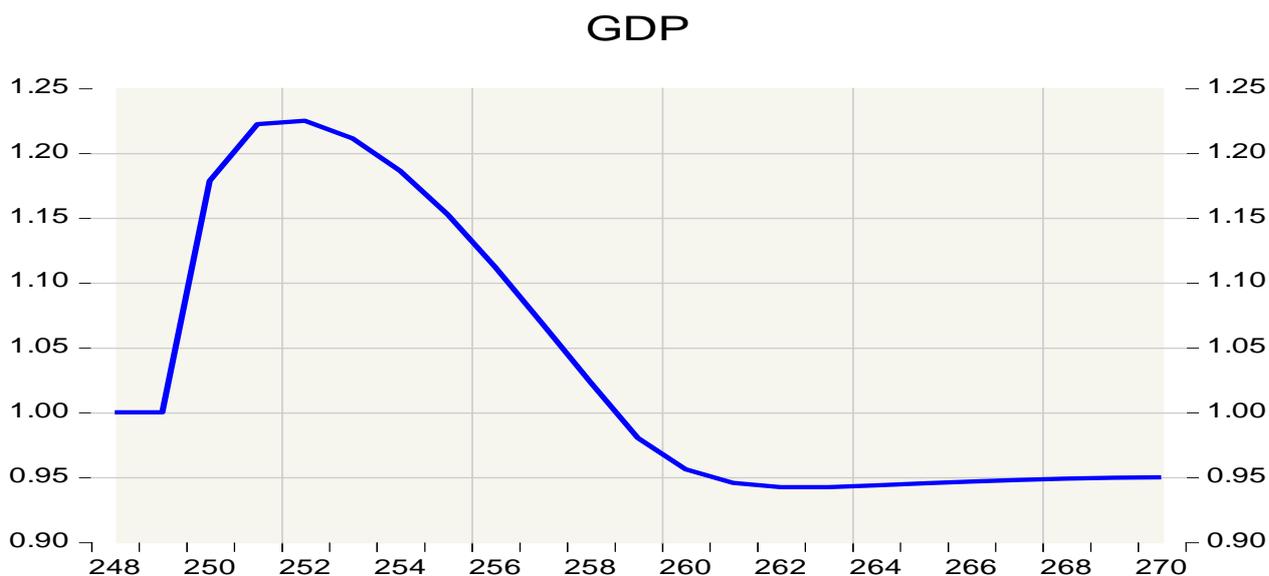


Fig. 12 shows the impact of the shock on GDP. It increases with consumption and declines when workers cut spending. The "stock-flow" dynamic of inside debt generates a business cycle similar to the one described by Palley: an increase in expenditure financed by borrowing has an expansionary impact on the economy in the first time, when the payback phase begins the "debt service transfer mechanism" puts contractionary forces

on the economy.

Another interesting result is that recovery from the recession takes time and the economy after the shock is below the “pre-shock” steady-state equilibrium during the number of period considered in this simulation.

Fig. 13

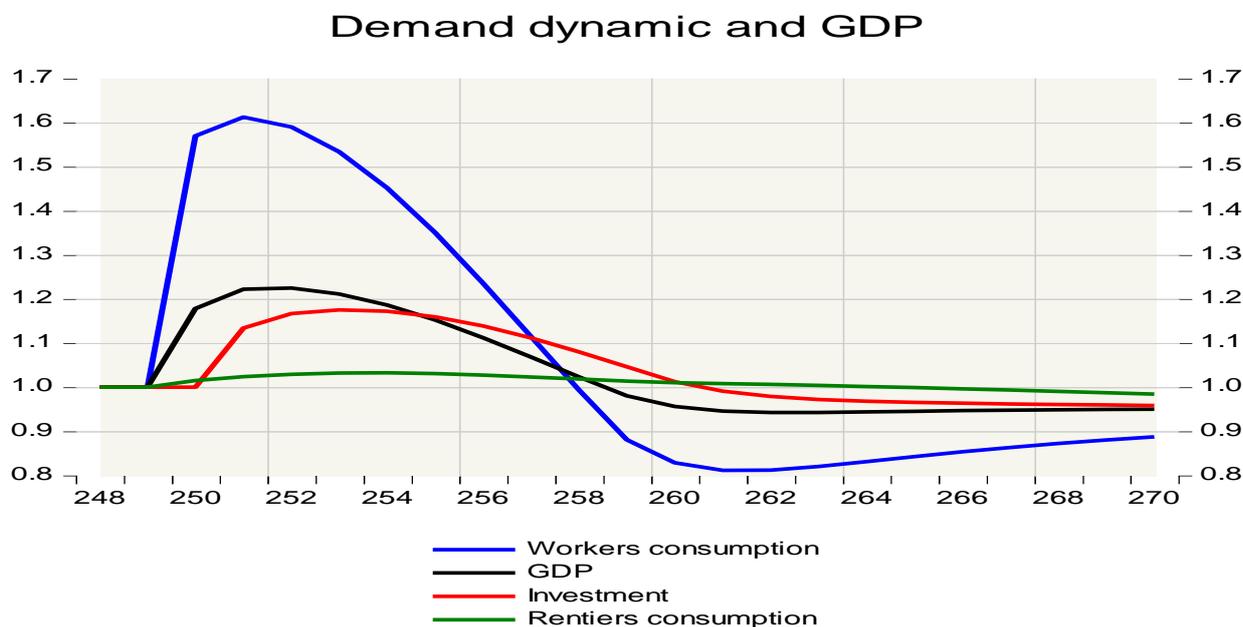


Fig. 13 shows the impact of the shock on all the components of the aggregate demand and on the GDP. Workers' consumption is the variable affected directly by the shock. Its recovery is slow, and it does not return to the pre-shock level. Investment responds with a lag to the shock and collapse during the consumption-led recession. Investment's recovery is faster than the recovery of consumption and it returns to the pre-shock level after few periods. This first simulation describes a simple consumption-led cycle in which the economy is driven by Workers' expenditures and the banking's sector willingness to lend.

