Financial fragility and income inequality

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Introduction

After the financial crisis of 2007/2008 academics and policymakers have turned their attention to how private debt can affect, significantly, the economic performance of a country.

In the period of the "Great Moderation", the increasing level of income inequality, together with structural transformations, has created an environment where a large portion of the private sector was more prone to rely on bank credit in order to finance its expenditure. While borrowing can have a first expansionary impact, because of the increase in the purchasing power of the borrowers, the increase in the stock of debt in the "medium-term" can have different negative effects. Debt repayment transfers resources to "high propensity to spend" agents (borrowers) to "low propensity to spend" agents (lenders). The impact of this income transfer can have a negative impact on final expenditure and, thus, on GDP. The increase in the stock of debt leads to an increase of the fragility of the household sector because of its increase in the vulnerability to different kind of shocks such as: an increase of the interest rates, a sudden decrease of the disposable income, a collapse of the assets used as collateral, and to possible changes of the attitudes of the lenders.

Starting from this, we developed three different theoretical models in order to describe the impact of an expansion of household debt, in an environment of high-income inequality.

The thesis is divided into three chapters. In the initial part of every chapter there is a description of different aspects of the increase in household debt during the period preceding the financial crisis of 2007-2008.

In the first chapter, the problem of household debt is addressed looking at the possible causes of the increasing willingness of households to finance their spending by borrowing and at the expansionary and contractionary effect of debt. The second part of the chapter contains a model that shows the Janus-like faces of household debt.

The model is composed of three sectors: a firm sector, a banking sector, and the households sector. The households sector is divided into two subsectors in order to detect differences in income and wealth and propensity to consume.

One of the main interesting results of the model is that: borrowing to finance consumption increases the level of aggregate demand and income like in a standard Keynesian model and in the multiplier-accelerator model by Samuelson, but at the same time fresh borrowing increases the level of the stock of debt, which has a negative impact on demand has it implies a transfer of resources from the high propensity to consume borrowers to lower propensity to consume lenders. The model is able to replicate a debt-driven cycle created by the interaction of the flow and the stocks effect of household debt.

The second chapter starts with a description of some crucial evolutions in place during the Great Moderation in the U.S. economy: the evolution of the financial sector, the increase in income inequality, changes in the attitudes towards consumption and in the use of debt of the households sector, and the long term trend of households' expenditure in US.

The second part of the chapter, contains a model which is an extension of the one in the first chapter. The model has three sectors: a household sector, goods market firms and firms who produces houses, and a banking sector. The focus is on the between the household sector, the

housing market, and the banking sector. Households are split into two sub-sectors in order to describe the implications of differences in income and wealth. An emulative consumption function and demand for houses is introduced in order to detect the impact of income inequality on spending and demand for loans. With two different shocks on credit access, we are able to replicate the boom and bust dynamics of debt led expansions and a financial accelerator dynamics where the interaction between the housing market, the banking sector, and the households sector generates a feedback loop that creates a cycle.

In the third chapter, the problem of household debt is studied looking at the international level. In the first part of the chapter, there is a description of the different demand regimes that have emerged during the period of the so-called financialization. In the second part, a two-economy model is presented. Each of the two economies has four sectors: households, banks, firms, and a government with its central bank. Like in the first two models, the household sector is divided into two subsectors to study the implications differences in income, consumption and investment behavior.

We perform two different experiments, in the first one we let the supply of credit in one country increase in order to detect what is the "international" impact of a credit supply shock. In a second experiment, we study the different effects of an income distribution shift when households have different access to credit.

The modelling methodology used is based on the Stock-Flow Consistent approach. This new class of models is very suitable to study the effect of financial variables on the economy because they focus their attention explicitly on the "sustainability" of the pattern of financial flows and the subsequent accumulation of stocks.

Household debt, aggregate demand, and instability in a stock-flow consistent model

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.

Starting from these stylized facts, the Stock-Flow Consistent model that we developed 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 and six we present a stock-flow consistent model that tries to replicate some of the dynamics we describe in section two and section three.

section seven concludes.

2. Descriptive statistics of the evolution of the household debt

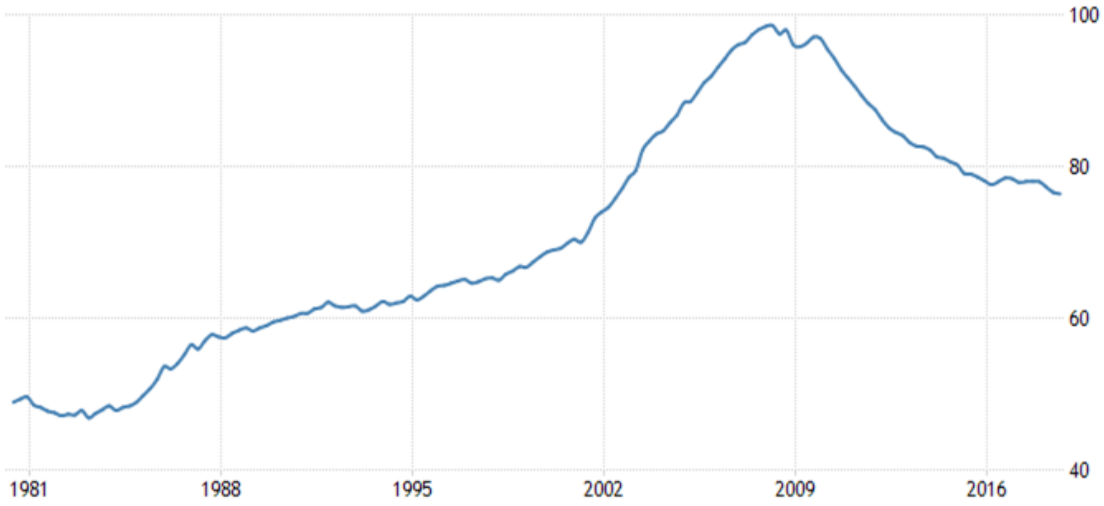
Since the beginning of the so-called Great Moderation period, the period that started in the early '80s and ended with the start of the Global Financial crisis, some of the most advanced economies have seen the evolution of some common trends. The most important was the dramatic increase in the household debt. If we look at the evolution of the debt held on the balance sheet of the household 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 household's debt-to-GDP ratio in the USA. We can split the evolution of household 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.

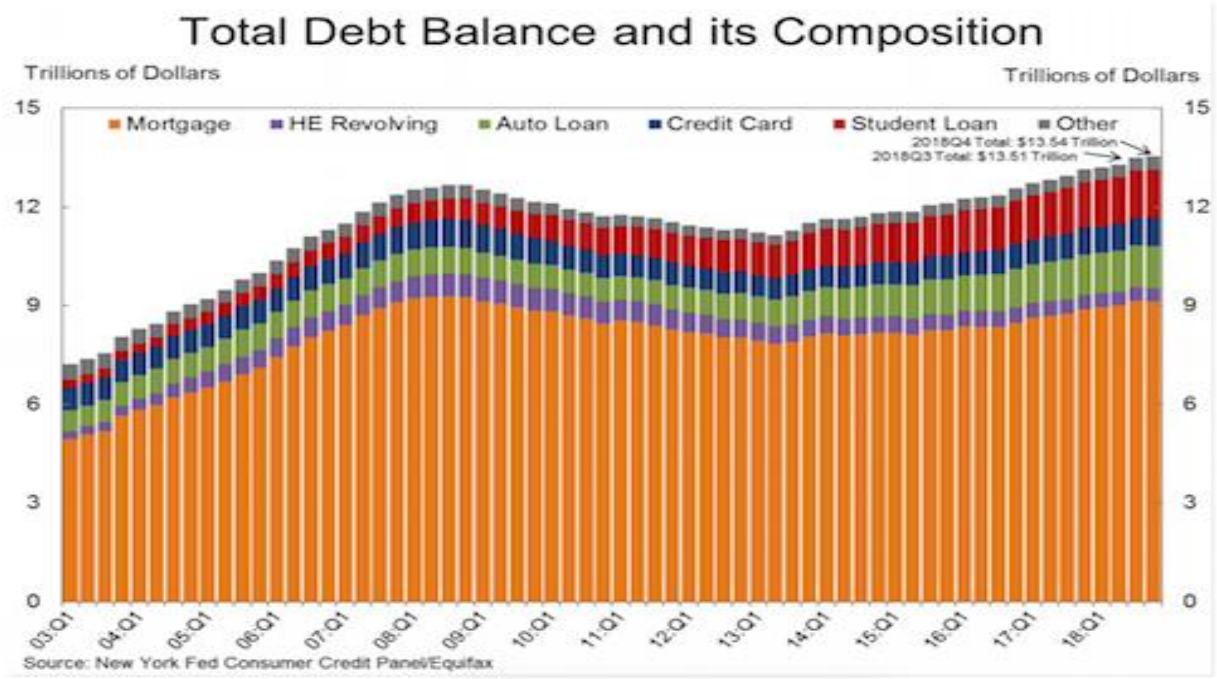
It is interesting to show how high level of debt are structural features of the US economy and this means that a decline in the disposable income can have important effect on the economy.

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



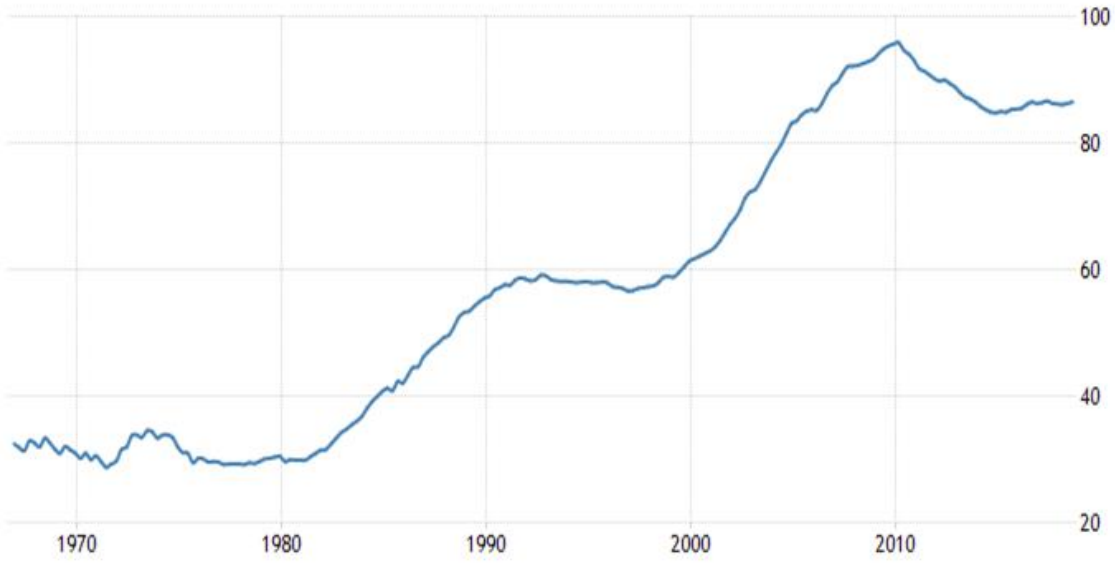
Source: Bank of international settlement

Fig.2



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

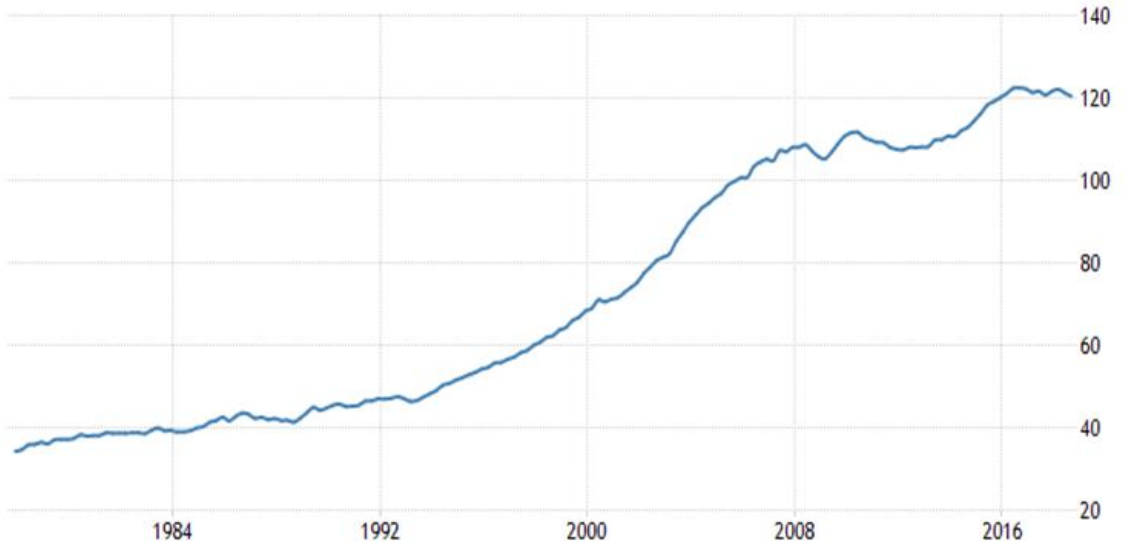


Source: Bank of international settlement

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

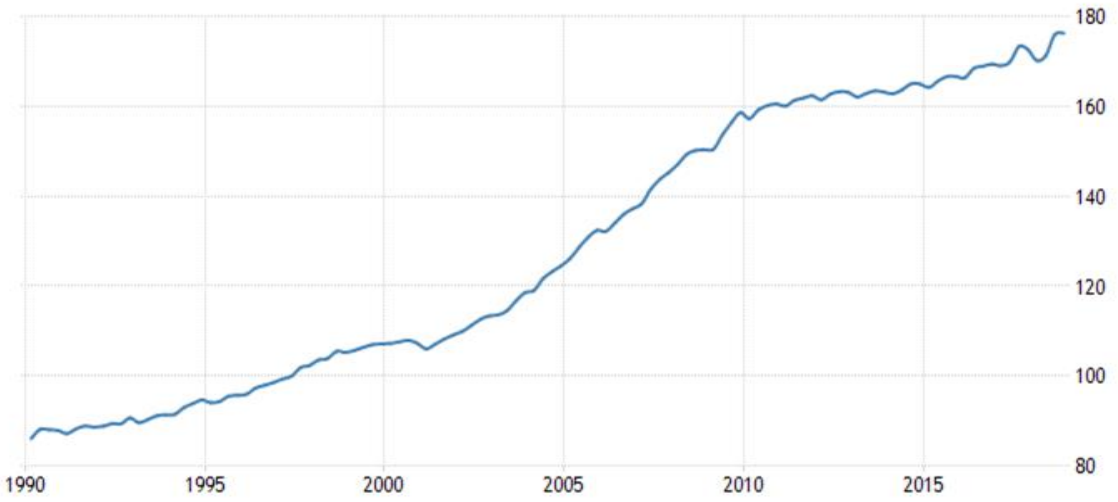
Looking at two other Anglo-Saxon countries, Canada and Australia, we can see a similar dynamic.

Fig. 4 Household debt-to-GDP for Australia



Source: Bank of international settlement

Fig. 5 Household debt-to-GDP for Canada

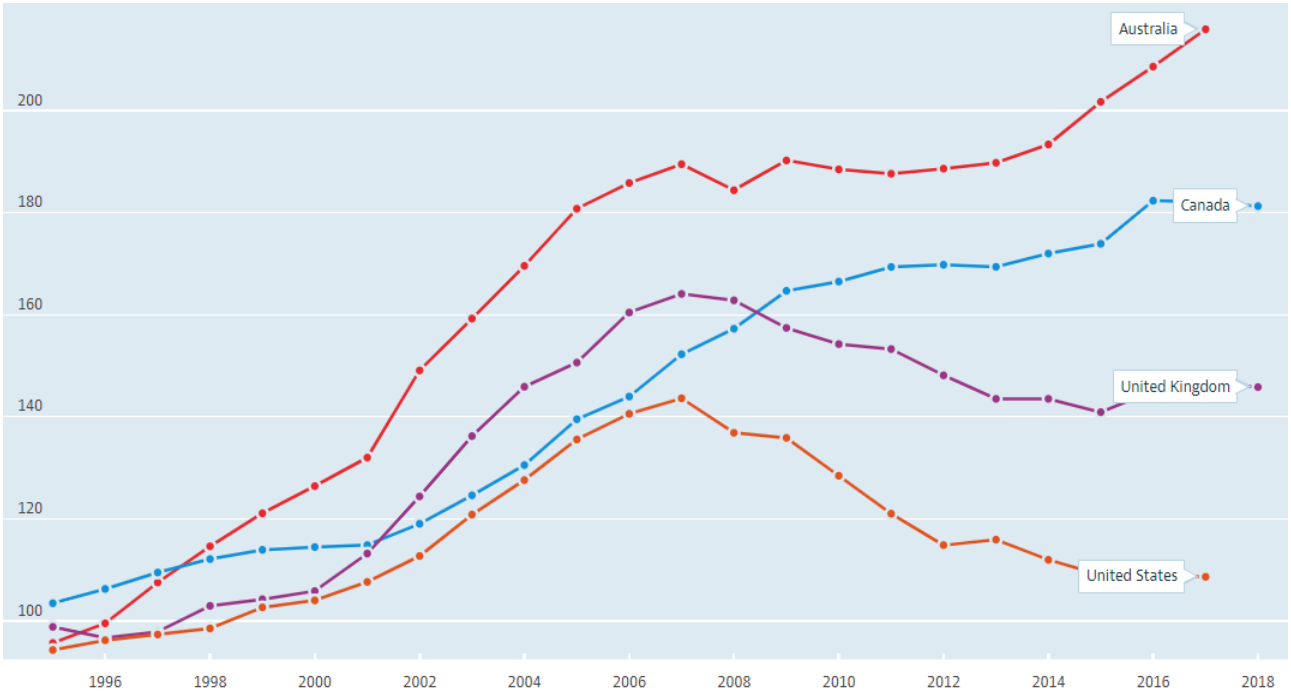


Source: Bank of international settlement

The difference is that household 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 debtTotal, % 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 "mainstream" view of households' borrowing and expenditure is based on the Life-Cycle Hypothesis[1]. Alternative explanations are based on Duesenberry's relative-income hypothesis[2], in his work, he hypothesize 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.

[1] "Debt is accumulated by far-sighted, utility maximizing households whose objective is to smooth consumption over a potentially infinite time horizon. From this perspective, consumption spending should not be the cause of deep recessions because it implodes owing to unsustainable patterns of household debt accumulation. Indeed, the life cycle hypothesis suggest that, in the limit, consumption follows a random walk Yun K. Kim & Mark Setterfield & Yuan Mei, 2014. "A theory of aggregate consumption," European Journal of Economics and Economic Policies: Intervention, Edward Elgar Publishing, vol. 11(1), pages 31-49, April

[2] Duesenberry, J.S. (1949) Income, Saving and the Theory of Consumer Behavior, Harvard University Press, Cambridge, MA

Several empirical studies support the relative-income hypothesis: Luttmer (2005) and Alpizar et al (2005) show how individual 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.[3]

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 chronical deficit with the rest of the world. Wynne Godley described the evolution of the US economy in this way:

"During the last seven years a persistently restrictive fiscal policy has coincided with sluggish net export demand, so rapid growth could come about only as a result of a spectacular rise in private expenditure relative to income. This rise has driven the private sector into financial deficit on an unprecedented scale. The Congressional Budget Office (CBO) is projecting a rise in the budget surplus through the next 10 years, conditional on growth's continuing at a rate fast enough to keep unemployment roughly constant, and this implies that it is government policy to tighten its restrictive fiscal stance even further (Congressional Budget Office 1999a, 1999c). At the same time, the prospects for net export demand remain unfavourable. But these negative forces cannot forever be more than offset by increasingly extravagant private spending, creating an ever-rising excess of expenditure over income[…]If, as seems likely, private expenditure at some stage reverts to its normal relationship with income, there will be, given present fiscal plans, a severe and unusually protracted recession with a large rise in unemployment. It should be added that, because its momentum has become so dependent on rising private borrowing, the real economy of the United States is at the mercy of the stock market to an unusual extent. A crash would probably have a much larger effect on output and employment now than in the past."(Godley 1999, p. 216-217)

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:

"An increase in income inequality and the current account deficit and a consolidation of the government budget lead to a decrease in the saving rate of the household sector. Such a process is unsustainable because it leads to an increase in the debt-to-income ratio of the households and its maintenance depends on some kind of asset bubble."(Nikiforos 2016, p. 563-564)

[3] Ibid.

While would be more accurate to take into account the external and the government sector in the rest of the chapter 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. A more general analysis will be presented in chapter three.

In the next two sections we will present some literature based on the Duesenberry 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, 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[4].

Since the late '70s, the attitudes towards borrowing started to change rapidly:

"*The share of total consumer debt made up by revolving debt, which consists primarily of credit card balances, increased steadily up until 1998 when it reached about 46 percent. The number of consumers who have access to revolving credit has increased as well (Torralba 2006). Between 1970 and 1998, the proportion of all U.S. households that had at least one bank-type credit card grew from 16 percent to 68 percent."* (Cynamon and Fazzari 2008, p. 15)

Cynamon and *Fazzari argue that* during the Great Moderation period attitudes towards borrowing started to change:

"...Borrowing for a home with 20 percent down and a fixed-rate mortgage was consistent with the financial norms of the 1960s and the 1970s. However, few people in that era would re-finance their mortgages to get cash for a new car or a vacation. When home equity loans with tax advantages became available in the late 1980s, borrowing against one's home for non-housing consumption became more common. In the 1990s, innovations in the mortgage markets reduced transaction costs and cash-out refinancing became more common. Initially, these actions were responses to changes in available financial products.We argue, however, that what households consider "responsible" behavior also evolved along with these changing practices." (Cynamon and Fazzari 2008, p. 14)

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[5].

[4] Cynamon, Barry Z. and Steven M. Fazzari (2008). "Household debt in the consumer age: Source of growth—risk of collapse." Capitalism and Society 3(2),
[5] ibid.

As Debelle (2004) writes:

"*The ability of households to extract equity has been considerably strengthened by the greater availability of products such as home equity loans, and the lower transaction costs of using those products.*" (p. 60)

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 countries.

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

"*The vast majority of adult household decision-makers from the end of World War 2 to the 1970s either had to confront the financial challenges of the Great Depression themselves or had parents who managed household budgets during this bleak period. These people have an aversion to consumer debt. The Depression is two generations removed for baby boomers, however, and they have been much more willing to borrow aggressively to get what they want.*" (Cynamon and Fazzari 2008, p. 16)

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.

"*A family, in isolation, might choose a more conservative financial path, but the influence of neighbours, both those who have a physical presence and those whose lifestyles are piped in through the media, drives both consumption and debt higher.*" (Cynamon and Fazzari 2008, p. 17)

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[6].

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:

"The borrowing behavior of working households is largely governed by a social consumption norm based on (inter alia) past consumption patterns and the consumption behavior of a reference group. We then describe working households as accumulating debt in order to finance consumption that

[6] Ibid.

they cannot fund from current income subject to deficient foresight regarding the long-term consequences of this behavior. Our theory of aggregate consumption thus emphasizes the important interplay of consumption spending, relative income, and household debt accumulation, and the potential contribution of these factors to household financial fragility and macroeconomic instability.[7]*"(* Yun K. Kim et al, *p. 46)*

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 covering two different periods. The results show a structural change in consumer behaviour. As the authors show in the paper:

*"During the 1952–2011 period as a whole, current income is significant in the consumption function whereas consumer borrowing is insignificant. During the 1980–2011 subperiod, however, current income is substantially less important while consumer borrowing is highly significant. Results of a Chow test confirm the existence of a structural break in the early 1980s. In neither period can our regression results be well explained by the canonical life-cycle hypothesis. In particular, the importance of household borrowing after the structural break is incompatible with the life-cycle hypothesis, in which rational consumers only use credit as a tool to smooth consumption in the face of fluctuating income. It is, however, compatible with the post-Keynesian theory of consumption outlined in this paper, which posits that households accumulate debt in order to finance consumption they cannot fund from current income subject to deficient foresight regarding the long-term consequences of this behaviour" (*Yun K. Kim & Mark Setterfield & Yuan Mei 2015, *p. 18)*

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[8].

"*We argue that the effect of income inequality on household indebtedness results from the need for consumers to maintain or improve their social position through conspicuous consumption (Frank and Cook, 1995). Marketers (e.g., Aaker, 1997; Levy, 1959; Soloman, 1983) and economists (e.g., Bagwell and Bernheim, 1996; Frank, 1985; Becker, 1974; Veblen, 1899) have long understood that consumers purchase products not only for their functional utility but also for their social meaning*" (Christen and Morgan 2005 p. 150)

[7] Yun K. Kim & Mark Setterfield & Yuan Mei, 2014. "A theory of aggregate consumption," European Journal of Economics and Economic Policies: Intervention, Edward Elgar Publishing, vol. 11(1), pages 31-49, April.
[8] Markus Christen, Ruskin M. Morgan "Keeping Up With the Joneses: Analyzing the Effect of Income Inequality on Consumer Borrowing" (Quantitative market and economics , 2005)

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".*[9] 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.

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 prices is the most robust determinant of household indebtedness in the long-run and the short-run, and that the explanatory variables have cycle-dependent asymmetric effects on household debt accumulation. Our results indicate that household debt accumulation is primarily an outcome of residential real estate transactions, that the phase of the debt and house price cycles matters, and that our results are driven by the boom periods. In addition, Granger causality tests suggest causality going from real residential house prices to household debt"(p. 568)

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:

"That real residential property prices are the single most important predictor of aggregate household debt-to-income ratios. Over the 1995 to 2007 period they explain between 25% and 39% out of the total 54% increase in the panel averaged debt-to-income ratio which is consistent with the prediction of the housing boom hypothesis. Since real estate is the most significant asset type for the vast majority of households in OECD countries, this is a highly plausible but often under appreciated result. Second, we fail to find a robust statistically significant relationship between income inequality measures and household debt. Using the top 1% income share as well as a Gini coefficient, we do neither find a robust positive nor negative relationship. This is not consistent with the expenditure cascades hypothesis. Third, the second most important predictor of household debt-to-income ratios are low interest rates which often show statistically significant coefficients, however are sensitive to estimator choice. Finally, we find that credit market deregulation is a robust predictor of household borrowing, however the size of this effect is modest"(p. 118)

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

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 chapter 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 generates 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 Leman 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, 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[10]. 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[11] and Keynesian literature. The other channel is the "debt-service transfer" mechanism that is emphasized mostly by the post-Keynesian literature[12].

In the "balance-sheet congestion" mechanism, the effect of debt on the economic cycle works through the interaction between lenders and borrowers[13]. The main idea is that accumulation of debt during the business cycle leads to the deterioration of the quality of borrowers' balance sheets and increasing their debt obligations, this leads to a lower ability to borrow in order to finance expenditure[14]. 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

[10] Thomas I. Palley, 2009. "The Simple Analytics of Debt-Driven Business Cycles," Working Papers wp200, Political Economy Research Institute, University of Massachusetts at Amherst.

[11] Bernanke, Ben, Mark Gertler, and Simon Gilchrist, 1999, "The Financial Accelerator in a Quantitative Business Cycle Framework" in J. B. Taylor and M. Woodford, eds., Handbook of Macroeconomics (New York: Elsevier Science--North Holland), vol. 1C, 1341-93

[12] Ibid.

[13] Thomas I. Palley, "Debt, AD and the Business Cycle: A Model in the Spirit of Kaldor and Minsky," Journal of Post Keynesian Economics, 1994

[14] Kiyotaki, N., and Moore, J., Credit Cycles, Journal of Political Economy, 105 (1997), 211 – 48.

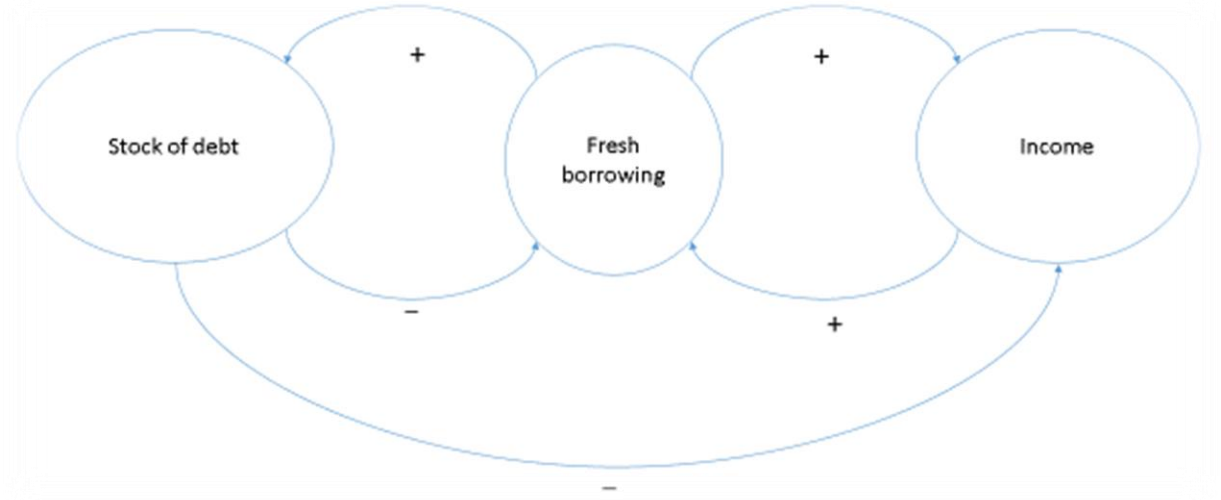
lowers the equilibrium output[15]. Both these interpretations are able to replicate the Minskyan notion of financial fragility:

"*Within the Minskyian framework, the business cycle is characterized by the gradual emergence of financial fragility, and this fragility ultimately causes the demise of the upswing. Minsky's descriptive model is as follows: The business cycle upswing is characterized as a period of tranquillity during which bankers, industrialists, and households become increasingly more "optimistic". In the real sector, this optimism translates into increased real investment, while in the financial sector it shows up in the form of an increased willingness to borrow, an easing of lending standards, and an increase in the degree of leverage of debtors. Effectively, there is a progressive deterioration of balance sheet positions measured by debt-equity ratios, accompanied by a progressive deterioration of debt coverage measured by debt service-income ratios. It is in this sense that there is growing financial fragility" (Palley 1994, p. 371)*

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[16].

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



[15] Thomas I. Palley, 2009. "The Simple Analytics of Debt-Driven Business Cycles," Working Papers wp200, Political Economy Research Institute, University of Massachusetts at Amherst.
[16] Thomas I. Palley, "Debt, AD and the Business Cycle: A Model in the Spirit of Kaldor and Minsky," Journal of Post Keynesian Economics, 1994

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. This is very similar to the standard Keynesian model and the multiplier-accelerator model developed by Samuelson[17]. 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[18].

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[19]. 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[20].

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.

5. Stock-Flow consistent modelling

We have tried to develop a Stock-Flow Consistent model in order to replicate some of the empirical stylized fact described above and the theoretical idea of the predator-prey dynamics of household debt.

Stock-Flow Consistent models are very well suited for the study of the impact of financial variables such as the stock of debt on the economy. As pointed out by Barwell and Burrows in their working paper for the Bank of England:

“*By building an accounting framework that follows the circulation of money through the economy, we can ensure that we account for all the critical flows of financing that lead to the stocks of assets and liabilities in which financial fragility can build. Moreover, we can trace the linkages between these financial fragilities and the flows of income and expenditure that are the more usual focus of mainstream models*.” (Richard Barwell and Oliver Burrows 2011, p. 45)

[17] Thomas I. Palley, “Debt, AD and the Business Cycle: A Model in the Spirit of Kaldor and Minsky,” Journal of Post Keynesian Economics, 1994

[18] Thomas I. Palley, 2009. "The Simple Analytics of Debt-Driven Business Cycles," Working Papers wp200, Political Economy Research Institute, University of Massachusetts at Amherst.

[19] Amit Bhaduri, 2011. "A contribution to the theory of financial fragility and crisis," Cambridge Journal of Economics, Oxford University Press, vol. 35(6), pages 995-1014.

[20] Thomas I. Palley, 2009. "The Simple Analytics of Debt-Driven Business Cycles," Working Papers wp200, Political Economy Research Institute, University of Massachusetts at Amherst.

Stock-Flow consistent modelling starts creating the accounting framework that constitutes the environment in which the economy will perform. In order to create the accounting framework, every transaction must be tracked.

"The main characteristic and advantage of the SFC approach are that it provides a framework for treating the real and the financial sides of the economy in an integrated way. In a modern capitalist economy, the behaviour of the real side of the economy cannot be understood without reference to the financial side (money, debt, and assets markets). Although this is a general statement, it became particularly evident during the recent crisis and the slow recovery that followed (hence, the aforementioned surge in the popularity of SFC models). For that reason, the SFC approach is an essential tool if one wants to examine the political economy of modern capitalism in a rigorous and analytical way." (Zezza, Nikiforos 2017, p. 1-2)

We can summarize the basic principle of stock-flow consistent modelling in four main accounting principle using the definition by Zezza and Nikiforos (2017):

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.

In the next section we will present a simple Stock-Flow Consistent model in order to describe some of the processes that the households' debt can generate.

6. The model

The model described in this section is a standard Stock-Flow consistent model based on the Godley and Lavoie book: "*Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth", and "The Monetary Circuit in the Age of Financialisation: A Stock-Flow Consistent Model with A Twofold Banking Sector"* by Passarella and Sawyer and very similar to the

work of Kapeller Schutz. "Conspicuous consumption, inequality and debt: The nature of consumption-driven profit-led regimes." The model contains also some of the insights presented by Palley in his works on inside debt.

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

The transaction-flow matrix for the economy is described in table below

				Firms			
		Rentiers	**Workers**	Current	Capital	**Banks**	Σ
Consumption		- C_R	- C_w	+ Ct			0
Investment				+ I	- I		0
Wages		+ w_R	+ w_w	- w_t			0
Firms profits		+Πd		-Π	+ Πr		0
Banks profits		+ Πb				- Πb	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 stocks of	Deposits	- ΔD_R	- ΔD_w			+ ΔDt	0
	Loans	+ ΔL_R	+ ΔLw		+ ΔLf	- ΔLt	0
Σ		0	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. Πd is the portion of profits distributed to the Rentiers sector by the firms. Π is the total amount of profits, Πr 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 modeled, but we assume that Rentier 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.

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

$$4)\ w_R > w_w$$

6.1) 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. In a series of working papers, the Bank of England has explained that banks do not act as simple intermediaries between savers and borrowers[21], 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."*

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 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,

[21] Jakab, Zoltan and Kumhof, Michael, Banks are Not Intermediaries of Loanable Funds — Facts, Theory and Evidence (October 26, 2018). Bank of England Working Paper No. 761

able to create deposits ex-nihilo[22]. 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*"(p. 1) when they shock the ability of borrowers to increase their amount of loans that they can receive.

We perform three experiments on the behavior 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 sheet of the households even if they continue to accumulate debt on their balance sheet. 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 behavior of the banking sector are the following.

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

Equation 5 describes the supply of loans by banks, as said above banks accommodate the demand for loans by economic agents expanding their balance sheet. 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 made the assumption that supply of loans to workers is not completely elastic. For workers households, 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 households. In the second and third experiment, ρ is a function of the leverage of the workers households. In the two scenarios, there will be a leverage ceiling to the willingness of both banks and workers supply and demand for loans.

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

Equation 6 describes the evolution of the stock of loans in the balance sheet 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) $D_d = D_w + D_R$

Equation 7 describes the amount of deposit held in the banking sector, which depends on the decisions of lending by the banking sector, as loans create deposits, and by the decisions of the agents to hold deposits.

[22] Jakab, Zoltan and Kumhof, Michael, Banks are Not Intermediaries of Loanable Funds — Facts, Theory and Evidence (October 26, 2018). Bank of England Working Paper No. 761

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 households.

6.2) The firm sector

The firm sector is stylized since our focus is on the behavior 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 investment[23] 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)$K = K_{t-1} + I_{t-1} - \eta * K_{t-1}$

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

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 ($i_L * L_{f(t-1)}$).

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

[23] 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).

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 households 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.

6.3) Rentier Households

Rentier households are composed by Managers, who receive an income from their managerial job in the firm sector, and "standard" Rentier Households, 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) $c_R = \alpha \cdot Y_{R(t-1)}^d + \beta \cdot W_{R(t-1)}$

Rentier consumption is given by a "standard" consumption function used by Godley and Lavoie in their books. 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.

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.

6.4) 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 households. 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.

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

Equation 23 describes the consumption function of workers households. 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 households 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 by workers households. 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 household, savings by workers households translate into demand for deposits.

$$26)\ D_w^d = W_w$$

6.5) Stock-flow consistent 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.

$$27) Ds - L_s = 0$$

6.6) 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 and for the willingness of households to borrow in an environment in which households try to consume looking at what their neighbours are doing. 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.

6.7) Credit Supply shock and steady-state equilibrium

In our model, as described above, workers households 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 the banking sector with an increase in the interest rate that banks charge on loans[24]. 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 particular assets held by the household 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

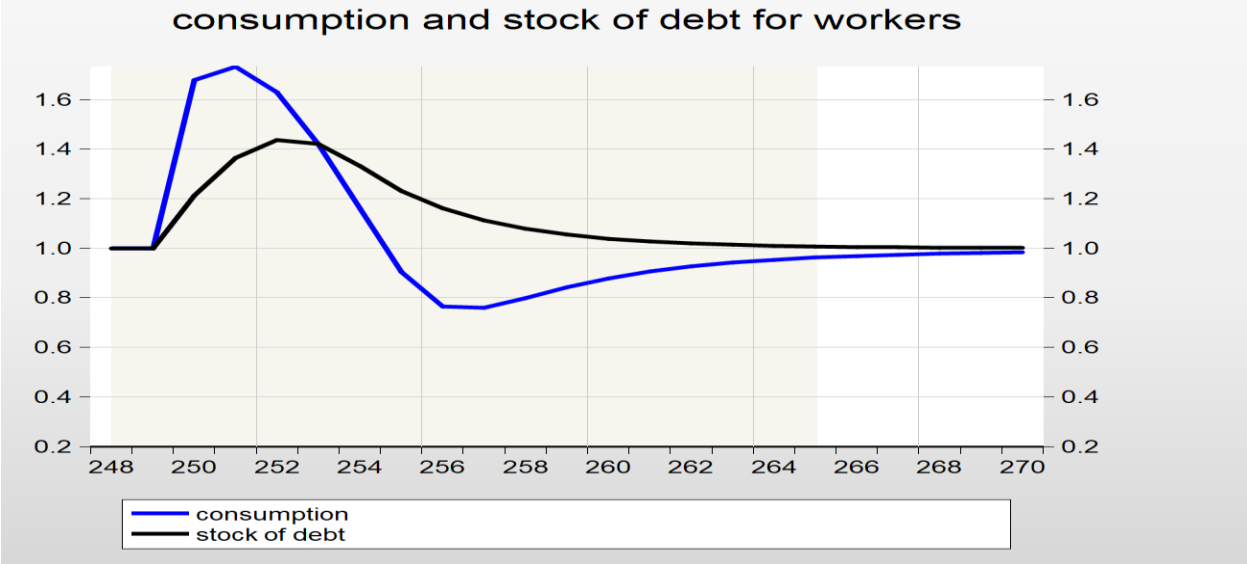
[24] Stiglitz, J.E., and Weiss, A., "Credit Rationing in Markets with Imperfect Information," American Economic Review, 71 (1981), 393 – 410.

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. As Palley[25] pointed out: *"For Minsky the business cycle upswing is characterized as a period of tranquillity during which bankers, industrialists, and households become increasingly more "optimistic". In the real sector, this optimism translates into increased real investment, while in the financial sector it shows up in the form of an increased willingness to borrow, an easing of lending standards, and an increase in the degree of leverage of debtors*." (Palley 1994, p. 371)

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

[25] Palley "Debt, AD and the Business Cycle: A Model in the Spirit of Kaldor and Minsky," Journal of Post Keynesian Economics, 1994

advanced countries before and after the Great Recession.