5.8) Minskyan extensions

Now, following Palley (1994, 2009) we introduce some extensions in order to study a complete “predator-prey” model of households' debt. In this model, the interaction between the impact of borrowing on aggregate demand and on the balance sheets of the borrowers creates a cycle. In order to produce this cycle, we introduce a leverage ceiling to the willingness of the banking sector to lend. We assume that once households reach this ceiling, banks reduce the number of loans extended. The leverage is calculated as the ratio between the stock of debt in the balance sheets and the disposable income of the

households. From the households' side, we introduce a different consumption function, similar to the one presented by Palley (1994).

$$5.1) \quad SL = DL_f + DL_R + DL_w * \rho$$

$$\rho = 0.8 \text{ if leverage} < \psi$$

$$\rho = 0.25 \text{ if leverage} > \psi$$

Where ψ represent the ceiling of the banking sector willingness to lend. From the households' side, the consumption function becomes:

$$28) \quad c_w = \alpha * Y_w^d + DL_w$$

We make the assumption that Workers consume all their income plus DL_w . DL_w is the demand for loans.

$$29) \quad DL_w = \sigma * Y_{w(t-1)}^d + \tau * \dot{Y}$$

$$30) \quad \dot{Y} = Y_{w(t-1)}^d - Y_{w(t-2)}^d$$

Demand for loans depends positively on the level of income of the previous period and positively by \dot{Y} , this variable captures *the: "Minskyian notion of financial tranquillity, whereby periods of income expansion make borrowers and lenders more optimistic, which then enables increased leverage."* (Palley 1994, p. 389)

With these Minskyian extensions, we try to show the "predator-prey" dynamic of debt described by Palley. Fresh borrowing increases aggregate demand and income; this, in turns, increases the ability to borrow more. Fresh borrowing feeds income that feeds back the ability to borrow more. At the same time, fresh borrowing increases the stock of debt in the balance sheets of the borrowers. The increasing level of the stock of debt preys on income by the repayment mechanism.