Fig. 9

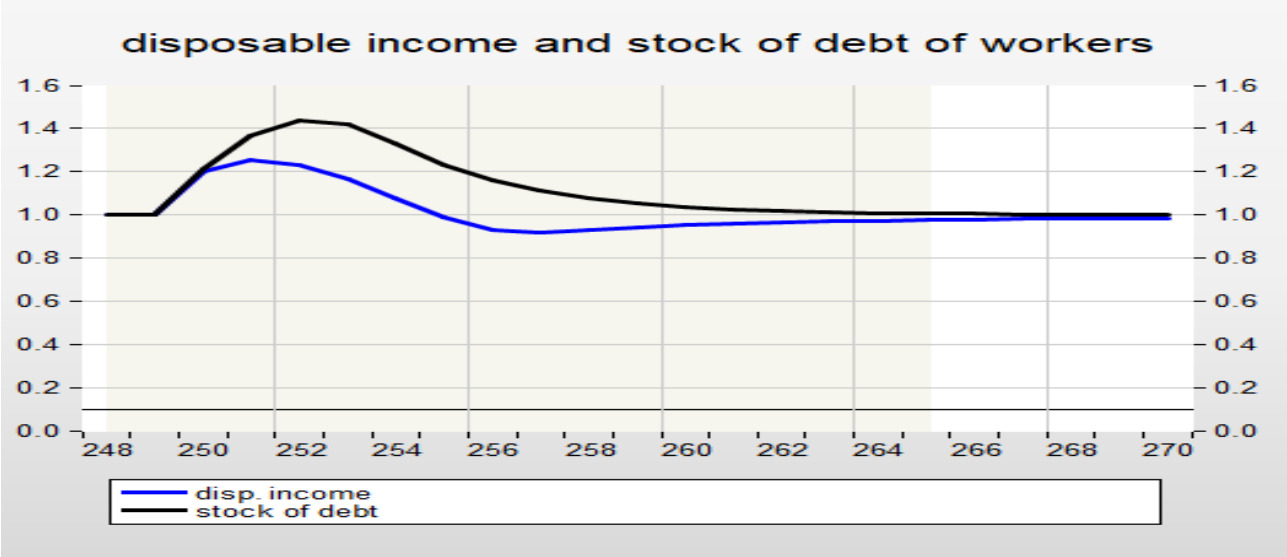


Fig. 9 shows the evolution of the disposable income of workers households with the evolution of the stock of debt. Disposable income starts to grow after the shock as the increase in consumption has an expansionary effect on the economy, increasing the level of income. When consumption starts to decline 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

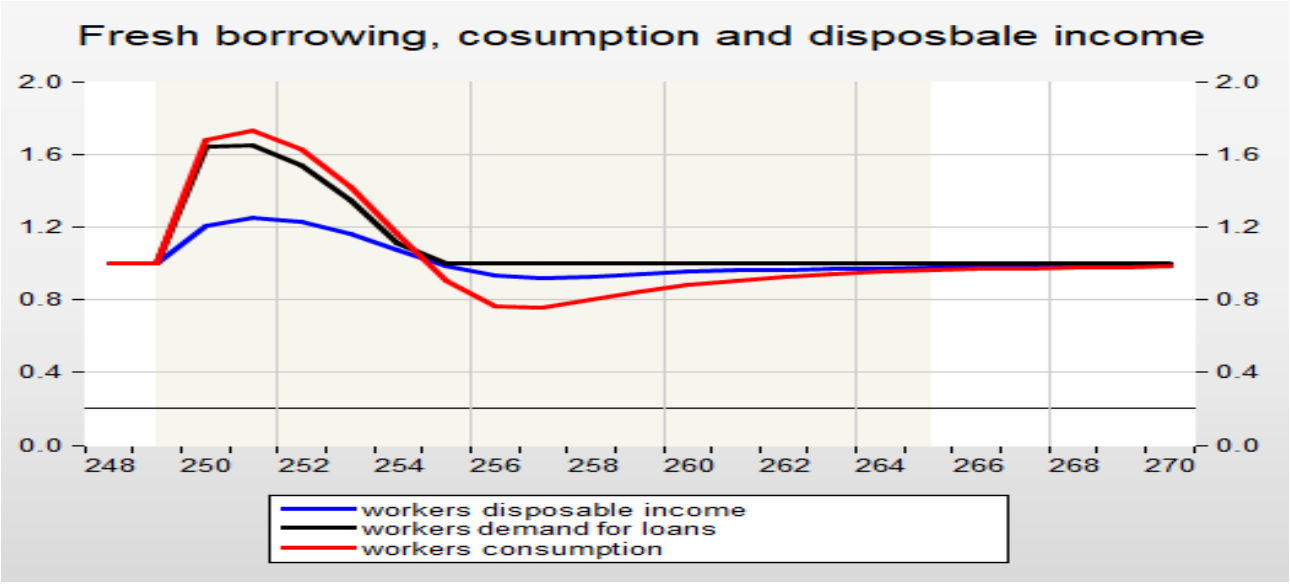


Fig 10 shows the movement of demand for loans by workers with consumption and disposable income. After the shock the demand for loans increases following the increases in consumption, when consumption collapses it decline and returns to its pre-shock level.

Fig. 11

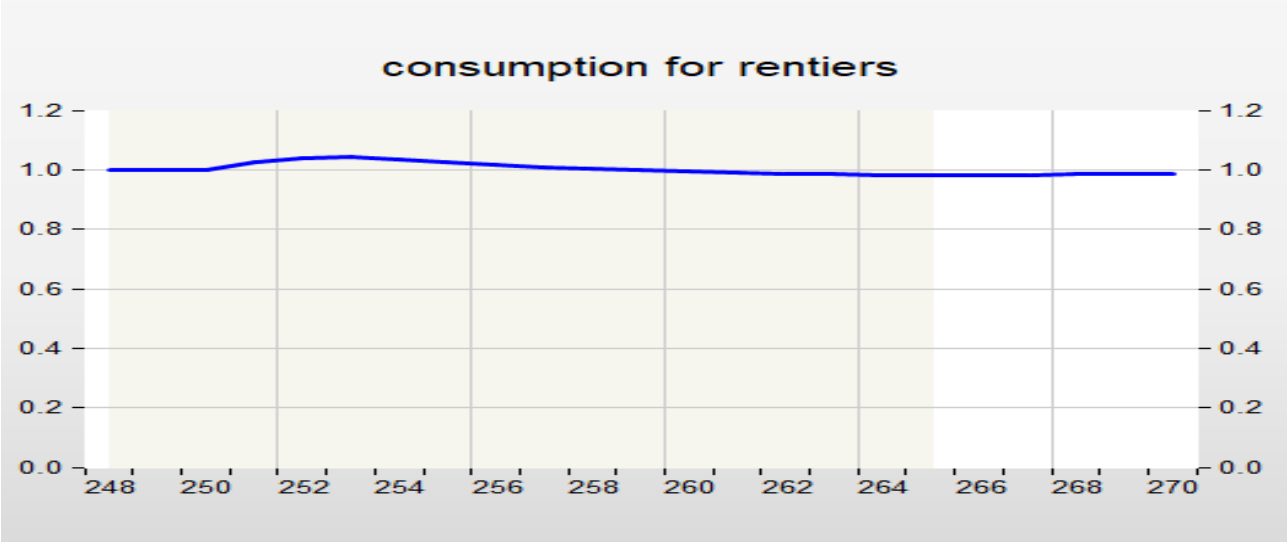


Fig. 11 shows the effect of the shock on Rentiers' consumption. Since Rentiers are "low propensity to consume agents", the expansionary effect of the credit supply shock is small. Figures 9, 10 and 11 illustrate the idea of Kaldor and Palley of the "debt service transfer mechanism". Debt repayment shifts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

Fig. 12

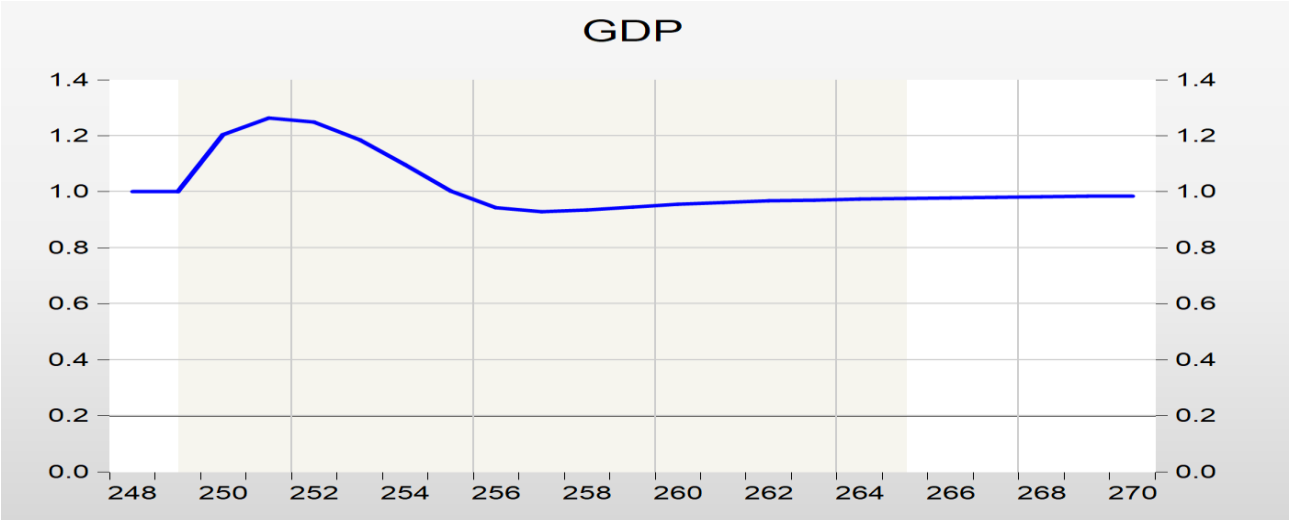


Fig. 12 shows the impact of the shock on GDP. It increases with consumption and declines when workers cut spending. The "stock-flow" dynamic of inside debt generates a business cycle similar to the one described by Palley: an increase in expenditure financed by borrowing has an expansionary impact on 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

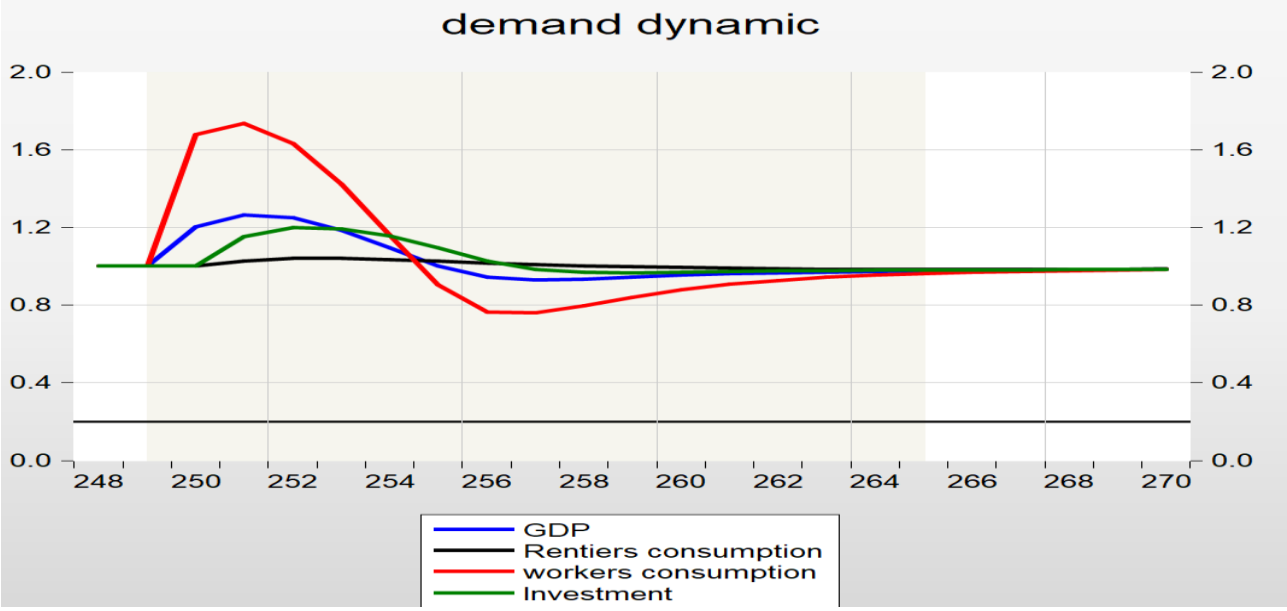


Fig. 13 shows the impact of the shock on all the components of the aggregate demand and on the GDP. Workers' consumption is the variable affected directly by the shock. Its recovery is slow and it does not return to the pre-shock level. Investment responds with a lag to the shock and collapse during 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.

6.8) Minskyan extensions

Now, following Palley (1994, 2009) we introduce some extensions in order to study a complete "predator-prey" model of household 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 and to the willingness of the workers to borrow. We assume that once households reach this ceiling, banks reduce the number of loans and workers reduce their demand for credit. 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).

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

$$\rho = 0.8 \; if \; leverage < \psi$$

$$\rho = 0.25 \; if \; leverage > \psi$$

Where ψ represent the ceiling of the banking sector willingness to lend. From the households side,

the consumption function becomes:

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

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

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

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

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

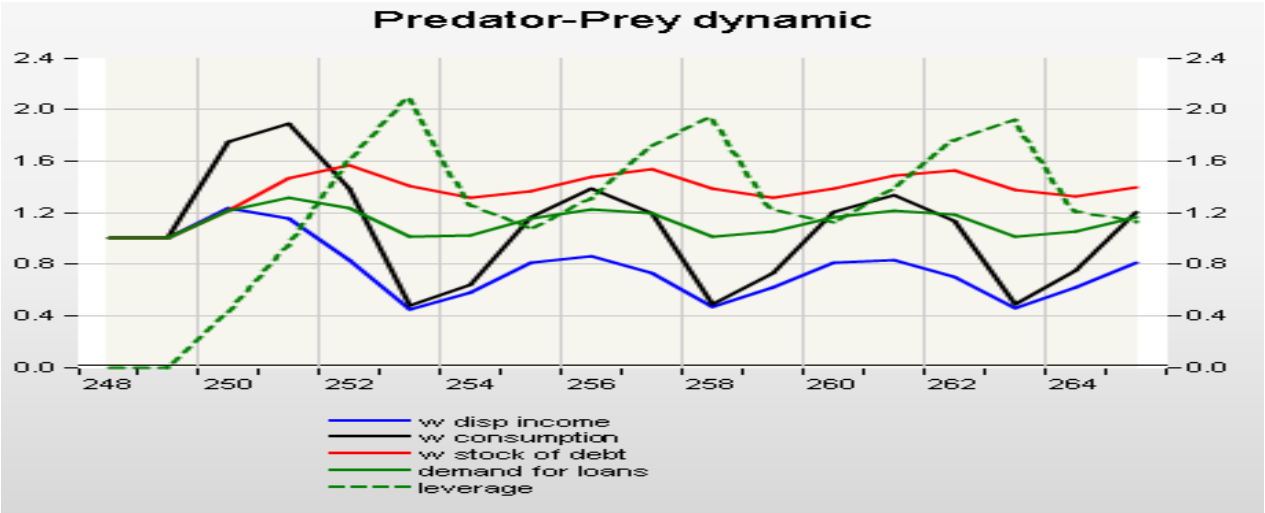


Fig. 15

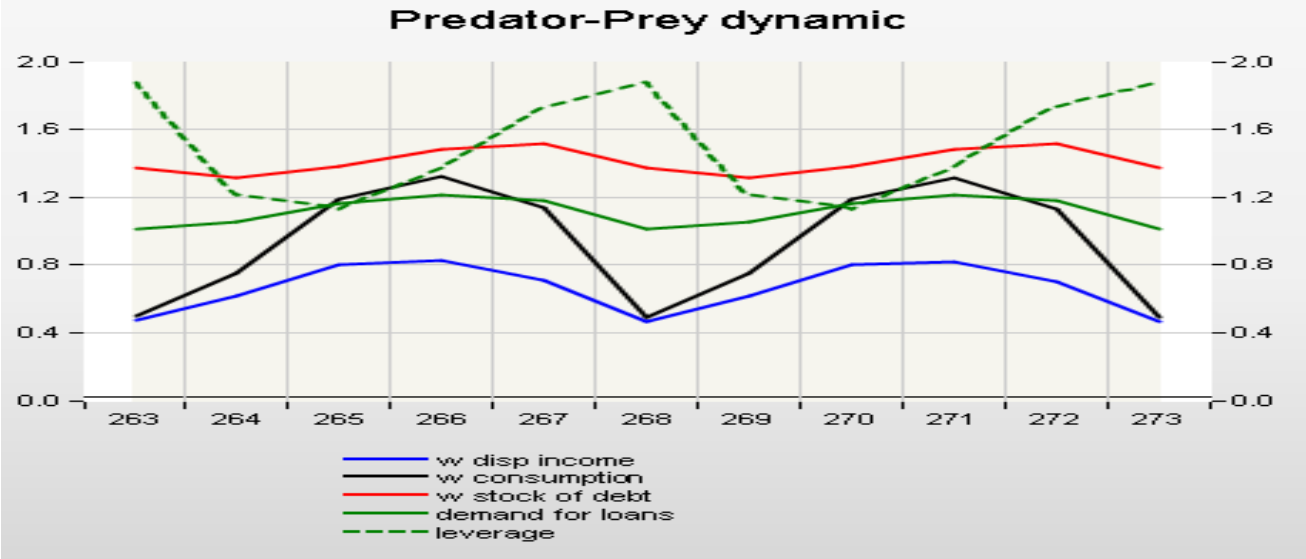


Fig. 14 and 15 show the predator-prey dynamic described above. As we said above, the economy is hit by a credit supply shock: banks decrease their standard of credit. The difference with the previous simulation is that, in this case there is a leverage ceiling imposed on the borrowers, this means that 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 Consolidation	2 Expansion	3 Expansion	4 Compression	5 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 households 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 results 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

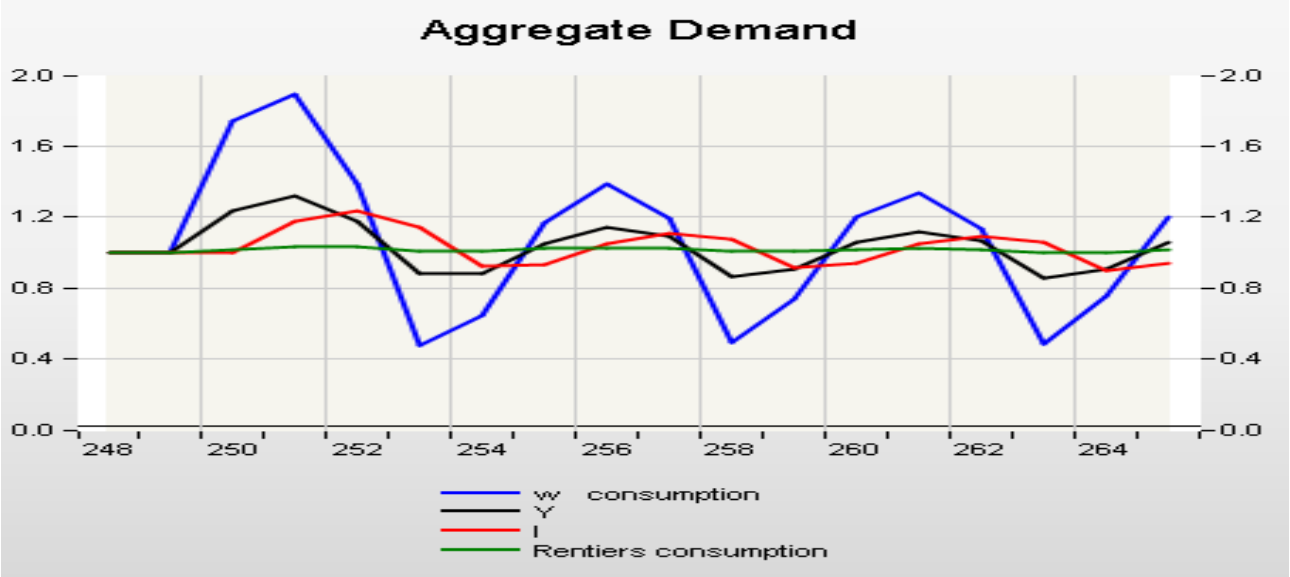


Fig. 16 shows the evolution of all the aggregate demand components and of GDP in this consumption-led dynamic financed by debt. Workers' consumption drives the dynamic, Investments respond with a lag to the movements of GDP. Rentiers' consumption is stable for all the phases of the cycle since Rentiers 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.

6.9) 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' behavior is the same as the Minskyan extension presented above, the banking sector's willingness to lend is tied to the leverage of the household sectors, once households reach this ceiling banks decrease the numbers of loans they extend.