Fig 14

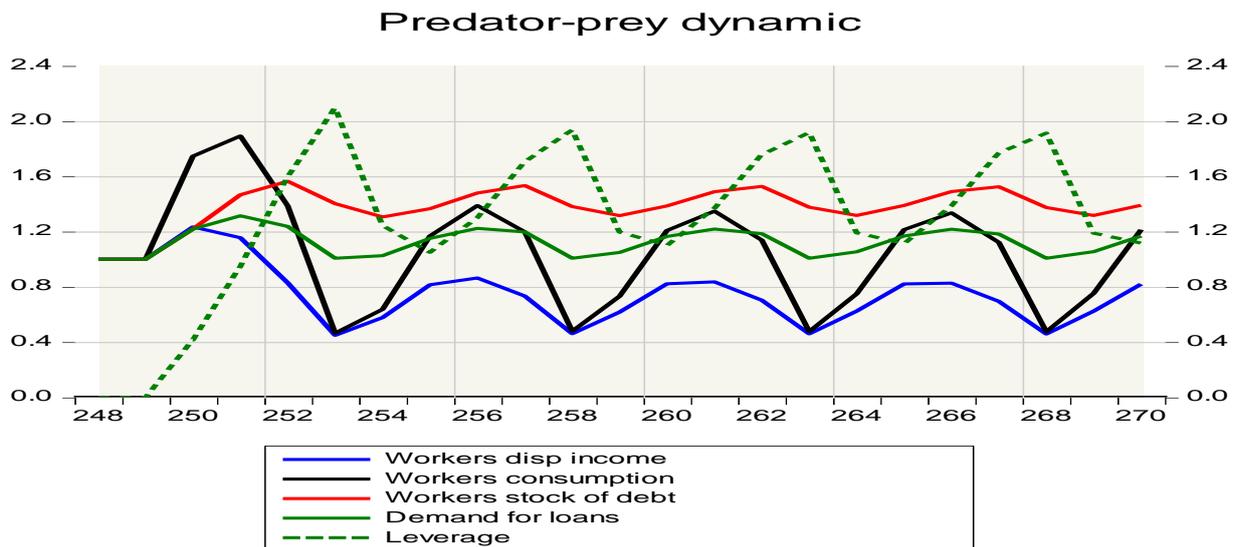


Fig. 15

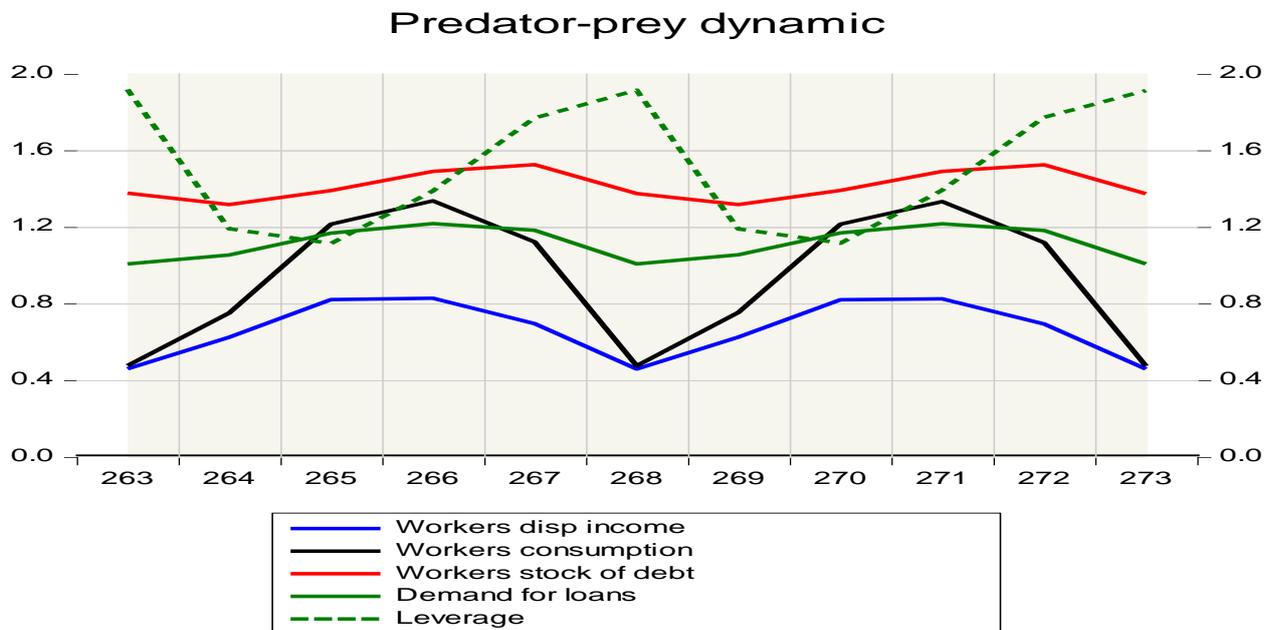


Fig. 14 and 15 show the predator-prey dynamic described above. As we said above, the economy is hit by a credit supply shock: banks decrease their standard of credit. The difference with the previous simulation is that, in this case there is a leverage ceiling imposed on the borrowers, this means that when the leverage will hit that ceiling the supply of credit will decrease. The interaction between the expansionary and contractionary effect of debt on income in the simulation creates a five-phases cycle that can be easily summarized by the following table:

Tab.1

	1	2	3	4	5
	Consolidation	Expansion	Expansion	Compression	Deleveraging
Consumption	+	+	Max	-	Min
Disp. Income	+	Max	-	-	Min
Leverage	-	Min	+	+	Max
Stock of debt	Min	+	+	Max	-
D. for loans	+	+	Max	-	Min

Tab. 1 shows the five phases of the predator-prey dynamic that create a cycle. In the first phase, the “consolidation phase”, the economy is recovering from the previous “recession”. Consumption and disposable income of Workers are growing, leverage is declining, the stock of debt is at its minimum and demand for loans is rising. In the second phase of the cycle, the expansion continues as demand for loans grows with consumption, disposable income reaches its maximum; leverage is at its minimum while the stock of debt starts to grow. The first and second phases describe perfectly the expansionary part of a debt-led expansion: fresh borrowing increases the purchasing power of the borrowers; this increases consumption and income. The third is the last of the expansion phase; consumption and demand for loans reach their maximum while disposable income starts to decline, the stock of debt continues to grow and as a result, the leverage starts to grow, in this phase the expansionary effect of fresh borrowing is not able to increase households’ disposable income. In the fourth phase of the cycle the contractionary part of the predator-prey dynamic begins; the stock of debt reaches its maximum and it continues to prey on the disposable income, consumption starts to decline, putting contractionary pressure on the economy, as a result of this dynamic the leverage continues to grow. In the last phase of the cycle, the level of leverage reaches the ceiling imposed by the banking sector as a result of the collapse of households’ disposable income. When the leverage ceiling is reached, banks reduce the quantity of loans, as a result consumption collapse even more, causing a contraction of households’ disposable income, in this phase both consumption and disposable income reach their minimum level while the stock of debt starts to decline because of the deleveraging imposed by the banking sector.