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

$$\rho = 0.8 \; if \; leverage < \psi$$

$$\rho = 0.25 \; if \; leverage > \psi$$

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

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

We also make the assumption that the Managers and Rentiers households demand credit in order to consume following the" Minskyan" demand for credit used in the previous simulation for the workers' households. The consumption function for Rentiers Households become:

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

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

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

With this last simulation, we aim to have a much more detailed description of some stylized facts in place during the "pre-recessions" periods. 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. 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. 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

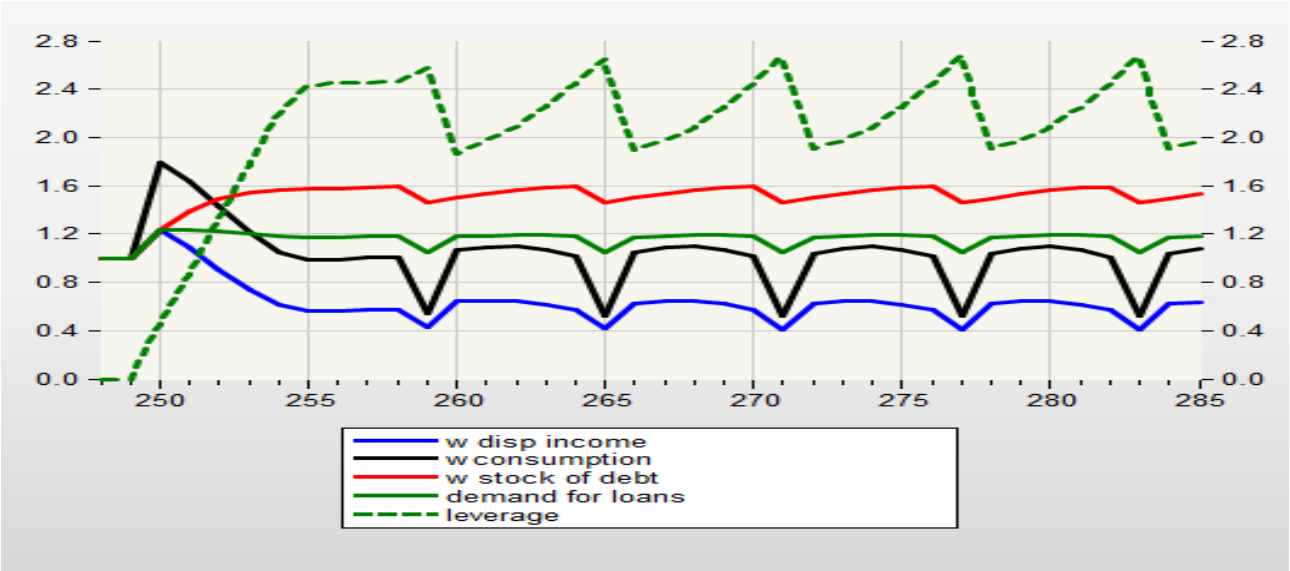
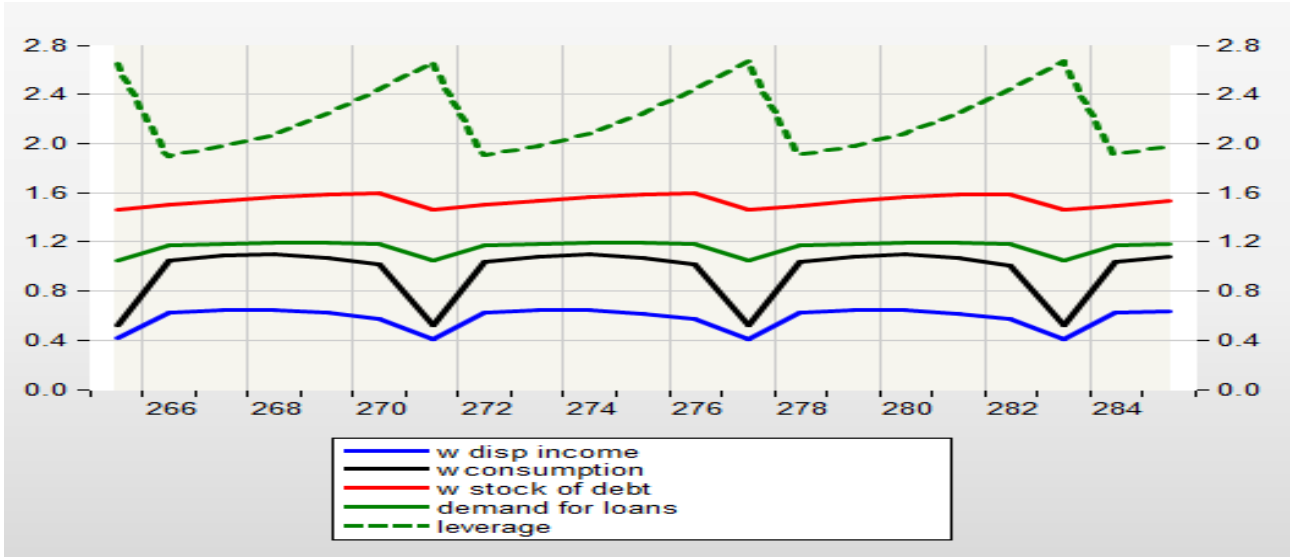


Fig. 18



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, 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' households 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 households 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' households 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 fluctuates around a range of values. The higher level of leverage is due to the ability of workers to borrow more.

Fig. 19

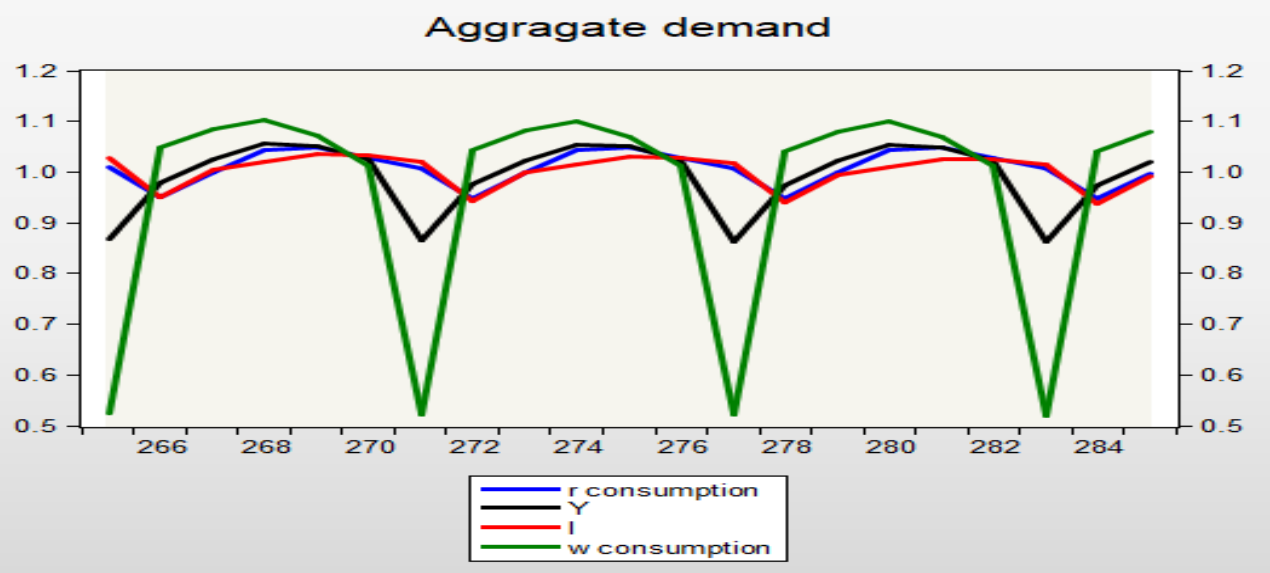
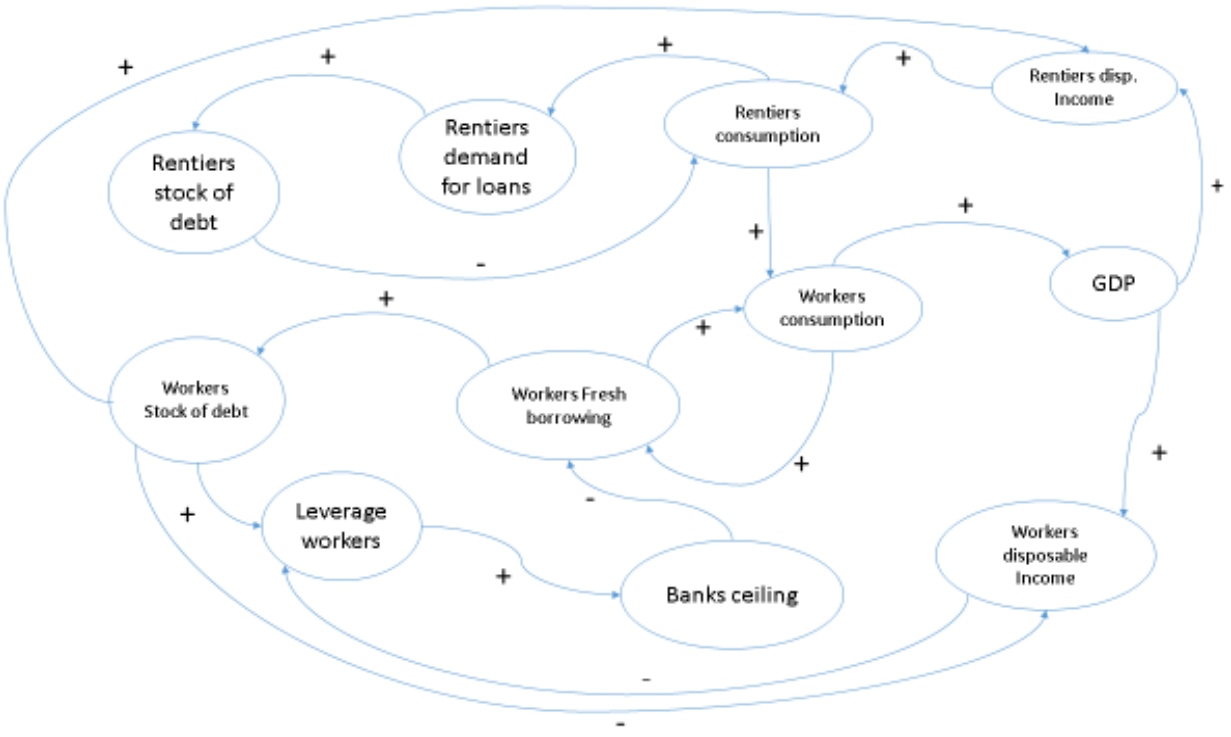


Figure 19 shows the interaction of the aggregate demand components. As in the first and second simulations, aggregate demand is driven mainly by fluctuations in workers' households' consumption.

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, 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 behavior of the model.

The simulation starts with an increase in the ability of workers households 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 households 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.

7) Conclusions

In the paper we analyse how household 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 household 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 lender's behavior 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 consistent model in order to study these dynamics; the results show that an increase in household 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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Parameters of the model

Firms

i_0 =0.1 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.

η= 0.2 depreciation rate of capital.

Φ =0.85 profits retention rate by firms.

Rentiers Households

α =0.4 propensity to consume out of income.

β=0.2 propensity to consume out of wealth.

γ= 0.2 principal repayment portion.

iL=0.02 interest on loans.

σ=0.8 parameter in the “minskyan” extension

τ=0.7 parameter in the “minskyan” extension

Workers households

α=0.7 propensity to consume out of income workers.

β=0.4 propensity to consume out of wealth workers.

γ=0.2 principal repayment portion.

iL=0.02 interest repayment on loans.

ψ= 1.85 leverage ceiling second simulation

ψ= 2.5 leverage ceiling third simulation

ϙ=0.5 emulation parameter first simulation

ϙ= 0.4 emulation parameter third simulation

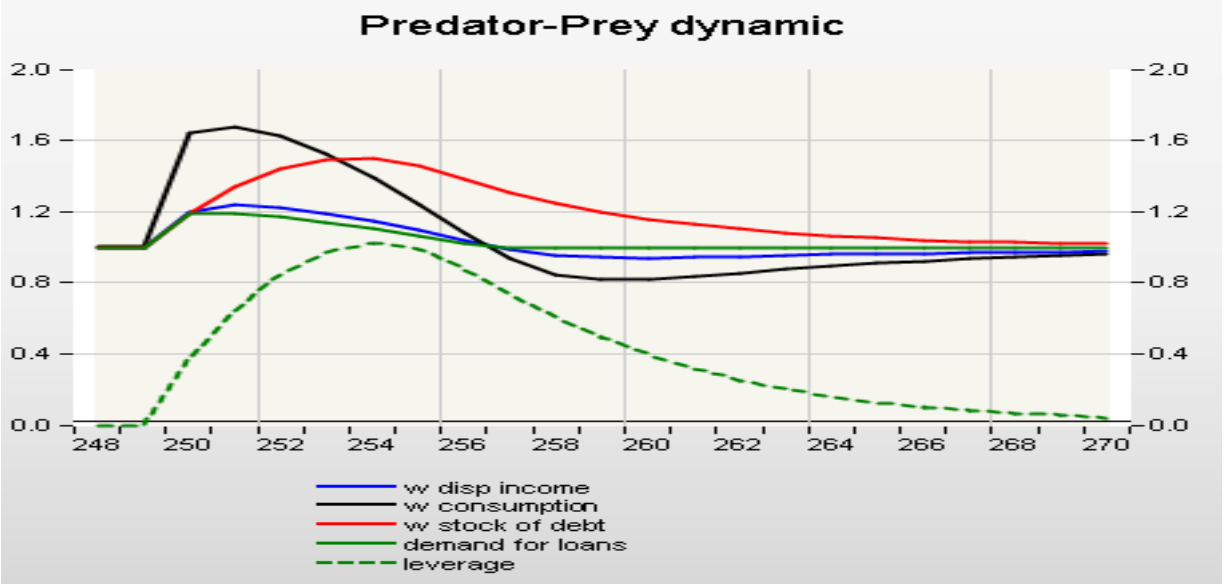
σ=0.8 parameter in the “minskyan” extension

τ=0.7 parameter in the “minskyan” extension

Additional graphs

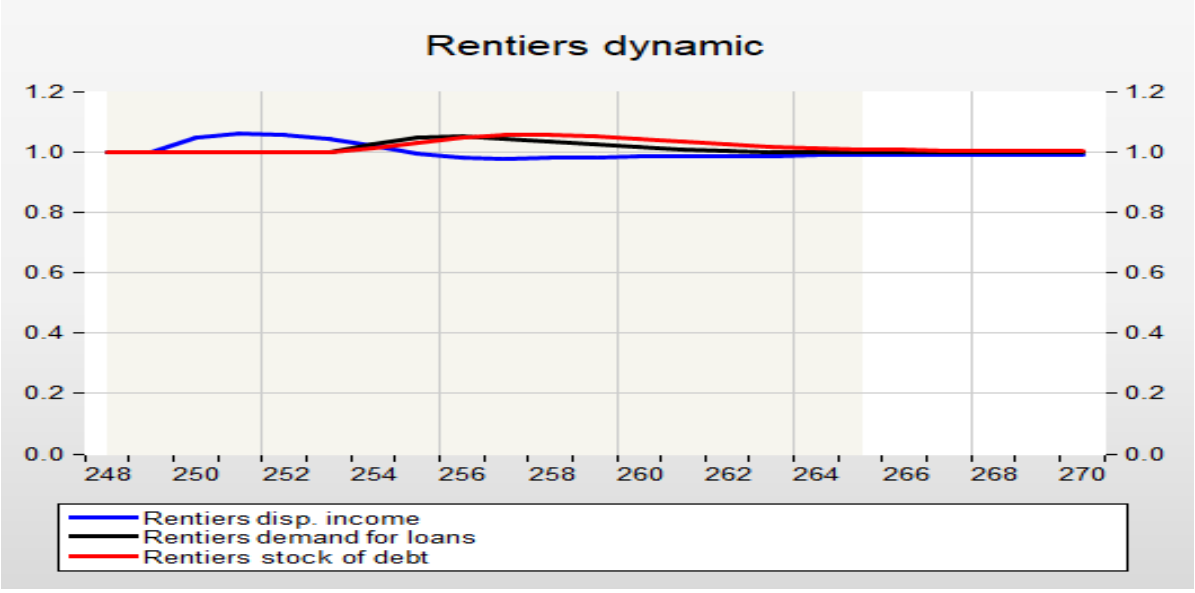
Predator prey or stock-flow dynamic first simulation

fig 21



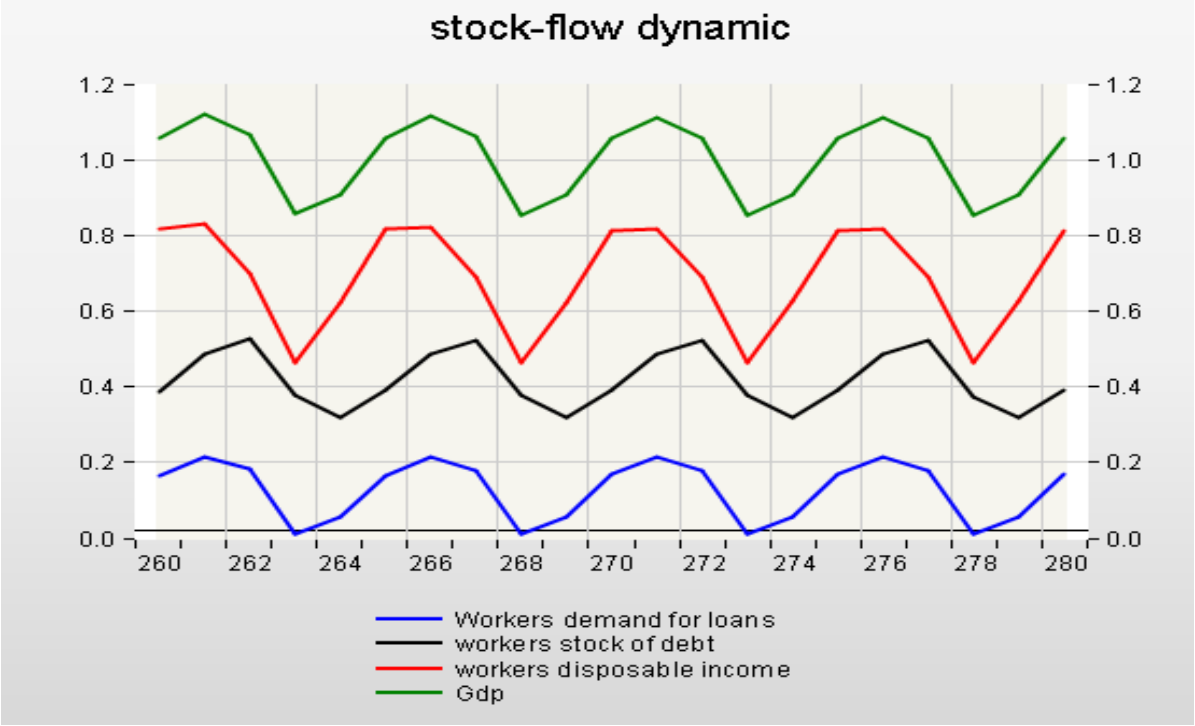
Rentiers disposable income, stock of debt and demand for loans first simulation

fig 22



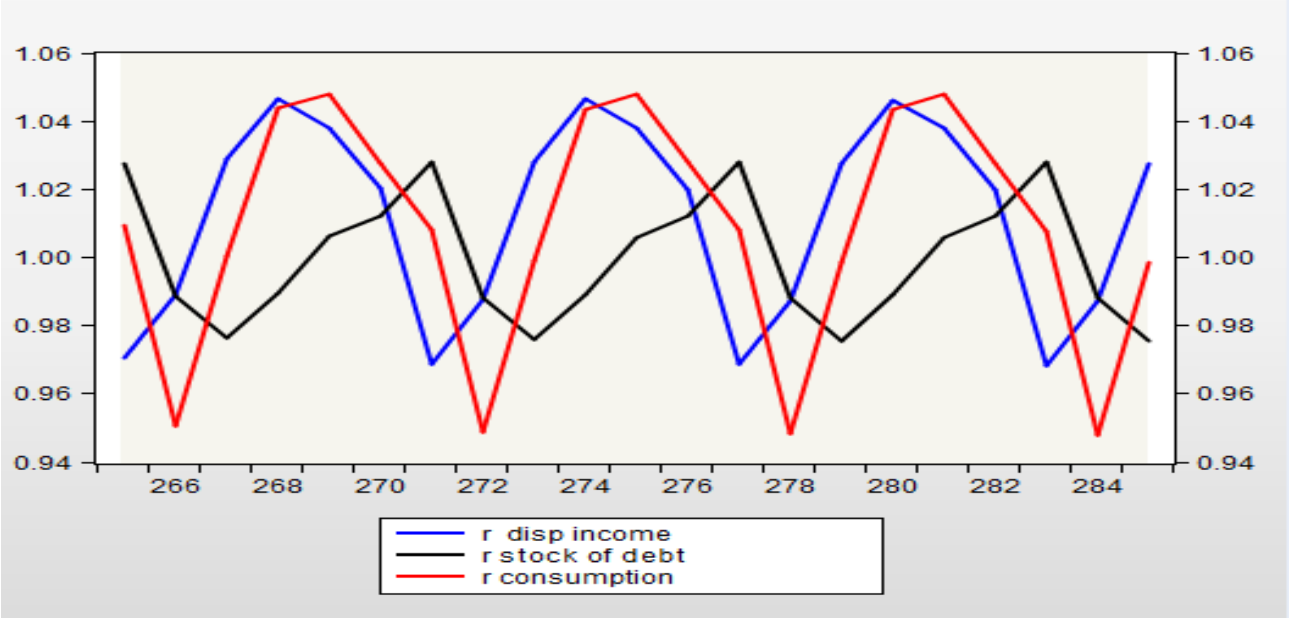
Stock-Flow dynamic second simulation

Fig 23



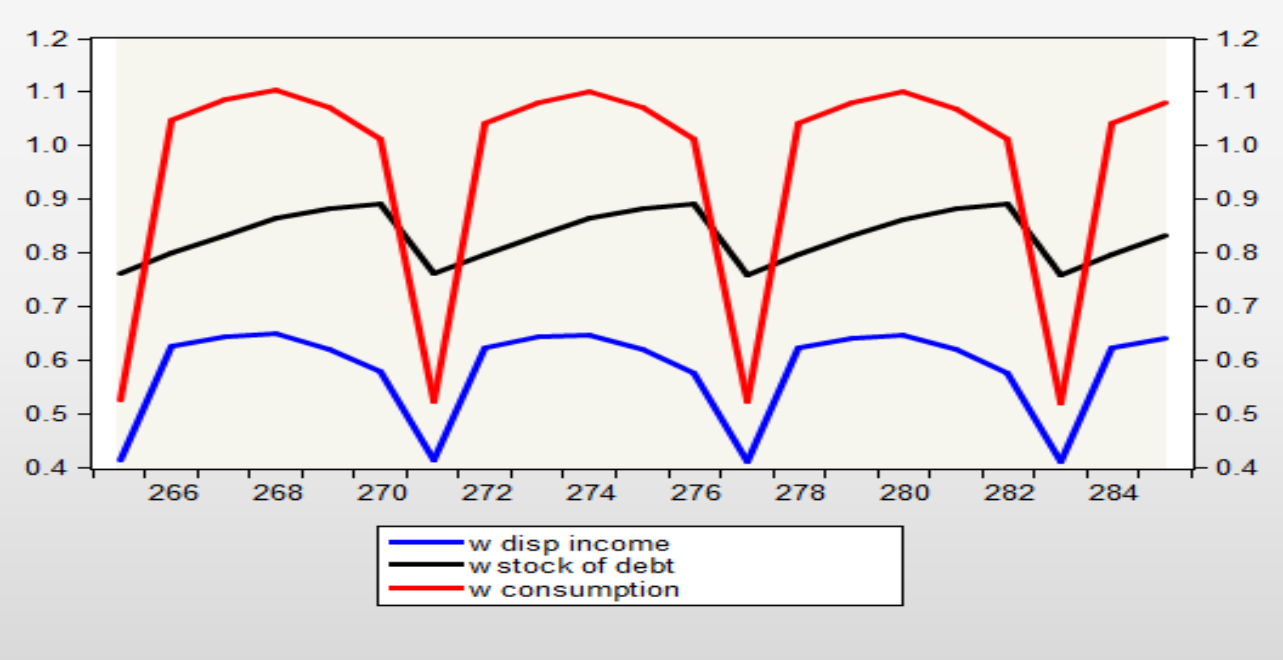
Stock-flow dynamic for rentiers, third simulation

Fig 24



Stock-flow dynamic for workers, third simulation.

Fig 25



Housing market, household debt, and stagnation

Introduction

The purpose of this paper is twofold: in the first place, we want to represent what happened to the U.S. economy during the period of the so-called Great Moderation until the financial crisis of 2007. We describe some of the long trend dynamics that were in place in most of the advanced economies, in particular in the Anglo-Saxon economies, using the US economy as an example. This dynamics is the evolution of the financial sector and the financial practice of the financial operators and their customers; the increasing polarization of the distribution of income in the hands of a smaller part of the population; an evolution of the consumption practice of the population that has created the ability of households' expenditure to become independent from disposable income and more related to access to credit and on the ability to use collateral to borrow.

The interaction of these three processes create a growth model driven mainly by household consumption financed by borrowing and investment in different classes of assets like housing. This debt-led growth model has enabled the U.S. economy to perform reasonably well during the Great Moderation, but it was creating the seeds of its collapse because it relied on an unsustainable accumulation of the stock of debt on the balance sheets of the households sector. When the housing market bursted and the U.S. economy entered a recession the fragility of this growth model has emerged.

After the description of these stylized facts, we present a macroeconomic model that tries to replicate the boom-bust dynamic generated by the debt-led growth model and try to describe a financial accelerator mechanism in which the credit access is tied to the price level of the housing market.
The model has four sectors: a household sector, goods market firms, a housing market, and a banking sector.

The focus is on the interaction among the household sector, the housing market, and the banking sector. Households are split into two sub-sectors to described differences in income and wealth. We introduce an emulative consumption function and demand for houses in order to detect the impact of income inequality on spending and demand for loans.

Demand for consumption goods and houses by low-income households is contingent on credit access granted by the banking sector that is tied to the value of homes that are accepted as collateral. Money is endogenous as banks expand credit on demand to borrowers.

Using different kinds of shocks on credit access, we are able to replicate the boom and bust dynamics of debt led expansions and the following stagnation period. The main result is that debt-led consumption expansions tend to lower the steady-state of the economy because of the impact on the disposable income and wealth of debtors. In a second experiment, we are able to replicate a financial accelerator dynamic where the interaction between the housing market, the banking sector, and the household sector generate a feedback loop that creates a cycle.

1 Evolution of the financial sector

During the last 30 years, the financial sector has evolved in different ways, the weight of the financial sector on the economy has boomed, from being twice the GDP in 1975 to five times larger in 2013[26]. At the same time, *"the size of the private depository institutions" (which can be considered a proxy for commercial banks) decreased from above 40 percent to around 20 percent"*; this evolution was due to the huge expansions of new financial institutions and of operators that were previously operating at the margin of the financial market[27]. Some of these new financial institutions are the Captive Finance Company, Money Market Mutual Funds (MMMFs), Special Purpose Vehicle (SPV). Furthermore, there was a development of new financial practices like securitization, credit card loans, REPO loans, subprime lending and lengthening of loan maturities. These new financial practices started to be used more frequently by most of the financial operators in the economy since the early '80s.

Even the flow of credit from the financial sector to the nonfinancial sectors rose strongly during this period. The difference between the pre-Great Moderation period and during the Great Moderation is quite clear if we look at the stock of debt; it rose from 87% of the GDP in 1952 to 99% in 1984 and to 143% of GDP in 2008 for the U.S. economy. This is was a more than threefold rise in the annual growth rate of the credit to GDP ratio that shifted from 0.4% between 1952 and 1983 to 1.4% over the 1984-2008 period[28]. During the period of the Great Moderation, the growth of the stock of credit to the nonfinancial sectors exceeds the growth in nominal GDP.

1.1 Securitization

Among all the new financial practices, the one that needs more attention in this context is the securitization process. Some authors had argued that the securitization process was a response of the banking sector to the Volcker's monetary policy initiated in 1979 (Minsky (1987), Kuttner (2007), and Wray (2009)). Volcker targeted directly the "money supply" in order to fight inflation. That policy led the fed funds rate above 20%, with this level of short-term interest "*no financial institution could afford to be stuck with long-term fixed-rate mortgages*"[29]; this was due to a "*competitive disadvantage in terms of the short-term growth of their ability to fund assets*"[30]. To avoid these problems the banking sector started to shift from the "*originate and hold*" model to the "*originate and distribute*" model of managing the loans.

Being more specific, the securitization is a process in which an "illiquid non-marketable" asset, a loan or a mortgage in most of the cases, is restructured in a liquid marketable asset. Mortgage-backed securities (MBS) or Asset-Backed security (ABS) are securities collateralized or backed by an asset, in the case of the MBS by a mortgage for the ABS by credit card loans, installment loans or student loans, or by a pool of mortgages or assets[31].

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[26] Alberto Botta, Eugenio Caverzasi & Daniele Tori: "Financial–Real-Side Interactions in an Extended Monetary Circuit with Shadow Banking: Loving or Dangerous Hugs?" 2015 International Journal of Political Economy

[27] Ibid.

[28] Maria Grydaki, Dirk Bezemer: "The role of credit in the Great Moderation: A multivariate GARCH approach" Journal of Banking & Finance, 2013, vol. 37, issue 11, 4615-4626

[29] L. Wray, 2011. "Minsky's Money Manager Capitalism and the Global Financial Crisis," International Journal of Political Economy, Taylor & Francis Journals, vol. 40(2), pages 5-20.

[30] Minsky, Hyman P. Ph.D., "Securitization" (1987). Hyman P. Minsky Archive. 15. https://digitalcommons.bard.edu/hm_archive/15

[31] Christopher Brown Inequality, Consumer Credit And The Saving Puzzle 2008

In the securitization process, a financial company "originates" a loan when a borrower demands it; the financial company can be a bank but also another financial institution that has the right to create loans. After the loan is originated the financial companies sell it to a "Special Purpose Vehicle" (SPV), the SPV are companies, often created by bigger financial companies, with the purpose of pooling the loans into homogeneous assets that can be sold to pension funds, insurance companies, and any other institutional investors[32].

Therefore, the role of the banks started to shift from "simple" lenders to "loans originators". The new assets that come from the securitization process carry an investment-grade like a Treasury bill or other safe assets because of the way in which the pool of mortgages or loans is composed. Furthermore, these assets attract the attention of most of the institutional investors because of the possibility of hedge the risk attached to them with other financial products, the so-called derivatives like the credit default swap or the interest rate swap. As Brown explains:

"[t]he asset securitization process, while complex, has won a secure place in corporate financing and investment portfolios because it can, paradoxically, offer originators a cheaper source of financing and investors a superior return. Not only does securitization transform illiquid assets into tradable securities, but it also manages to transform risk by means of the separation of sound financial instruments from a company with little or no loss." (Brown 2008, 71)

This process creates "financial papers" very suitable for a globalized financial structure where international investors were continuously looking for high yield financial products with relatively low risk[33].

During the Great Moderation, the "originate and distribute" model of banking by securitization explodes. Only in the US. the growth of securities outstanding, securitized by credit card and consumer installment receivables, has increased more than twenty-fold since the late '80s. More than forty percent of the outstanding consumer credit between the late '80s and 2005 can be associated with the rise of asset-backed securities. More than sixty percent of the growth of revolving credit in these periods was "accounted by the issue of securities backed by non-revolving receivables"[34].

2. Income distribution

Changes in income and wealth distribution are some of the most important trends that most of the advanced economies have experienced since the late '70.

Both Functional and personal distribution sees a polarization in favor of a part of the population in all the OECD countries.

Functional distribution during the period of the "Great Moderation" saw a shift in favor of capital at the expense of labor. In this period most of the economies have seen a rebounded of profits, a surge of the financial rents and of the share of income that goes to self-employed[35]. As Eckhard Hein has shown, the fall of the labor share of distribution has been much accentuated in countries

[32] Ibid.
[33] L. Wray, 2011. "Minsky's Money Manager Capitalism and the Global Financial Crisis," International Journal of Political Economy, Taylor & Francis Journals, vol. 40(2), pages 5-20
[34] L. Wray, 2011. "Minsky's Money Manager Capitalism and the Global Financial Crisis," International Journal of Political Economy, Taylor & Francis Journals, vol. 40(2), pages 5-20
[35] Eckhard Hein, 2015. "Finance-dominated capitalism and re-distribution of income: a Kaleckian perspective," Cambridge Journal of Economics, Oxford University Press, vol. 39(3), pages 907-934.

like Austria and Ireland, followed by Greece, France, Italy, and Spain. However, countries like the USA, UK, and Germany have seen a less decrease in the labor share of income.

Data from UK and US show a substantial difference if we subtract the income of the top 1% wage earners from the labor share, the reason for this difference is that this part of the labor share mostly includes managers who in most of the case receives a combination of capital and labor income[36].

Some reports from the ILO show that the increase in the capital share of income is due to an increase in profits within the industries, especially in the financial industries.[37] Personal income distribution has seen a shift in favor of a specific part of the population.

In most cases, this process meant stagnation of incomes for the bottom and middle part of the population and by increasing average incomes at the top of the population[38]. In some countries, the explosion of the average top percentile income was more pronounced than in others; in the Anglo-Saxon countries, especially the USA and UK, the income at the top and the accumulation of wealth in the hands of few people have grown more. If we consider the top ten percentile of the income distribution, within this group the increase in the share was driven mainly by the top 1 percent. As Piketty and Saez (2006) noted: "*top executives (the "working rich") replaced top capital owners (the "rentiers") at the top of the income hierarchy during the twentieth century*." (p. 204)

For continental Europe, the explosion of the top percentile income was not so pronounced, but the stagnation of the bottom and middle income was worst for countries like Germany.[39]

As Atkinson, Piketty, and Saez have shown in the U.S. most of the change in the top decile was due to a dramatic change of the top percentile that rose from 8.9% in the late '70s to almost 23.5% in 2007. Atkinson et al. show how the income of a tiny part of the population, the top 0.1%, has more than quadrupled, from 2.6 to 12.3 during this period.

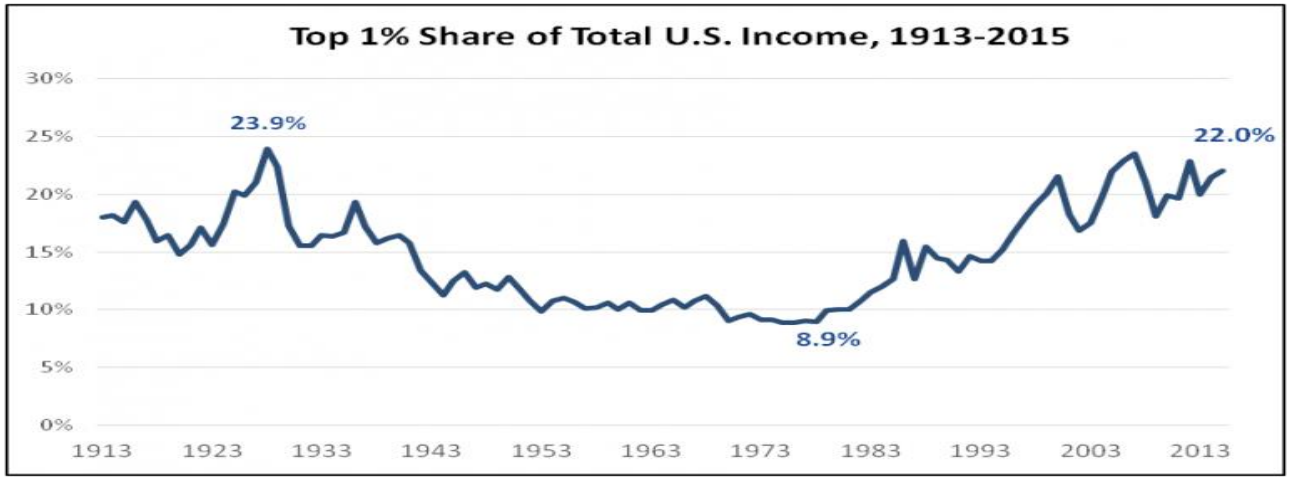
Income has grown for the population in the US. at a 1.2 percent annual rate during this period, but when the top 1 percent has excluded the rate of growth for the 99 percent becomes 0.6, so the top 1% of the population took almost 50% of the real economic growth. (Atkinson Piketty and Saez).

The share of 0.1 % has remained constant for other countries like France, Italy, and Spain In the US. the explosion of the top income share was mainly driven by an increase in business income, an increase in top salaries like wages, bonuses and stock options.
In some cases, the increase of top salaries has decreased the fall of the general level of the salaries, so excluding from the calculation of the wage share the top salaries would show an even more pronounced polarization of the functional distribution.
Atkinson, Piketty, and Saez show how the growth of the income of the 1% was fast and strong. If we look at two periods of expansions, 1993-2000 and 2002-2007, the real income of the 1% grow

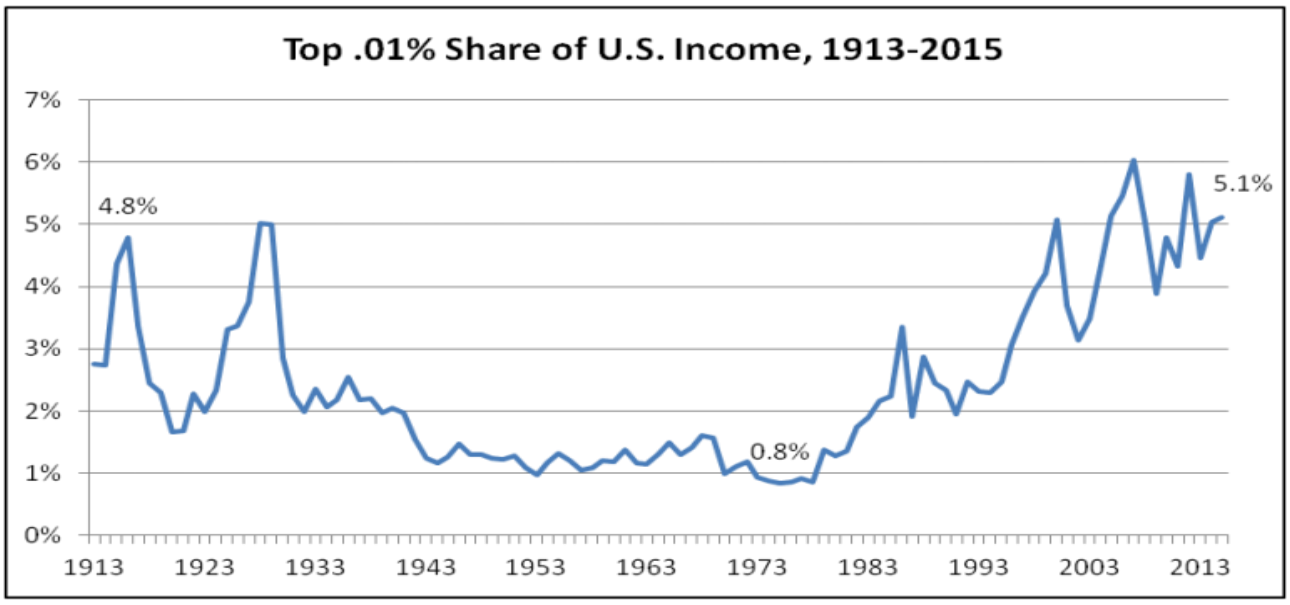
[36] Maurizio Franzini and Mario Pianta: The making of inequality. Capital, labour and the distribution of income Working Papers 1507, University of Urbino Carlo Bo, Department of Economics, Society & Politics - Scientific Committee - L. Stefanini & G. Travaglini, revised 2015
[37] Ibid.
[38] Salvatore Morelli & Anthony Atkinson, 2015. "Inequality and crises revisited," Economia Politica: Journal of Analytical and Institutional Economics, Springer;Fondazione Edison, vol. 32(1), pages 31-51, April.
[39] Thomas Piketty & Emmanuel Saez, 2006. "The Evolution of Top Incomes: A Historical and International Perspective," American Economic Review, American Economic Association, vol. 96(2), pages 200-205, May.

by an annual rate of 10.1 and 10.3 while the growth of the 99% was of 2.7 and 1.3.[40] The growth of income was not concentrated only in the top one percent, the income share of the top five percent of the income distribution starts to rise significantly since 1980, starting from a value around 22-24% in the early '80 and reaching a value of 36% in the immediate aftermath of the Great Recession[41].