Fig 16

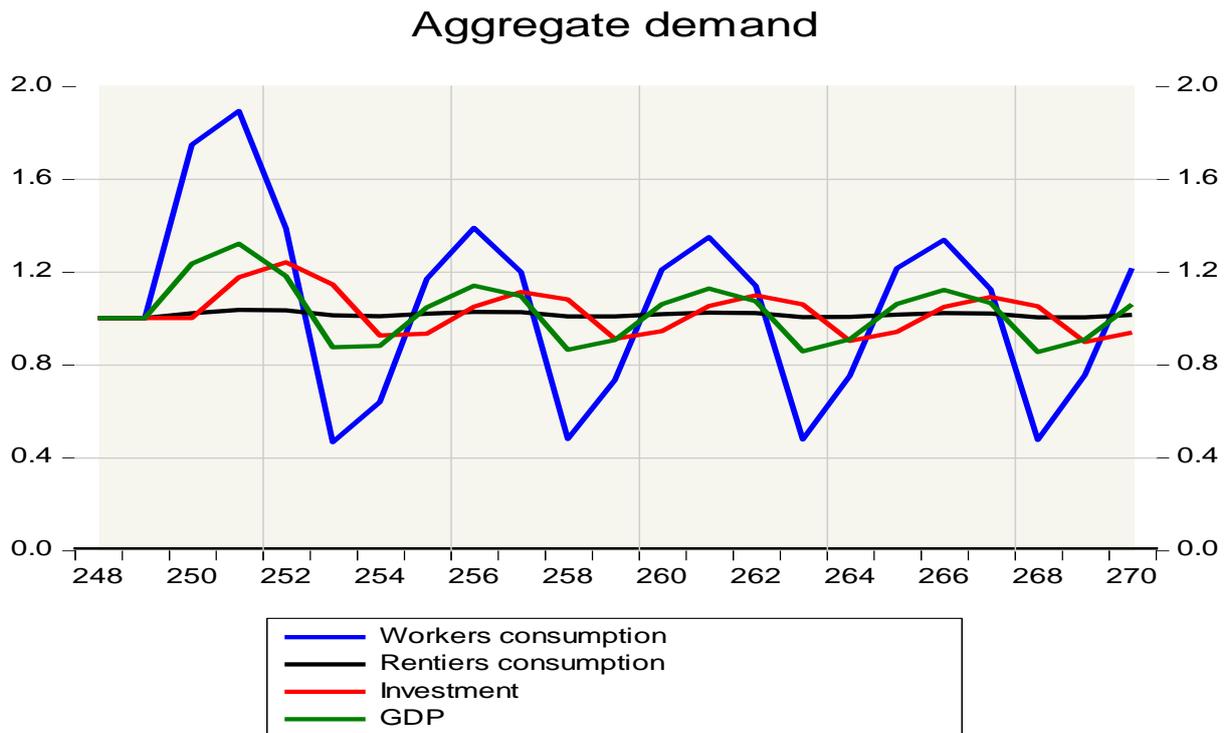


Fig. 16 shows the evolution of all the aggregate demand components and of GDP in this consumption-led dynamic financed by debt. Workers’ consumption drives the dynamic, Investments respond with a lag to the movements of GDP. Rentiers’ consumption is stable for all the phases of the cycle since Rentiers receive the profits from the banking sector. This result is in line with the “debt-service transfer” mechanism. Debt service transfers income from the high propensity to spend agents to the low propensity to spend agents. Rentiers’ consumption acts as an “attractor” for the GDP, being stable in both the expansion and contraction phase it does not allow the dynamic to be completely explosive.

5.9) Emulative consumption and banks lending ceiling

In this section, we add to the basic model presented above a leverage ceiling for the supply of credit and a demand for loans by Rentiers. The idea behind banks' behaviour is the same as the Minskyan extension presented above, the banking sector’s willingness to lend is tied to the leverage of the households’ sector, once households reach this ceiling banks decrease the numbers of loans they extend.

$$5.1) \quad SL = DL_f + DL_R + DL_w * \rho$$

$$\rho = 0.8 \text{ if leverage} < \psi$$

$$\rho = 0.25 \text{ if leverage} > \psi$$

We also assume that the willingness of the Workers to keep their consumption in line with the average consumption of the economy is affected by their leverage. When leverage reaches a “perceived ceiling”, workers households reduce the quantity of consumption devoted to keeping up with the average consumption of the economy.

$$23.1) c_w = \varphi * C_{av} + \alpha * Y_w^d$$

Equation 23.1 describes the new consumption function for workers households, where φ describes the leverage ceiling that influences the willingness of the workers’ households to keep up with the consumption average, φ value is between 0 and 1.

We also assume that the Managers and Rentiers demand credit in order to consume following the “Minskyan” demand for credit used in the previous simulation for the Workers. The consumption function for Rentiers become:

$$30) c_R = C^0 + \alpha * Y_{R(t-1)}^d + \beta * W_{R(t-1)}$$

$$31) \dot{C}^0 = \sigma * Y_{R(t-1)}^d + \tau * \dot{Y}$$

$$32) \dot{Y} = Y_{R(t-1)}^d - Y_{R(t-2)}^d$$

With this last simulation, we aim to have a much more detailed description of some stylized facts in place during the “pre-recessions” periods. While for the low and middle-income share of the population the use of debt can be seen as a substitute for the stagnation of their disposable income, the richer part of the population in the U.S. and other advanced economies have started to use debt in the face of an increase of their disposable income.¹⁰ This reflects, at least partially, the idea coming from Minsky, that realization of cash flows increases the willingness of economic agents to use more debt in order to finance their expenditure.

Fig.17

¹⁰ Cynamon and Fazzari (2017) and Mason (2018) have shown how the increasing use of debt in the U.S. was not limited to low and middle-income share of the population.