DeBacker et al. (2012) find that the increasing inequality in the US economy during this period is before and after taxes, so they conclude that this redistribution of income was permanent and not just transitory[42].



Source: Emmanuel Saez: world inequality database



Source: Emmanuel Saez: world inequality database

The two graphs above describe the evolution of the distribution of income in the US economy.

[40] Facundo Alvaredo, Anthony B. Atkinson, Thomas Piketty, and Emmanuel Saez "*The Top 1 Percent in International and Historical Perspective*" Journal of Economic Perspectives—Volume 27, Number 3—Summer 2013—Pages 3–20

[41] Barry Z. Cynamon and Steven M. Fazzari: "Rising Inequality and Stagnation in the US Economy" European Journal of Economics and Economic Policy, volume 12, number 3

[42] Jason DeBacker & Bradley Heim & Vasia Panousi & Shanthi Ramnath & Ivan Vidangos, 2013. "Rising Inequality: Transitory or Persistent? New Evidence from a Panel of U.S. Tax Returns," Brookings Papers on Economic Activity, Economic Studies Program, The Brookings Institution, vol. 44(1 (Spring), pages 67-142.

2.1 Aggregate demand generation process

Since economics was born the main question that most of the economist try to answer is how an economy grow, more specifically, what are the dynamics that allow the economies to grow. Following a macroeconomic perspective, growth requires two different features that to some extent evolve separately. The first feature is the "supply-side" of an economy; the second one is the aggregate demand[43].

The supply side includes the resources, capital and labor, and the technology that create the potential output of an economy that is the output that can be produced if all the resources are used. An ever-increasing supply is necessary for growth but it is not enough. The ability of a firm to sell the output that comes from the supply process is not automatic; it depends on something that is not under the control of the firm[44].

The demand generation process is the second feature that an economy needs in order to grow. Following the "Keynesian" view of how monetary economies work, we believe that the demand generation process plays a very important role in the determination of output and employment and that the process that generates the demand for the goods is to some extent independent from the "supply" process.

"There are undoubtedly many ways in which the dynamics of the supply side and demand side are linked. For example, a strong demand-side leads to higher capacity utilization that stimulates capital formation and R&D, which both affect the supply side. Alternatively, technological innovation of a desirable consumer product could stimulate demand growth. Our main point here is that demand generation is independent of the supply side to a large enough extent that demand can constrain output and employment growth below a supply-determined growth path, which should not be interpreted as denying important linkages between supply and demand." (Fazzari and Cynamon, 2015 p. 171)

So for our point of view, the demand generation process can affect the growth of an economy with upward or downward pressure beyond the "short-run" and nominal adjustments, like price adjustment, are not always able to restore the growth on a stable path[45]. Fazzari (1998) and Palley (2008) have shown how deflation and disinflation can destabilize even more an economy because of the impact that they have on the ability to pay back debts by borrowers. In our view price movements in an economy in which nominal debt contracts are used are source of instability instead of stability.

2.2 Distribution of income and consumption

In economic theory, the effect of income distribution on the demand side of the economy, in particular the consumption, is not clear. For Keynes, a policy that would redistribute the income in an equal way would increase the aggregate demand by the impact of the propensity to consume that is greater for the low-income part of the population (Keynes, 1936, p. 95). By contrast, no

[43] Cynamon, Barry Z. and Steven M. Fazzari "*Rising inequality and stagnation in the US economy*" European Journal of Economics and Economic Policies: Intervention, Vol. 12 No. 2, 2015, pp. 170–182
[44] Ibid.
[45] Ibid.

attention is given by Milton Friedman and Modigliani in their theory of consumption to the effects of income distribution[46].

In the post-Keynesian tradition, more attention is given to how income distribution can affect the demand side and the growth of an economy. The distinction between wage-led and profit-led countries describe how changes in income distribution can have a different impact on the demand generation process.

We can identify a profit-led regime as one in which a fall in the wages and a corresponding rise in the profit share leads to an increase in investment or an increase of the export that compensates the decrease in consumption demand (Bhaduri and Marglin, 1990). If the investment and export channel are not strong enough to compensate for the decrease in consumption, we can consider the economy a wage-led one[47].
Therefore, the impact of income distribution on growth depends on its ability to stimulate investment, in the case of an increase of the profit share, or to stimulate export, in case of a reduction of the wage share, and on the negative impact on consumption demand, in the case of a reduction of the wage share[48].

The negative impact of a shift of income distribution in favor of profit at the expense of wage on consumption is based on the idea that the ability of spending, in particular of consumption spending, is always constrained by income.

Saying that the consumption function is dependent on income we imply that consumption spending is "passive" and it depends on the level of income and how is distributed.

The evidence from the last 30 years casts doubt on this idea. As we have already shown income inequality is a worldwide phenomenon, but some countries did not see an increase in investment after the increase of the profit share; instead, they saw an increase in the consumption expenditure even in presence of falling wage share[49].

Several works analyse how demand for consumption can be to a certain extent "independent" from income and how it can play an important role both in the short and in the long run.

The concept of "passive consumption function" makes sense when households face a "hard budget constraint"[50], a situation in which households could rely just on their income and on their past savings in order to make expenditures. However, if the households have the option to borrow in order to finance their outlays the situation is radically different. If we consider the possibility to borrow in order to finance consumption then the consumption function becomes to a certain extent independent of income and can be influenced by other variables like the willingness to

[46] CHRISTOPHER BROWN: "Does Income Distribution Matter for Effective Demand? Evidence from the United States" Review of Political Economy, Volume 16, Number 3, 291–307, July 2004
[47] Jakob Kapeller & Bernhard Schütz "*Conspicuous Consumption, Inequality and Debt: The Nature of Consumption-driven Profit-led Regimes*" Metreconomica Volume66, Issue1 February 2015 Pages 51-70
[48] Ibid.
[49] Robert H. Frank, Adam Seth Levine and Oege Dijk (2014), "Expenditure Cascades", Review of Behavioral Economics: Vol. 1: No. 1–2, pp 55-73
[50] CHRISTOPHER BROWN: "Does Income Distribution Matter for Effective Demand? Evidence from the United States"

borrow of the household, the willingness to lend by the financial sector, household wealth and "peer effect".

Our idea is that the evolution of the financial sector, particularly the development of the securitization process and the consequent increasing willingness of the financial sector to lend has decreased the impact of the shift in the distribution of income.

One of the most important effect of the securitization process was to boost the borrowing power of a wide band of the household sector[51].

"*Financial engineering boosts aggregate demand because it effectively raises the maximum amount that could be borrowed by households at virtually every tier of the creditworthiness hierarchy*" (Brown 2007, p. 441)

The reason why the securitization process increases the willingness of the financial sector to lend relies on the "granularity" of the ABS. Granularity comes from the fact that an ABS is made by thousands of loans, so there is no exposure just to a single borrower. So the risk associated to an ABS is perceived to be less by the institutional investors, this creates a large demand for this kind of securities and an incentive for the banking sector to continue to lend and then sell the assets that come from the lending process[52].

So financial engineering creates the possibility of an alternative growth model in which income inequality and increasing level of consumption coexist. Some economists call this growth model debt-led consumption growth model or consumption-driven profit-led regime.

Our view is that since the start of the Great Moderation, thank to these two long-term dynamics (income inequality, the evolution of the financial system) a large part of the developed countries started to rely on this kind of aggregate demand generation process.

2.3 Expenditure cascades and trickle-down consumption

The expansion of the demand for credit was not only due to financial engineering and to an increase in the willingness to lend by the financial sector. Another important feature was the increasing willingness of the household sector to borrow and to consume an ever-increasing part of their income.

The Permanent Income Hypothesis by Milton Friedman and the Life-Cycle Hypothesis provide the foundations for the modern macroeconomic analysis of household spending and saving[53].

These two theories assume that every household in order to maximize their intertemporal utility choose a path of consumption and saving based on the intertemporal income and wealth that they will have during all their life. So if future income/wealth is supposed to be higher than actual one households would choose to borrow now in order to consume more and they will be able to repay the debt in the future without decrease the level of consumption.

[51]Christopher Brown 2007 *"Financial Engineering, Consumer Credit, and the Stability of Effective Demand"* Journal of Post Keynesian Economics, Vol. 29, No. 3 (Spring), pp. 427-453
[52] Christopher Brown Inequality, Consumer Credit And The Saving Puzzle (2008)
[53] Robert H. Frank, Adam Seth Levine and Oege Dijk (2014), "Expenditure Cascades", Review of Behavioral Economics: Vol. 1: No. 1–2, pp 55-73

In this approach, the level of consumption is independent of the actual level of income and should remain quite stable over time. Indebtedness of the household sector so comes from the choice to smooth consumption over the life cycle and to compensate for temporary income decline.

Our explanation of the path of consumption, saving and borrowing of the household sector in the U.S. and other advanced economies is based on an alternative view of how economic agents make decisions.

As Duesenberry explains, the decisions about how much consume, depend also on the decisions of consumption of "the others":

"The strength of any individual's desire to increase his consumption expenditure is a function of the ratio of his expenditure to some weighted average of the expenditures of others with whom he comes into contact" (Duesenberry, 1949, chapter 2)

Following the works of Frank, Levine and Dijk (2010), Bertrand and Morse (2016), Christen and Morgan (2005) we argue that there is a correlation between "bad income distribution" and the willingness of the lower part of the income distribution to consume more and to use debt in order to finance additional spending.

Frank, Levine, and Dijk (2014) use the term: "*expenditure cascades*" to describe the behavior of agents that responds to change in consumption patterns of those above them 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 all. (2014, p. 57)

Their interpretation is that the shift in income distribution occurred since the '80s, particularly the explosion of top income salaries, which has led to an increase in consumption, a decline in the savings rate and an increase in borrowing by the household sector[54].

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. With this situation, low-income households have been "*increasingly exposed to increasingly rich co-resident*". For the authors, this 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. This explanation is quite robust if we look at the data, a ten percent increase in the 80th percentile of the income distribution leads to an increase of consumption of the household below this percentile about 3%[55].

Bertrand and Morse test their hypothesis for possible explanations, like the permanent income hypothesis, wealth effect, local price pressures, and social comparisons. The results of the test find

[54] Robert H. Frank, Adam Seth Levine and Oege Dijk (2014), "Expenditure Cascades", Review of Behavioral Economics: Vol. 1: No. 1–2, pp 55-73

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

positive results only for the local price pressures and social comparisons. Therefore, for the authors, the increase of consumption and borrowing of the low-income part of the population is due to the pressures on local prices that a shift of income distribution can produce in specific local areas and on the social comparison effect[56].

Christen and Morgan (2005) try to explain in their work how income inequality creates the need for households with lower income gains to using debt in order to keep up their consumption level relative to households with large income gains.

"*We argue that the effect of income inequality on household indebtedness results from the need for consumers to maintain or improve their social position through conspicuous consumption* (Frank and Cook, 1995*). Marketers* (e.g., Aaker, 1997; Levy, 1959; Soloman, 1983) *and economists* (e.g., Bagwell and Bernheim, 1996; Frank, 1985; Becker, 1974; Veblen, 1899) *have long understood that consumers purchase products not only for their functional utility but also for their social meaning*" (Christen and Morgan 2005, p. 150)

The basic idea is that instead of using a utility maximization process when households want to consume they turn to the others, more specifically to the others above them in the income distribution ranking or to whom represent a particular social reference.

That is because what defines an acceptable school, housing, clothing, transportation, and other items depends on how much others spend on them.

Therefore "*when the income of a neighbour increases, other consumers with no or smaller income gains need to finance more consumption with debt to keep up with the Joneses*." (Christen and Morgan 2005, p. 150)

Conspicuous consumption creates a "*positional arms race*" because it establishes always new and more expensive reference points. This race requires consumers to take increasingly more risk as income inequality increases, even when they are inherently risk-averse (Gaba and Kalra, 1999), and therefore may not stop until a party is overextended financially".[57]

Therefore, a shift in income distribution affects household indebtedness as long as consumer's consumption utility depended on the income and on the consumption of the others.

Christen and Morgan, divided the impact of income inequality on household borrowing in two different effects. The "own" effect, the effect of a reduction of income on the willingness to borrow in order to maintain some standard of living, and the "cross" effect, that is the effect of an increase in income on the willingness to borrow to whom doesn't see his income raise.

Bob Davis of the Wall Street Journal reported, *"[m]ore and more Americans are turning to debt for lifestyles their current income cannot support. They are determined to live a better life than their parents, seduced by TV shows like 'The O.C.' and 'Desperate Housewives' which take upper-class life for granted, and bombarded with advertisements for expensive automobiles and big-screen*

[56] Ibid.
[57] Ibid.

TVs...For Americans who aren't getting a big boost from e workplace raises, easy credit offers a way to get ahead, at least for the moment"[58] (2005 p. A1)

2.4 Financial accelerator and consumption

Another variable that enables household expenditures to become an active aggregate demand component, rather than a merely passive one, is the presence in the balance sheet of the household sector of different kinds of financial and real assets.

The presence of real and financial assets in the balance sheets of the households sector creates the ability to borrow against the value of the assets to finance additional spending. The ability to borrow using the value of an asset creates the ability to disconnect the spending decisions of the households from the evolution of their disposable income[59].

As pointed out by Badhuri*: "When the assets held by the debtor serve as collateral for the lender in a credit agreement, capital gain on the asset enhances the repayment capacity of the borrower and boosts the purchasing power for additional borrowing."* (Badhuri 2015, p. 160)

The ability to borrow using collateral is known in the economics literature as the concept of the "financial accelerator". While this concept is often used to study the borrowing behavior of firms and banks; we believe that the evolution of the financial sector and the financial practice have created an environment where households have started to rely more on borrowing against their assets to finance their spending.

As pointed out by Ben Bernanke in his speech on June 15, 2007: The financial accelerator and the credit channel:

"Financial accelerator effects need not be confined to firms and capital spending but may operate through household spending decisions as well. Household borrowers, like firms, presumably face an external finance premium, which is lower the stronger their financial position. For households, home equity is often a significant part of net worth. Certainly, households with low mortgage loan-to-value ratios can borrow on relatively favourable terms through home-equity lines of credit, with the equity in their home effectively serving as collateral. If the financial accelerator hypothesis is correct, changes in home values may affect household borrowing and spending by somewhat more than suggested by the conventional wealth effect because changes in homeowners' net worth also affect their external finance premiums and thus their costs of credit. If true, this hypothesis has various interesting implications. For example, unlike the standard view based on the wealth effect, this approach would suggest that the distribution of housing wealth across the population matters because the effect on aggregate consumption of a given decline in house prices is greater, the greater the fraction of consumers who begin with relatively low home equity. Another possible implication is that the structure of mortgage contracts may matter for consumption behaviour." (Ben Bernanke, 2007. "The Financial Accelerator and the Credit Channel" (Remarks at a Conference

[58] Cynamon, Barry Z. and Steven M. Fazzari (2008). "Household debt in the consumer age: Source of growth—risk of collapse." Capitalism and Society 3(2), Article 3.
[59] Amit Bhaduri, Srinivas Raghavendra and Vishwesha Guttal "On the Systemic Fragility of Finance-Led Growth" Metroeconomica 66:1 (2015)

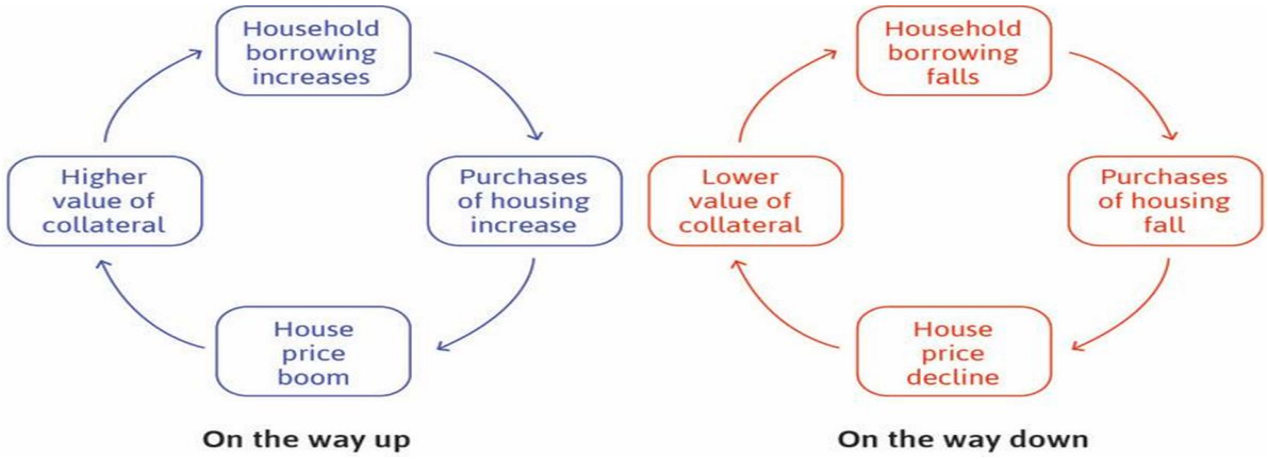
on the Credit Channel of Monetary Policy in the Twenty-first Century, Federal Reserve Bank of Atlanta p. 8*)*

The financial accelerator can create a positive feedback process between rising asset prices and households' expenditures. The change in asset prices affects the macroeconomics outcomes because it amplifies the business cycle stimulating spending of previously credit-constrained households[60].

In this section, we will focus on the effect of a housing driven financial accelerator dynamic. We believe that for the U.S. economy, and other Anglo-Saxon countries, this dynamic can explain the increase of expenditure and borrowing by households. Here we will focus on the financial accelerator from a theoretical point of view; in the next section, we will discuss better the evolution of consumption in the U.S.

The mechanism of the financial accelerator relies on the characteristic of the goods used as collateral that seen their prices increase. Since these goods are generally used as a store of wealth, an increase in price increases the demand by investors, this dynamic creates a loop by which an increase in price increases the demand, which in turn puts pressure on the prices.

Data show that the US. house prices started to boom in the early to mid-2000s before falling dramatically between 2006 and 2011[61]. At the same time, US households continuously increased their borrowing during all the cycle preceding the financial crisis. This dynamic of both increases in the price of housing and the increase in lending is crucial for the definition of "financial cycle" considered by the Bank of International Settlement. The inter-relationship between the banking sector and the housing market is crucial for the financial cycle, and this inter-relation is based on the financial accelerator dynamics.[62]
Following Carlin and Soskice (2014) we can describe the housing based financial accelerator dynamic with the following graph.



Source: W. Carlin, D. Soskice: "Macroeconomics Institutions, instability, and the financial system."

[60] Ibid.
[61] Arestis, P., and Karakitsos, E. "The U.S. Housing Slump and the Consumer." Journal of Post Keynesian Economics, Spring 2008, 30 (3), 335–352.
[62] Wendy Carlin, David Soskice "*Macroeconomics: Institutions, Instability, and the Financial System*" Oxford University Press, USA

In the graph, the feedback loops of the financial accelerator are described in the upswings and downswings.

In the upswing phase, we can begin with an increase in the ability to borrow by the household sectors, this can be due to an increase in the willingness of the banking sector to lend. The increasing availability of funding of the households sector increases their demand for housing. The increase in the demand for housing feeds back into higher house prices. Higher house prices mean a higher value of the collateral that can be used by the households to borrow more, in this case even households that have reached their "normal" borrowing ceiling can try to expand their borrowing using their house as collateral. If the households sector decides to use the collateral to borrow more to consume or buy another house the upswing feedback loop will continue[63].

It is important to note that this feedback loop can start for several reasons and by some "exogenous" shocks. In the previous example, the external shock is an initial relaxation of the credit constraint imposed by the banking sector. This dynamics works if:

1)The market price of the house is considered as a good indicator of the value of the house by the banking sector that accepts the house as collateral for additional borrowing[64].

2)The households that have seen their credit-constrained relaxed decide to use some of the additional borrowings to buy more housing, pushing up the price of the housing market.

In the downswing phase, the mechanism of the upswing is reversed. The expansion does not continue forever, at a certain point the price of the housing market will start to decline. A lower housing price reduces the collateral of households, some of them will be forced to reduce their indebtedness. Because of lower borrowing, the demand for housing will fall, this will reduce housing prices even more, creating another round of the feedback loops process.

Like for the upswing, the downswing can begin for several reasons and through several "exogenous" shocks. It can starts because a portion of the household sector finds himself over-indebted and starts to cut spending to deleverage, putting contractionary pressures on the economy and the housing market.

If the downswing is severe enough it can spread to the banking sector creating a banking crisis that has several spillover effects[65].

To conclude, the financial accelerator creates a positive feedback loop process because it increases spending by previously financial constrained households, that usually have a high propensity to spend. If the financial accelerator is based on the prices of the housing market, it stimulates the economy increasing the construction of new houses, since it is reasonable to assume that the increase in demand for housing will stimulate the supply[66]. In the downswing, the contractionary

[63] Ibid.
[64] Ibid.
[65] Ibid.
[66] Ibid.

forces work on the deleveraging and the collapse of the value of the housing market reducing overall spending and the credit access of the household sector.

3 The long-term consumption trend during the great moderation

As we said above some advanced economies had experienced a particular kind of growth model in the three decades before the financial crisis. U.S. and U.K. are two good examples.

We believe that this particular growth model was the result of the two long-term trends that we have described before: a shift of the distribution of income in favor of capital and top incomes, a radical transformation of the financial sector in terms of its practices and of the number of the "players".

These trends were common in all the countries, with differences in the size, but the impact that they had on the growth was different, this also because of the policy responses that were different from country to country.

In our opinion from the early '80s, two models of growth emerged and were adopted by an increasing number of countries. These two models are the "export-led growth model" and the "deb-led consumption growth model". These two-growth model are "complementary" to a certain extent because in most of the cases the countries with a consumption-led model of growth experience deficits in the balance of payment while "export-led" experience surplus in the balance of payment so we can easily guess that the foreign demand for the "export-led" countries comes prevalently from the "debt-led consumption" countries.

For many authors, this complementary is at the root of the global imbalances and of the imbalances between some core and periphery countries of the Euro area.
For those countries that experienced the consumption-led growth model the two trends that we have described above create long-term dynamics that we can summarize in this way:

1-The shift of the distribution of income in favor of the top incomes and the stagnation of the middle and low income increased the willingness of the lower part of the income distribution to consume more and to use debt in order to finance additional spending.

2-The development of the financial sector has created the source of purchasing power for the households in order to sustain the growth of aggregate consumption even in the presence of stagnation of their incomes.

3-The explosion of the top incomes has generated a pool of savings seeking high yield and, in most of the case, relatively safe assets.

4-The development of the financial sector has created new institutions capable to manage large quantities of money, like the money market mutual funds (MMMF), and new kinds of assets with relatively high return and low risk, at least apparently, suitable for the new pool of money generated by the shift in the distribution of income.

5-The increasing flows of money destined to particular class of assets has eased the creation of speculative bubbles. The creation of bubbles has a positive effect on growth, even if temporary, because of the effect on investment (Dot-com bubble) and on consumption (Real Estate bubble).

For the U.S. the magnitude of the consumption expenditure as a source of economic growth is clear. In 2006 consumption constitute over 70% of U.S. aggregate demand, during the twenty-five (1982-2007) years before the recession consumption accounted for 70.8 percent of average real GDP growth, while all other components contributed to 29.2 percent. The consumer share of U.S. GDP on average during the '80s, '90s, '00s grew from 64.6% to 67.3% and 70.0% while investment decreased from 20.3% to 18.9% and 18.6%. During the 10 years until the "pre-recession" quarter personal consumption expenditure (PCE) grew at a continuously compounded rate of 3.47 % while overall inflation annual growth of gross domestic product (GDP) averaged 2.91%, during the same period the remainder of the economy, Investment, net export, and government expenditure grew at only 1.70%[67].

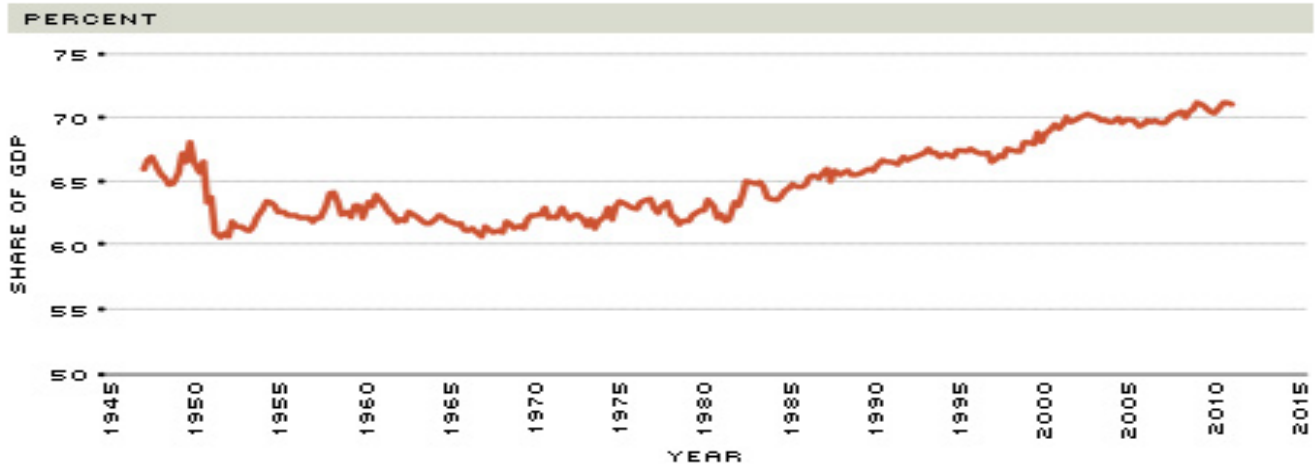
It is more important to look at the rate of growth of consumption instead of its share in the Gross domestic product. This because consumption accounts for the majority of spending in all advanced nations. In order to detect when a country relies on consumption in order to grow is better to look at the rate of growth of consumption and the rate of growth of the GDP[68]. So we define consumption-led growth: *"as periods during which private consumption grows more quickly than GDP, either in nominal terms, so that the consumption-to-GDP ratio increases over time, or in real terms, so that real consumption growth exceeds real GDP growth"* (Kharroubi and Kohlscheen 2017, p. 27)

If we look at the quarter-century ending in the third quarter of 2007, that is all the period of the Great Moderation, consumption expenditure grew on average at a 3.5 annual rate while the rest of the economy grew at a 2.79% annual rate[69].

If we look at the U.S. household expenditure relative to income, we can see how personal outlays have risen as a share of disposable income from 88% in the early '80s to almost 100% before the recession of 2007.

[67] William R Emmons "Don't Expect Consumer Spending To Be the Engine of Economic Growth It Once Was" Federal Reserve Bank of St. Louis
[68] Kharroubi and Kohlscheen Consumption-Led Expansions BIS Quarterly Review, March 2017
[69] Cynamon, Barry Z. and Steven M. Fazzari (2008). "Household debt in the consumer age: Source of growth—risk of collapse." Capitalism and Society 3(2), Article 3.

Personal Consumption Expenditures (PCE) as Share of Gross Domestic Product (GDP)



SOURCE: Bureau of Economic Analysis; quarterly data through 2011: Q3.

The rise in household consumption has created the demand stimulus that the U.S. economy needed in order to grow, given the relative stagnation overtime of the other components of the aggregate demand. The impact of consumption on long-term growth is clearer if we look at the dynamics of the recession of 1990-91 and 2001 compared to the recession of 1974-75 and 1981-82. Considering the peak to trough declines in GDP, we have a decline of 3.1% and 2.9% in 1974-75 and 1981-82. During the 1990-91 recession, GDP fell by just 1.3% and in 2001 there was a decline of just 0.2.[70]

When consumption took a pause in 1990 the economy entered a recession, but in 1992, it started to grow again. During the recession of 2001, the level of consumption did not decrease, the consumption-income ratio continued to grow even after the collapse of the bubble in the stock market.

As Burhouse noted: "*consumer spending and borrowing patterns during and after the 2001 recession departed significantly from historic norms.U.S. Households in 2002 continued to spend and borrow at a record pace even as personal bankruptcy filings reached record levels. While part of the recent climb in bankruptcy filings may be cyclical, some of the rises reflect unprecedented consumer credit availability. Innovations in consumer credit modeling, new pricing strategies for consumer loans, expanded funding options, and changes in regulations governing consumer lending have brought about a revolution in consumer lending and a new lending culture that provides consumers much greater access to credit and banking services*" (NY times, 2002, p. 6)

The sustainability of this demand generation process was questioned after the collapse of the dot-com bubble[71]. Some authors, like Palley (2002) believed that the household sector was approaching a "debt-ceiling" and was not able anymore to finance consumption by reduction of saving and increasing debt[72]. We believe that instead of approaching a "debt-ceiling" the household sector uses the increase in house prices that started in 2002 to increase consumption even more.

[70] Ibid.
[71] Godley 1999 questioned the sustainability of US. Growth in a more general analysis.
[72] Thomas I. Palley, 2002. "Economic contradictions coming home to roost? Does the U.S. economy face a long-term aggregate demand generation problem?" Journal of Post Keynesian Economics, Taylor & Francis Journals, vol. 25(1), pages 9-32.

As Mian and Sufi have shown in their several works, the real estate bubble that started in 2002 and ended dramatically in 2007 created the possibility for many households to borrow against the value of their house. In that period, home equity credit has been one of the cheapest forms of borrowing, with tax-advantaged treatment and rates below those on credit card debt.

"*Following the 2001 recession, there was an expansion in the supply of mortgage credit especially toward households that traditionally had difficulty obtaining mortgage finance the expansion in mortgage credit fed house price appreciation by increasing demand for housing*" (Mian and Sufi)

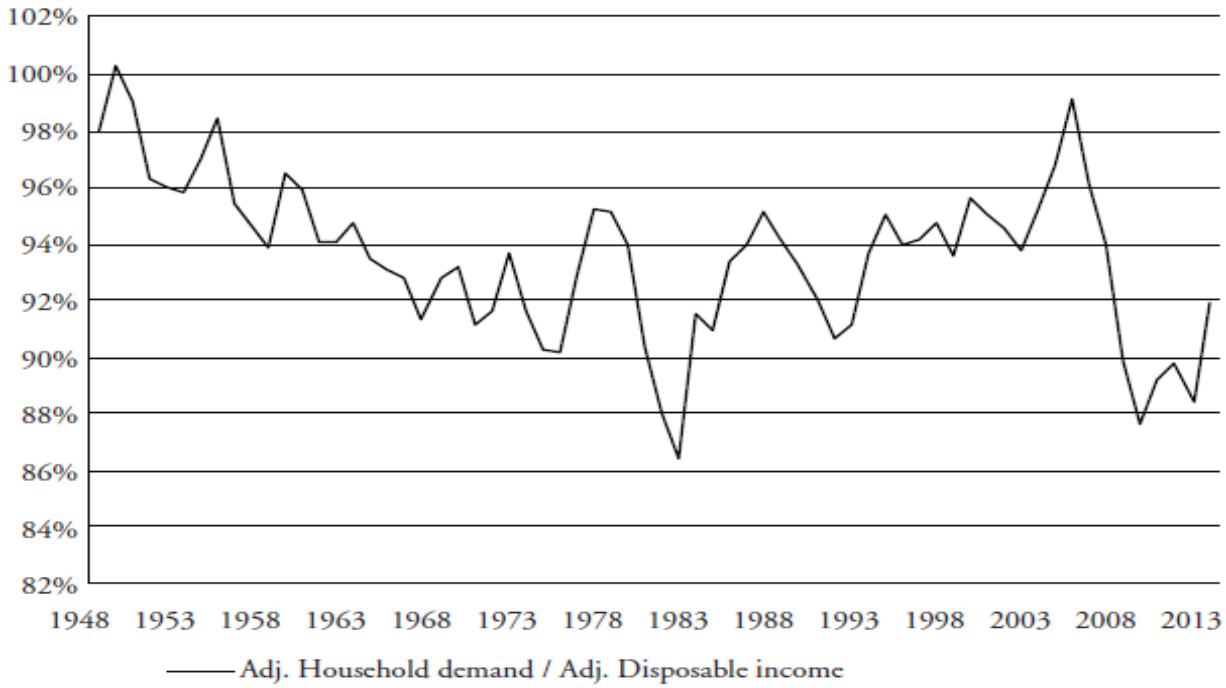
Households responded to the increase in house prices by aggressively borrowing against the rise in home equity. In their research, Mian and Sufi have shown how usually homeowners respond borrowing $0.25 against each dollar increase in home equity, but when we look at "constrained" household (they call this type of household "marginal borrowers"), they borrowed extremely aggressively, almost $0.75 for every dollar rise in home equity.

For the authors, between 2002 and 2006 the effect of housing wealth on spending was driven mainly by borrowing against home equity by those who were constrained by low levels of cash on hand. In that period, home equity became one of the cheapest forms of borrowing; our idea is that a substantial amount of home equity withdrawal was used for consumption and home improvement[73]

Therefore, instead of declining because of the approaching of a "debt-ceiling", the debt-led consumption continued to grow from 2002 thanks to the increase of real estate prices and of the process of home-equity withdrawal.

Cynnamon and Fazzari, have built a new measure of household expenditure in the U.S. trying to exclude from the data all the expenditures made by third parties that are usually counted as expenditure of the households. The new measures created by adding housing expenditure, which is included in the investment of the households, show the upward trend of household expenditure for all the period of the Great Moderation[74].

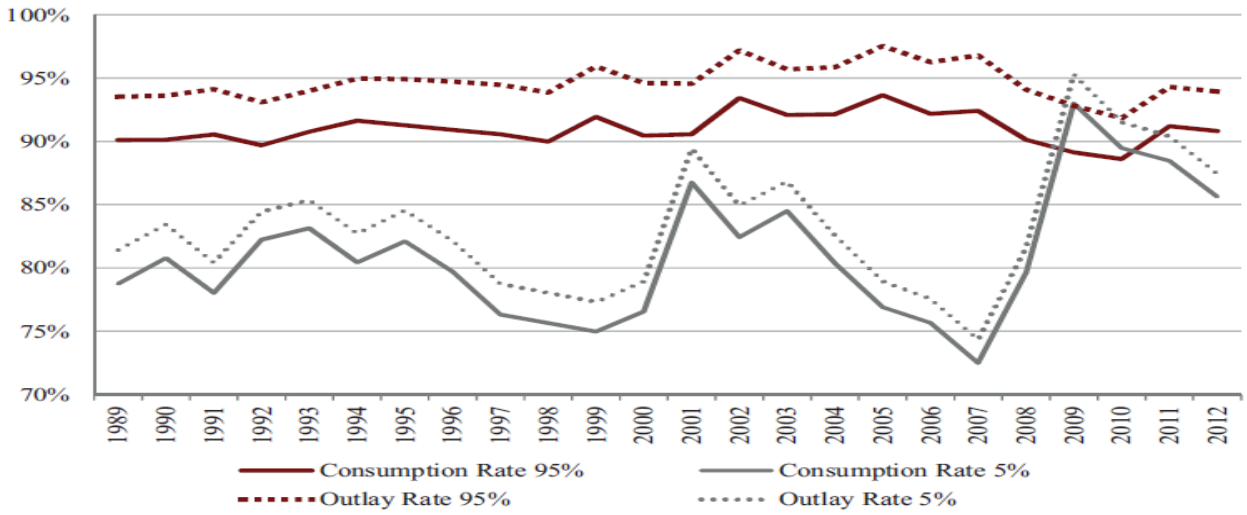
[73] Mian, Atif and Amir Sufi 2011. "House Prices, Home Equity-Based Borrowing, and the U.S. Household Leverage Crisis." American Economic Review 101(5), 2132—2156.
[74] Barry Z. Cynamon & Steven M. Fazzari, 2017. "Household Income, Demand, and Saving: Deriving Macro Data With Micro Data Concepts," Review of Income and Wealth, International Association for Research in Income and Wealth, vol. 63(1), pages 53-69, March.



Source: Barry Z. Cynamon & Steven M. Fazzari, 2016 Rising inequality and stagnation in the US economy European Journal of Economics and Economic Policies: Intervention, Vol. 12 No. 2, 2015, pp. 170–182

The figure shows the long term rise of household demand with respect to disposable income during all the period of the Great Moderation. The high volatility is due to the presence of housing expenditure which is more volatile than normal consumption expenditure.

If we disaggregate the behavior of households by income groups we can see how different have been their behavior during this period.



Source: B Cynamon and S Fazzari (2015) demand rate: ***Disaggregated personal consumption and outlay rates***

The graph shows the different trends in households' expenditure for the top 5% and 95% of the U.S. household income distribution.

The volatility of trend for the 5% shows how this group smoothed consumption overtime[75], as explained by Cynamon and Fazzari (2015):
"The first peak of the rate in 1993 occurs during a period of slow income growth around the recession of 1990–91; our measure of top 5% real income grew at an annual rate of just 1.3% from 1989 through 1994, about a quarter of its long-term average from 1980 to 2007. When real income growth of the top 5% accelerates dramatically to an annual rate of 8.2% from 1994 through 2000, its consumption rate declines. This consumption rate cycle is repeated almost exactly in the 2001 recession and the subsequent swift recovery of top 5% income during the middle 2000s (top 5% real income growth fell at an annual rate of 9.3% between 2000 and 2002 and then rose at 6.6% from 2002 to 2007)."(p. 11)

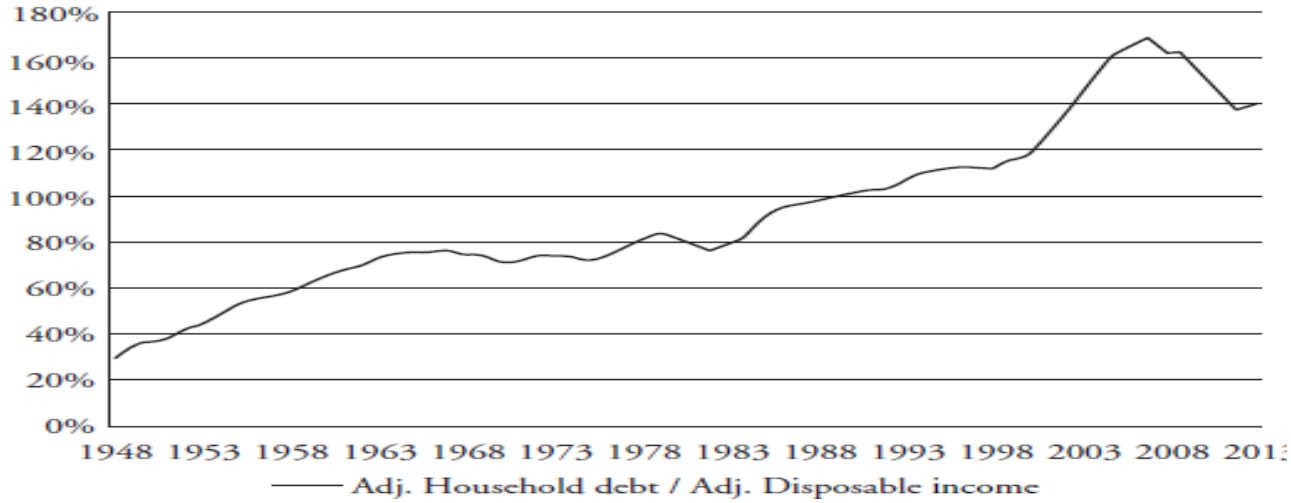
The demand trend of the bottom 95% was upward. The top 5% spend a smaller share of their income, while, during the period of the "Consumer Age" the spending share of the bottom 95% increase over time[76]. As pointed out by Cynamon and Fazzari:

"From 1989 through 2007, prior to the large changes that start with the Great Recession, the average consumption rate for the bottom 95% exceeds that for the top 5% by about 10 percentage points. This result provides empirical support for the widely held view that, other things equal, rising inequality will create a drag on consumption spending." (p. 10)

In the face of stagnant and decreasing disposable personal income the 95% needed to cut down the consumption rate to prevent an unstable path of the debt to income ratio. The graph shows how instead of cutting down consumption the 95% has increased its spending since the late '90s.

3.1 Increase in household debt

The consumption trend described above was mirrored by a constant increase in household debt during the period of the Great Moderation.