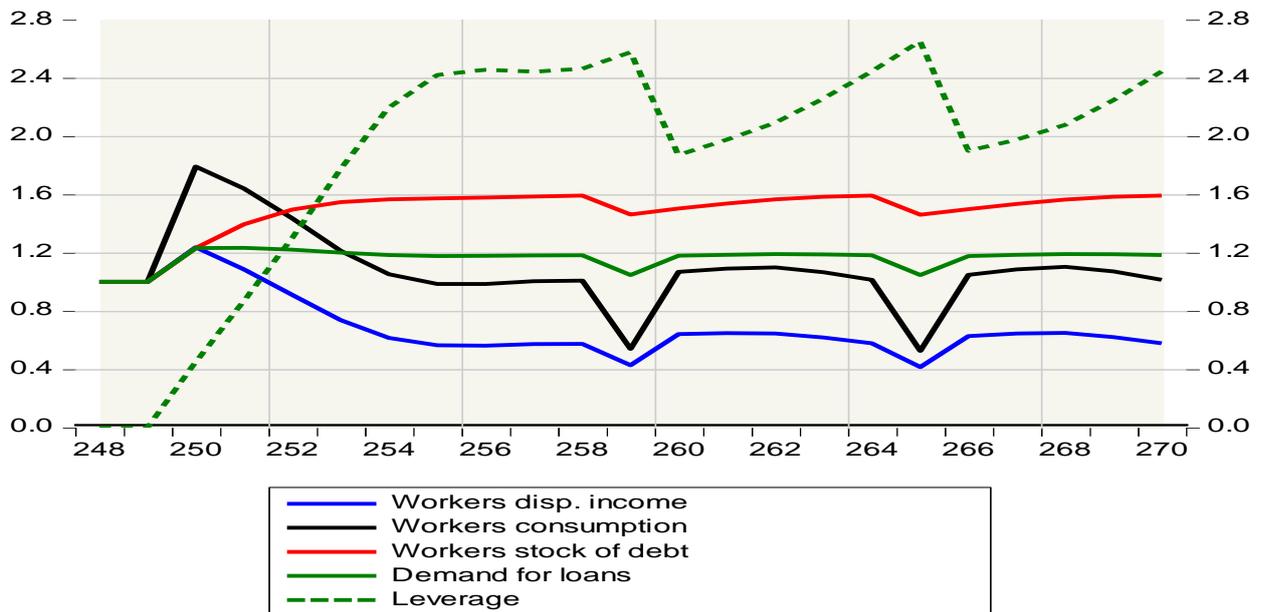
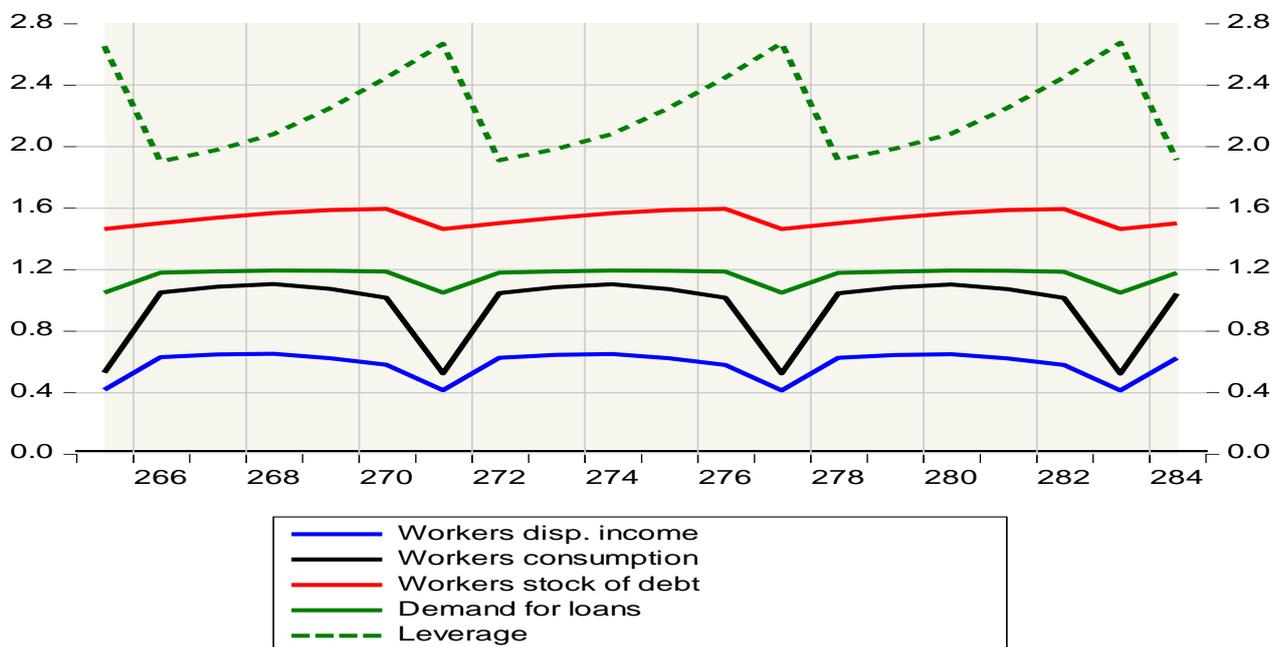


Fig. 18



Figures 17 and 18 show the predator-prey dynamic generated by the interaction between the expansionary impact of fresh credit on GDP and the contractionary impact of the stock of debt. The two faces of debt drive the dynamics: when leverage is below the ceiling imposed by the banking sector, and the self-imposed ceiling by the workers' households, the demand for credit fuels a consumption-driven expansion. When leverage reaches the ceiling, consumption decreases, and households start to deleverage. Fresh borrowing increases the ability to consume more of Workers and at the same time increases the stock of the debt in their balance sheets, but the increase in consumption does not increase the disposable income of workers households by the same proportion. The “debt service transfer” mechanism plays a role in generating the cycle, but its effect is mitigated

by the fact that Rentiers also demand loans in order to consume more when their income increases. Demand for loans by Rentiers is stimulated in the expansionary phases by the increase in income generated by the increase in consumption of the workers' households. In the contractionary phase demand for loans by Rentiers is decreased by the decrease of general income, but at the same time, it is increased by the transfers of income from the Workers to the banking sector when workers households pay back their debt. Fluctuations of Rentiers' consumption are mitigated by the interaction of these two dynamics. After the shock the leverage increases and starts to fluctuate around a range of values. The higher level of leverage is due to the ability of workers to borrow more.

Fig. 19

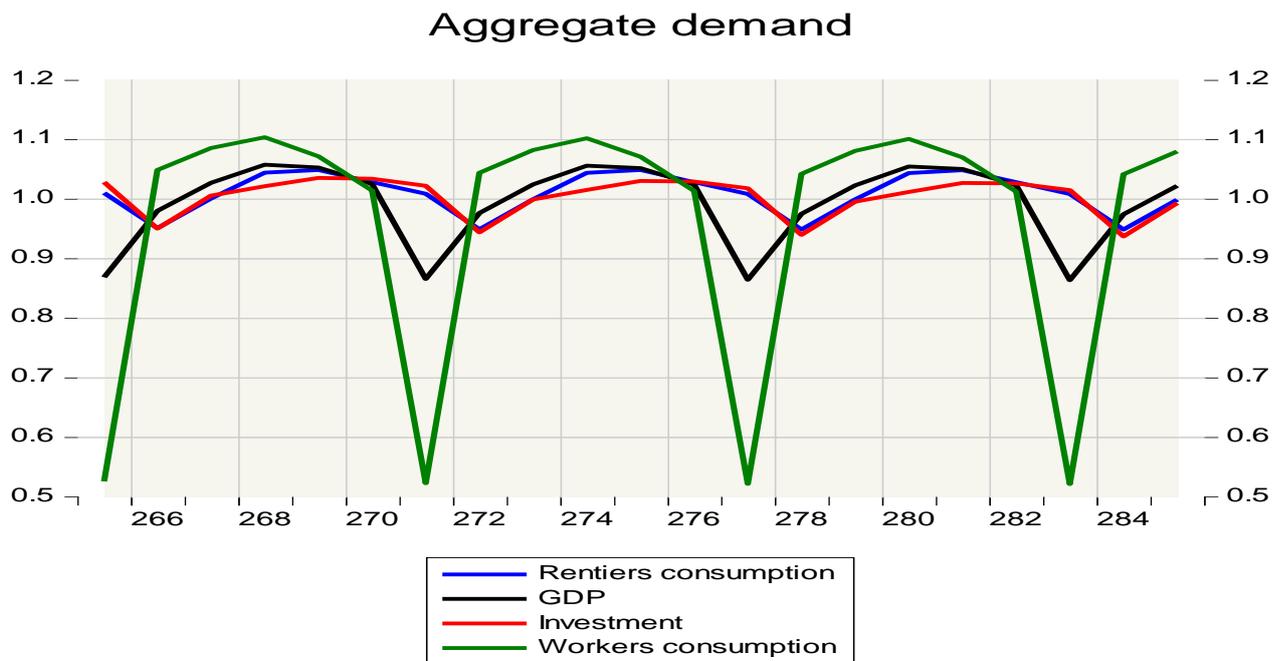
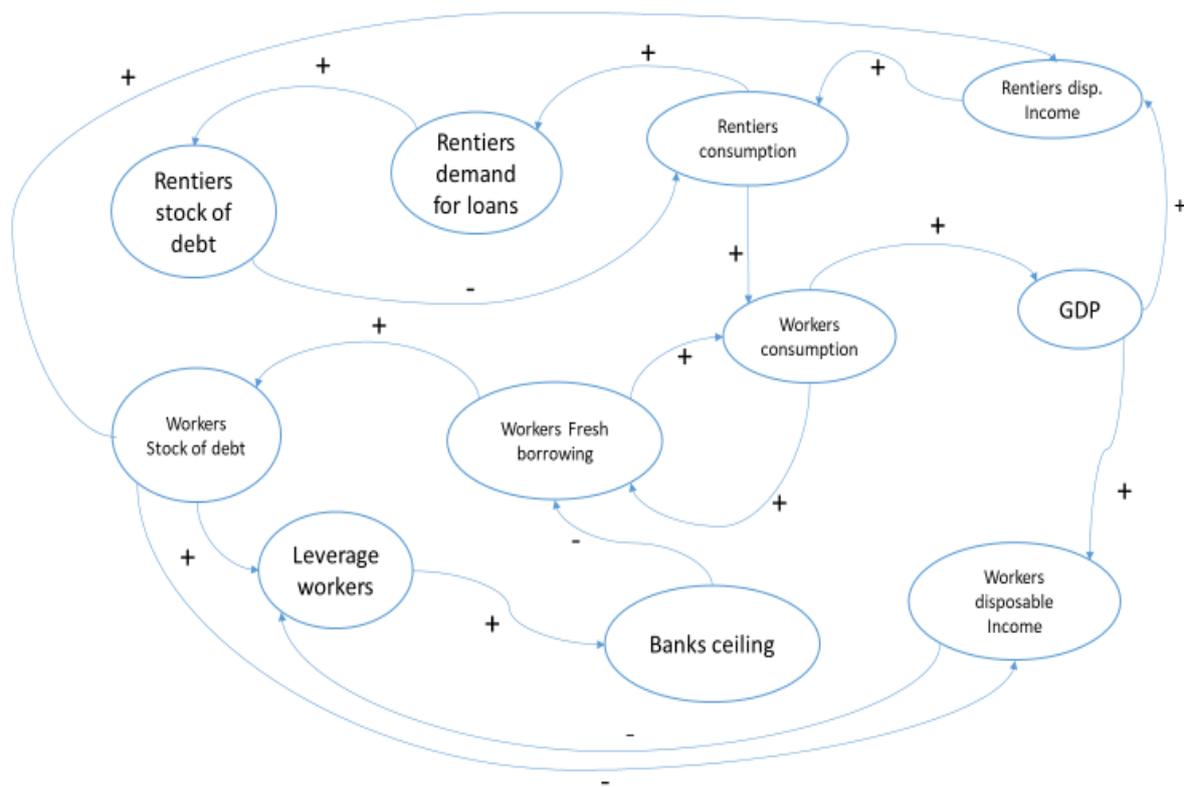


Figure 19 shows the interaction of the aggregate demand components. As in the first and second simulations, aggregate demand is driven mainly by fluctuations in Workers' consumption. The difference with the first two simulations is given by the fluctuations of rentiers households' consumption. If before the stability of rentiers' consumption was a stabilizer for the entire economy, now the fluctuations of the GDP are greater, since rentiers' consumption responds more to the movement of their disposable income.

Figure 20



Following figure 7 that we have presented above, in figure 20 we can show an extended version of the “stock-flow” dynamic of debt that we have presented in this last simulation of the model. The dynamic presented is similar to the one in figure 7 but the layer of complexity is higher. A series of feedback dynamics drive the behaviour of the model.

The simulation starts with an increase in the ability of Workers to borrow more. The increase in fresh borrowing of Workers allows them to consume more. An increase in consumption by Workers increase the GDP of the economy. The expansion of the economy translates into an increase in the disposable income of Workers. At the same time, when the GDP increases Rentiers’ income increase, this drives up Rentiers’ consumption. The increase in Rentiers’ consumption affects Workers’ consumption via the emulative component in the Workers’ consumption function. Furthermore, the increase in Rentiers’ consumption puts expansionary pressures on GDP, this increase households’ disposable income. The increase in Workers’ disposable income increases their ability to borrow more because an increase in disposable income decreases the value of the leverage ratio. The first feedback loop is composed of this “Keynesian dynamic” augmented by the fact that Workers decide how much to consume looking at the average consumption in the economy, so, when Rentiers’ consumption increases this has a positive effect on Workers’ consumption. The flow dynamic described before puts expansionary pressures on the economy. The “Mynskian extension” on Rentiers’ behavior expand this flow dynamic, when Rentiers’ income increase, their desire to increase borrowing in order to consume more increase as well. Therefore, the increase in GDP has a twofold impact on Rentiers’ expenditure, the first is by the “normal” increase in their

disposable incomes, the second is through their willingness to borrow more in order to finance additional expenditure. Besides the flow effect, the stock effect plays its contractionary role in generating the cycle. The increase in fresh borrowing increases the stock of debt of Workers. The increase in the stock of debt decreases the disposable income of the Workers because of the burden of interest and principal repayment. At the same time, the increase in the stock of debt decreases the ability of Workers to borrow more because of the increase in the level of the leverage, pushing the Workers' household close to the bank lending ceiling. For the Rentiers the stock effect is slightly different, the payback phase for Rentiers does not affect really their disposable income since they receive profits from the banking sector. The ability to borrow of Rentiers is affected by the increase in the leverage ratio due to the increasing stock of debt in their balance sheets. Even though in the reality this can become a real problem for the rich part of the population, in our experiment the increase in the leverage ratio does not affect significantly the ability to borrow of Rentiers.

6) Conclusions

In the paper we analyse how households' debt can have a significant impact on the stability of the economy, considering the different linkages by which debt affects aggregate demand and the economic outcomes. We highlighted some institutional changes that bring households' debt to a new higher level with no tendencies to significantly decrease. In such an environment, the presence of a high level of households' debt strongly affects economic outcomes. We try to formalize the different mechanisms that private debt brings into the pictures, the first is the Keynesian "debt-service transfer" mechanism highlighted by Palley. In this mechanism the expansionary and contractionary effects of households' debt comes first from the transfers of monetary resources from low-propensity to spend agents to high-propensity to spend agents, this transfer stimulates the economy in the borrowing phase increasing aggregate demand, but the pay-back phase has a contractionary impact because it reduces the monetary resources of high-propensity to spend agents. The second mechanism involves a lenders' behaviour in the face of an increasing risk of insolvency of the borrowers. Lenders impose a leverage ceiling to the borrowers when leverage reaches this ceiling lenders reduce the amount of loans. We use a "stock-flow" model in order to study these dynamics; the results show that an increase in households' borrowing can lower the equilibrium steady state of the model because of the "debt-service transfer" in the absence of any redistributive force. The second result is that the interaction between lenders and borrowers with a leverage ceiling can create a cycle in which debt shows its two faces, it increases income by fresh borrowing, but at the same time, it preys on income via the stock of debt. Since high levels of households' debt can be considered a new normal, at least in the current social and political situation, we believe is important for the policy makers to take into account the double effects of borrowing by households in the economy.

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Appendix- Parameters of the model

Firms

$i_0 = 0.15$ portion of gap between the actual stock of capital and the target level of capital.

$v = 1$ proportion of GDP that describes the target level of capital.

$\eta = 0.2$ depreciation rate of capital.

$\Phi = 0.85$ profits retention rate by firms.

Rentiers Households

$\alpha = 0.4$ propensity to consume out of income.

$\beta = 0.2$ propensity to consume out of wealth.

$\gamma = 0.2$ principal repayment portion.

$iL = 0.02$ interest on loans.

Workers households

$\alpha = 0.7$ propensity to consume out of income workers.

$\beta = 0.4$ propensity to consume out of wealth workers.

$\gamma = 0.2$ principal repayment portion.

$iL = 0.02$ interest repayment on loans.

Additional graphs

fig 21: Predator prey or stock-flow dynamic first simulation

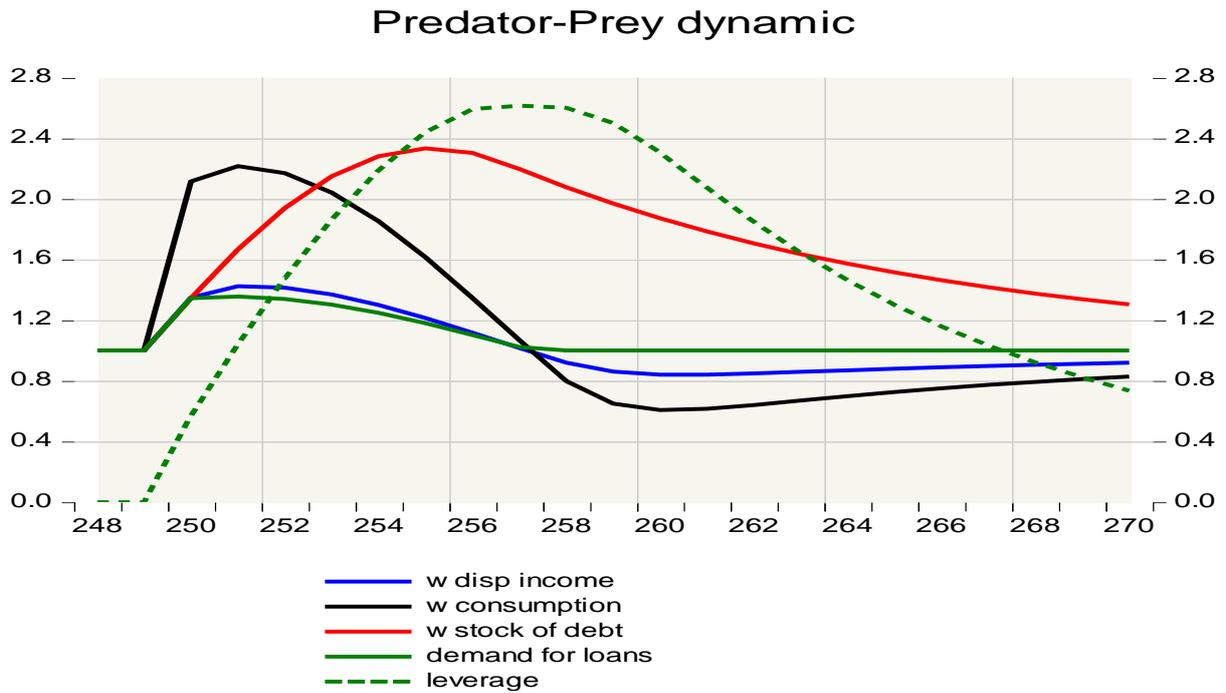


Fig 22: Stock-Flow dynamic second simulation

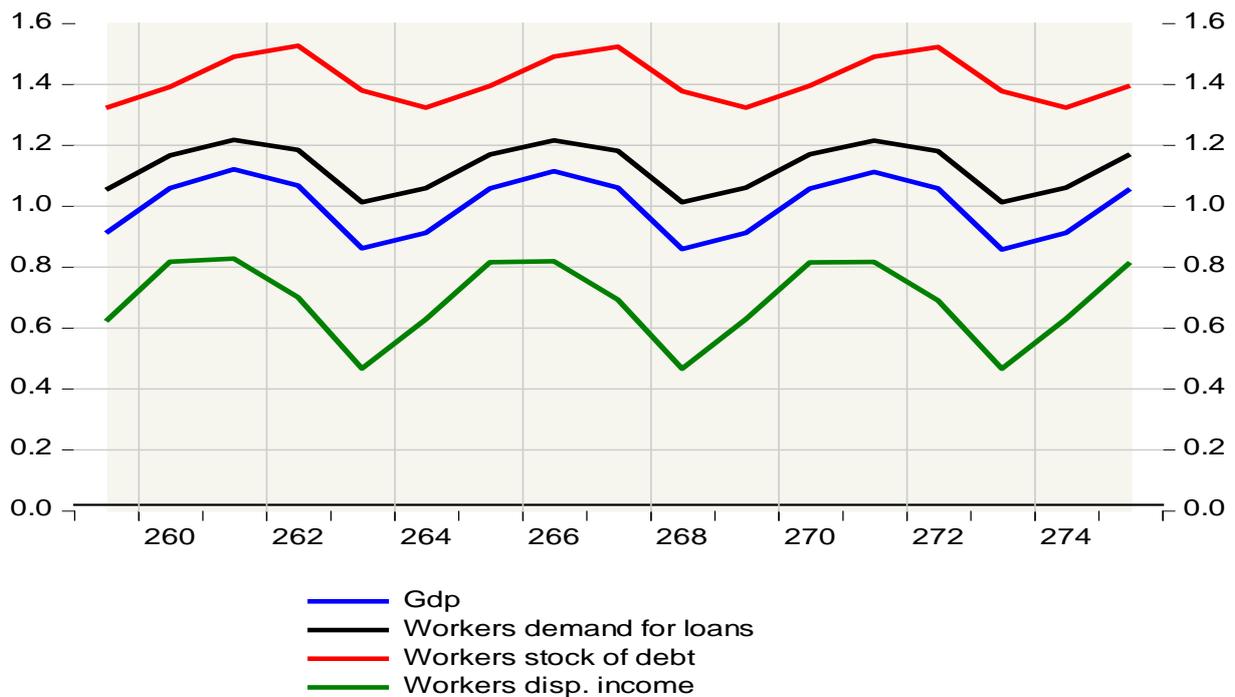


Fig 23: Stock-flow dynamic for rentiers, third simulation

Rentiers disposable income, stock of debt and consumption

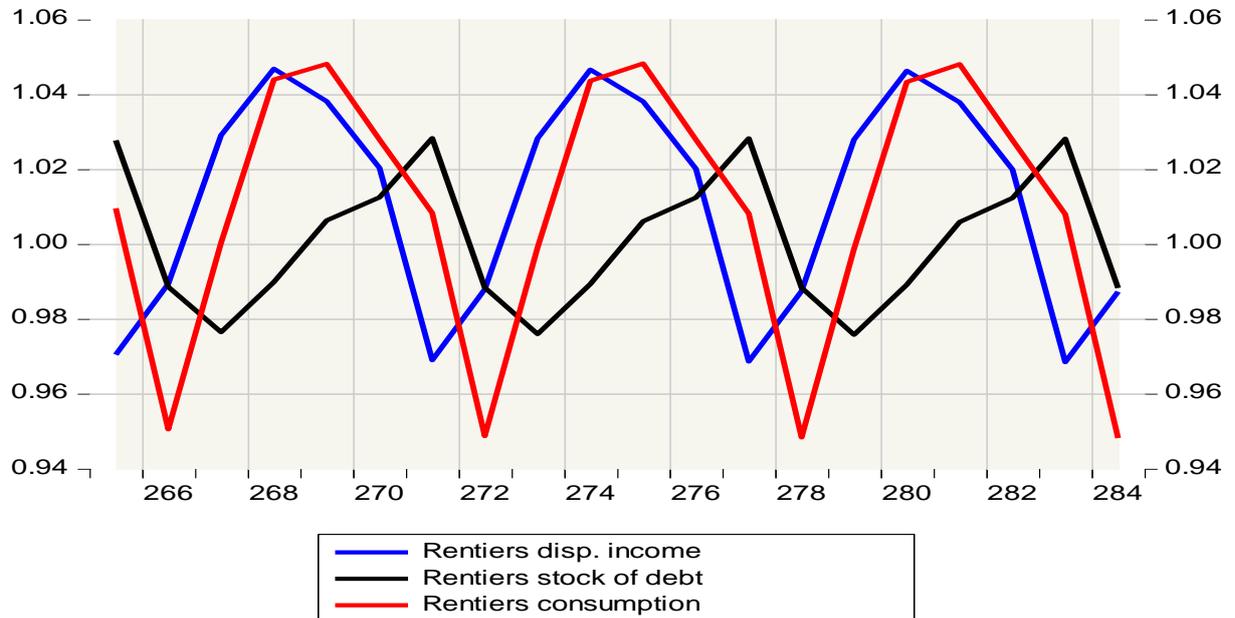


Fig 24: Stock-flow dynamic for workers, third simulation.

Workers disposable income, stock of debt and consumption