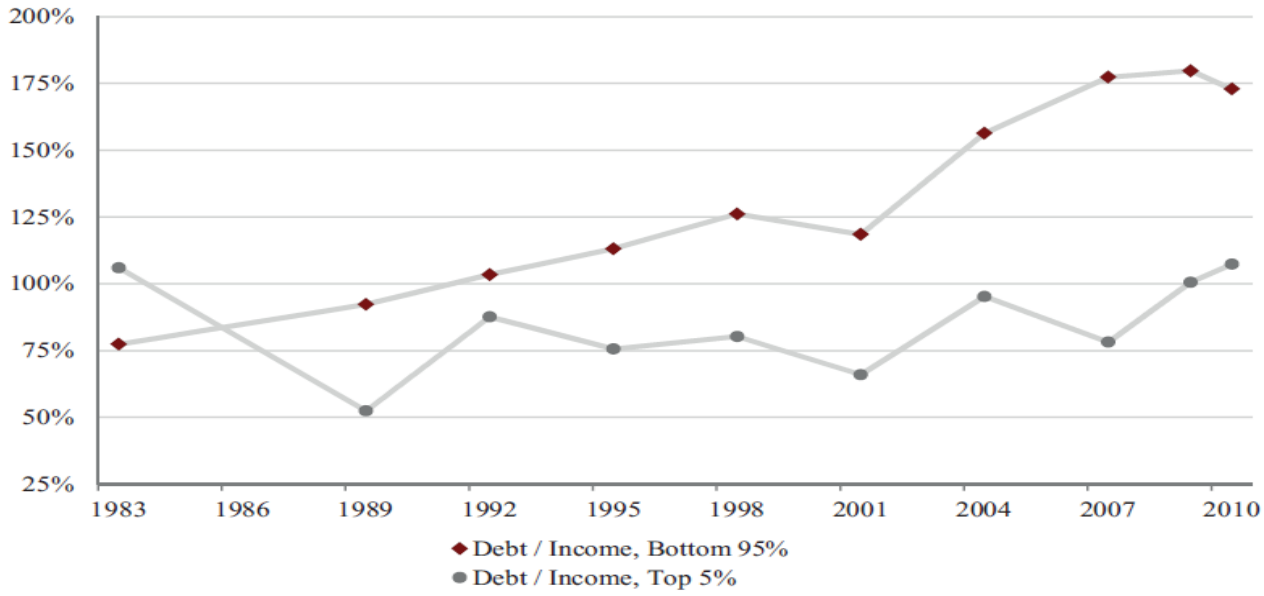


Source: Barry Z. Cynamon & Steven M. Fazzari, 2016 Rising inequality and stagnation in the US economy European Journal of Economics and Economic Policies: Intervention, Vol. 12 No. 2, 2015, pp. 170–182

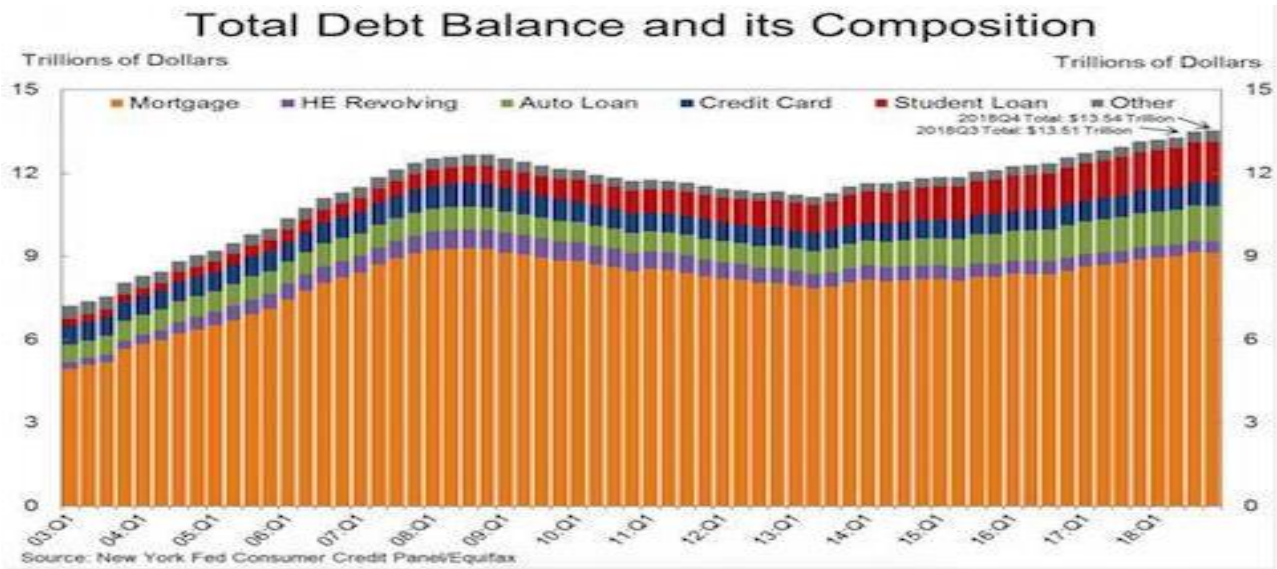
[75] Cynamon B. and Fazzari S. 2015 *"Inequality, the Great Recession and slow recovery"* Cambridge Journal of Economics
[76] Ibid.

The chart above describes the evolution of the household debt to disposable income ratio. We can divide the evolution of household debt during the Great Moderation in two periods. The first period goes from the early '80s to the late '90s in which the trend was upward but the household debt was increasing relatively slowly. The second period goes from the late '90s until the begin of the Financial Crisis in 2007, in this second-period household debt rose fast and exploded. The second period is related to the dot-com bubble and the housing market bubble.

Cynamon and Fazzari 2015 provided a disaggregation of the evolution of the households' debt to disposable income. For the 95% group the ratio rises dramatically from 77% to 177% while for the 5% there are different fluctuations but it is difficult to identify a real trend. The graph below shows these results and provides evidences for the unsustainable households' balance sheets dynamics before the Great Recession that was concentrated in the bottom 95%[77].



Source: B Cynamon and S Fazzari Inequality, the Great Recession and slow recovery Cambridge Journal of Economics 2015 Household debt to disposable income



[77] B Cynamon and S Fazzari Inequality, the Great Recession and slow recovery Cambridge Journal of Economics 2015

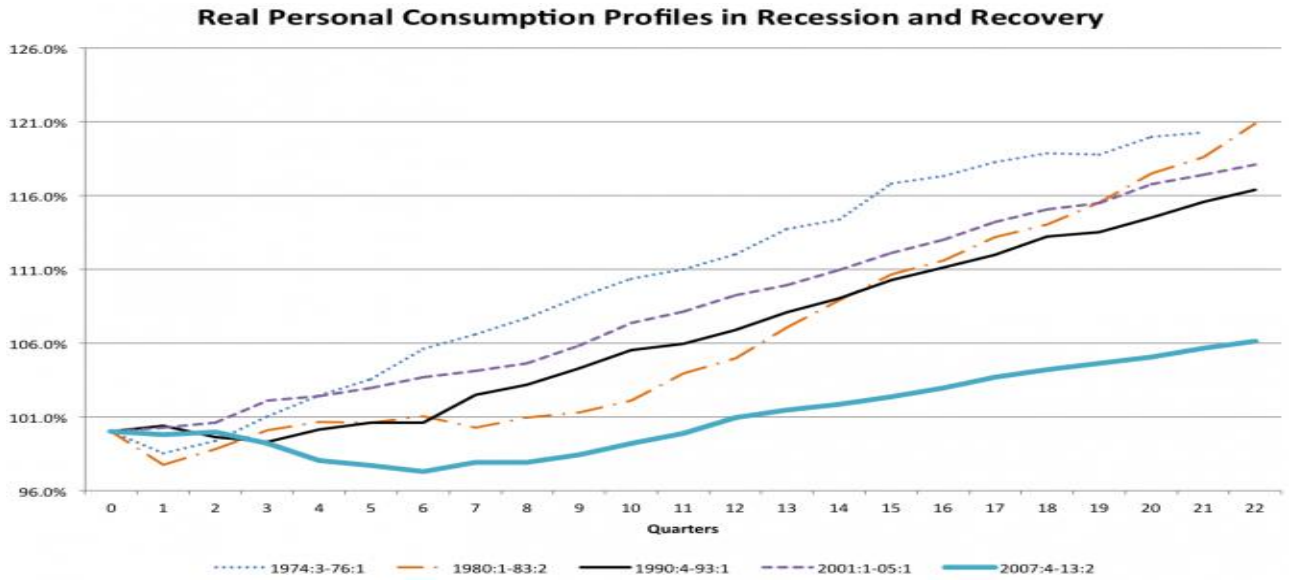
The chart above shows the composition of household debt in the period before the start of the financial crisis and during the recession. For the composition of household debt, is clear that mortgage loans are the major component of the stock of household debt. Auto loans were the second most important component before the crisis. After the crisis, households began to deleverage, but the level of the stock of debt did not decrease substantially and in 2019 household debt is $869 billion higher than 2008's $12.68 trillion peak. In the aftermath of the financial crisis, the level of mortgages loans decreased slightly, while the stock of student loans and auto loans have increased, showing how borrowing is still a need for the household sector.

3.2 The Great Recession and Demand stagnation

What we have described above is the demand generation process in place in the U.S. during the Great Moderation. In this demand regime, consumption norms have become increasingly disconnected by the evolution of the disposable income of a large portion of the population. The real income stagnation suffered by the low and middle income portion of the population was offset by the evolution of financial practice and norms of the financial sector and by an increasing attitudes of the household sector to finance their expenditure by the use of credit and of the value of their home as a collateral in order to borrow.
The sustainability of this demand generation process was precarious. Instead of creating an optimal environment for household expenditure, it led to an ever-increasing financial fragility due to an unsustainable accumulation of debt in the balance sheets of the households sector.

"*By the late 2000s, the growth regime in the U.S. economy was thoroughly dependent not just on the "ordinary workings of the goods and labor markets" (necessary to generate the income flows required to service outstanding debt), but also what came to be perceived as the "ordinary workings of financial markets" – more specifically, their proclivity to roll over existing debt, and continue expanding new credit. The entire U.S. economy was, as a consequence, increasingly vulnerable to any bad news in the short run that would give pause for thought to the households and/or financial institutions participating in the run-up of indebtedness that undergirded seemingly impressive macroeconomic performance*." (Barry Z. Cynamon, Steven Fazzari, Mark Setterfield p. 304)

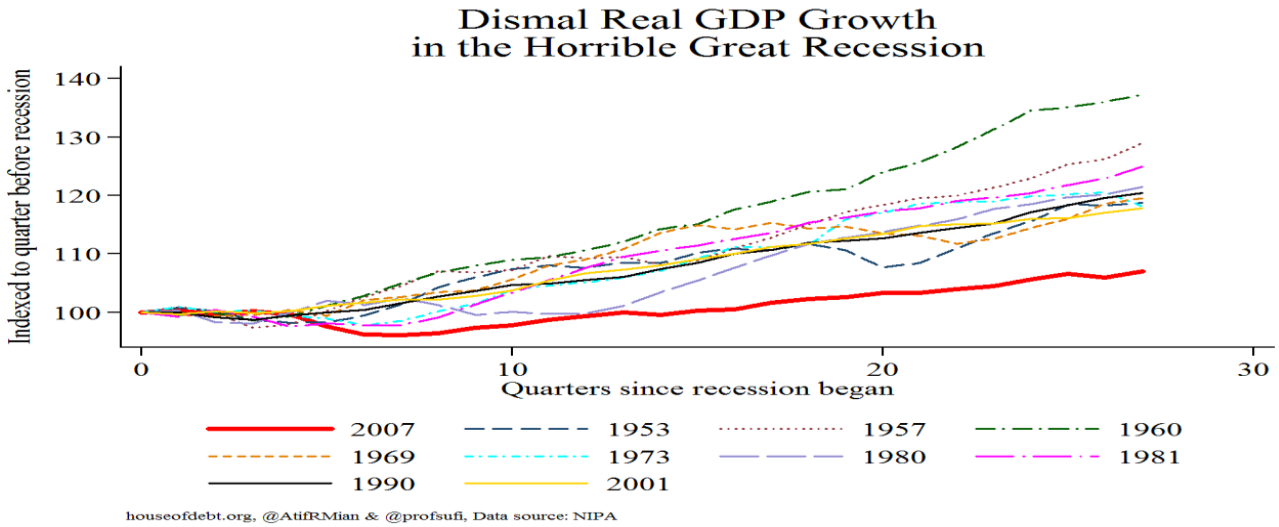
In the end, this demand generation was ended by various causes. The end of the housing bubble meant that households were no longer able to use the rising value of their property as collateral. With the decline in the value of the housing markets started the downswing phase of the financial accelerator that we have described above. The increase in the interest rate and the collapse of the financial markets during the crisis destroyed the ability of households to refinance their loans and in general to borrow.
The conclusion was a sudden collapse of households' expenditure that brought the U.S. economy into a recession.
When the ability to borrow vanished, households' expenditure was constrained for three different reasons: households were not able to offset the stagnation of their income by using debt, the stock of debt in their balance sheets started to play its contractionary role, the destruction of a large portion of households' wealth after the burst of the housing bubble also plays an important role in constraining households spending.



Source: B. Cynamon and S. Fazzari "Rising inequality and stagnation in the US economy" European Journal of Economics and Econ omic Policies: Intervention

The graph above shows the "real adjusted household demand[78]" after every U.S. recession from 1974 from the last peak before every recession extends to seven years. For every business cycle before the recession of 2007 household demand recovered, on average, to a level 18 percent higher than the peak before the recession. For the last recession, the blue line, the situation is radically different. After seven years households' demand is just 2% higher than the 2006 peak. This means that the household sector is not playing its role in generating the demand needed by the economy to have a growth similar to what happened after the other recessions.

It is clear from this graph that the demand generation process in place during the Great Moderation has come to an alt with the beginning of the financial crisis. Our idea is that the stagnant household demand is one of the most important reasons for the poor performance of the U.S. economy during the recessions and the recovery.



[78] Cynamon, Barry Z. and Steven M. Fazzari "*Rising inequality and stagnation in the US economy*" European Journal of Economics and Economic Policies: Intervention, Vol. 12 No. 2, 2015, pp. 170–182

The graph above shows how the stagnant recovery of households' demand is mirrored by a stagnant recovery of GDP. As the graph for household demand, the graph above shows the dynamic of GDP for the U.S. from the last peak before every recession, this time since 1953. The red line shows how GDP responded after the 2007 recessions. The stagnant households' demand is mirrored by a stagnant recovery of the GDP.
Several authors have described this situation as "secular stagnation" from the term coined by Alvin Hansen in the post-war era.
It is clear from this point that the income distribution shift and the burden of debt are playing an important role in constraining household demand and consequently the growth of GDP even in the long run. From our point of view policies that aims to lower the level of inequality and the burden of debt in the balance sheets of the households sector are strongly needed to restore a demand generation process able to let the economy grow.

4. The model

Starting from this point, we have tried to create a simple model, based on the model presented in the first chapter, that tries to replicate some of the stylized facts described above. We try to study the interaction between the banking sector, the housing market and the household sector in an environment in which households want to borrow in order to spend more and the banking sector increase their lending or enables them to use their houses as collateral.

				Firms			
		Rentier Households	**Workers Household**	Current	Capital	**Banks**	Σ
Consumption		$-C_R$	$-C_w$	+ Ct			0
demand for housing		$-Dh_R \cdot P_h$	$-Dh_w \cdot P_h$	$+H_n \cdot P_h$			0
Investment				+ I	- I		0
Wages		$+W_R$	$+W_w$	- Wt			0
Firms profits		+ Πd		- Π	+ Πr		0
Banks profits		+ Πb				- Πb	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 stocks of	Deposits	- ΔD_R	- ΔD_w			+ ΔDd	0
	Loans	+ ΔL_R	+ ΔLw		+ ΔLf	- ΔLs	0
Σ		0	0	0	0	0	0

The model is made up of three sectors: a banking sector, who provides funding for all the other sectors in the economy, a firm sector, made up by firms who produce consumer goods and invest in capital, and firms who produce houses[79]. The third sector is the household sector. Households are divided into two different subsector, rentiers and workers, to detect differences in income, wealth and expenditure decisions.

[79] We follow Gennaro Zezza (2008) in the aggregation of the "two types of firms".

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 ($C_w + C_R$) by both the classes of households and by the investment (I) and new construction of houses multiplied by the price ($H_n \cdot P_h$).

2) $Y = C_w + C_R + I + H_n \cdot P_h$

4.1 Banking sector

Since there is no government and central bank in the economy, every transaction takes place using bank money, deposits, created by the banks every time someone asks for a loan. The creation of money in the economy is endogenous. 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. Every transaction that takes place between sectors, between households and firms, is recorded by a change in the balance sheet of the banking sector.

We perform two experiments on the behaviour of the banking sector; in the first experiment, we assume that banks increase their propensity to lend and they do not change their behaviour anymore, in this simulation credit supply is determined by credit demand and the willingness of the banks to lend. In the second experiment, we assume that the banking sector tied its willingness to lend to the price level of the housing market. With this second experiment, we try to replicate a "financial accelerator-driven cycle" where households use the value of their home as collateral and the banking sector uses the price level of the housing market to decide if reduce or increase the amount of lending.

3) $SL = L_f + L_R + L_w \cdot \rho$

Equation 3 describes the supply of loans by banks; as said above banks accommodate the demand for loans by every economic agent expanding their balance sheet. The ability of banks to create loans is not constrained by the amount of deposits held. We made the assumption that supply of loans to workers is not completely elastic. For workers households, the supply of loans is contingent on ρ which is an institutional parameter representing the willingness of banks to lend. As we said above, we perform two experiments, in the first one ρ is exogenously determined and receive a shock during the simulation, in the second experiment it is tied to the price level of the housing market. This second experiment can be seen as a rise in the loan-to-value (LTV) ratio banks are allowed to use in making mortgages. As explained by Carlin and Soskice:

"*The LTV ratio is calculated as the value of the loan received divided by the value of the property purchased. For example, if a borrower took out a loan of $160.000 to buy a house worth $200,000 then the LTV ratio would be 80%. In the USA, mortgages with LTV ratios in excess of 100% became widely available in the mid-2000 this meant that borrowers could receive a loan larger than the value*

of the property they were buying without providing any down payment. These looser lending standards made it possible for lower-income groups to purchase residential properties and consequently boosted mortgage demand." ("*Macroeconomics: Institutions, Instability, and the Financial System*" 2014 Oxford University Press, USA, chapter 6, p. 197-198)

4) $L_s = L_{s(\mathrm{t}-1)} + SL$

Equation 4 describes the evolution of the stock of loans in the balance sheet of the banking sector, which is equal to the previously accumulated stock of loans ($L_{s(\mathrm{t}-1)}$) and the new flow of credit extended to the economy SL.

5) $D_d = D_w + D_R$

Equation 5 describes the amount of deposit held in the banking sector, which is equal to the sum of the deposits held by workers (D_w) and Rentiers (D_R).

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

Equation 6 describes the total stock of deposits supplied by the banks, which is equal to the previously accumulated stock of deposits ($D_{s(t-1)}$) and the new flow of credit ($L_s - L_{s(t-1)}$).

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

Equation 7 describes the profits of the banking sector, banks charge an interest rate on the loans and pay interest on the deposits held, and the profits are determined by the spread between these two interest rates. Banks' profits are entirely distributed to the Rentiers households.

4.2 The firm sector

In this section we describe the behaviour of the firms; they pay wages to workers and managers and invest in order to accumulate capital stock. In this section we will focus on the behavioural equations of the firms that produce goods and capital goods. The behaviour of the housing market will be presented in section 4.5. The equations related to the profits of the firm includes all the firms, since we include both types of firms in the same macro-sector.

8) $I = \omega \cdot \left(K^t - K_{(t-1)}\right) + \eta \cdot K_{(t-1)}$

Equation 8 describes the investment decision by the firms' sector; firms try to close the gap between the target level of capital and the level of capital accumulated ($\omega \cdot \left(K^t - K_{(t-1)}\right)$) and to cover the quantity of capital depreciated

9) $K^t = Y \cdot v$

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

10) $K_t = K_{(t-1)} + I - \eta \cdot K_{(t-1)}$

Equation 10 describes the law of motion of capital stock. The stock of capital is given by the amount of capital accumulated in the previous periods ($K_{(t-1)}$) plus the investments (I) minus the quantity of capital depreciated ($\eta \cdot K_{(t-1)}$).

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

Firms' profits 11 are equal to the sum of consumption, new construction of houses and investment minus the outflows for the wages that the firms pay to the workers and managers and the interest on the stock of loans.

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

Firms' profits are partially distributed to the rentiers and partially retained to cover investment costs. Equation 12 describes the share of undistributed profits, where ϕ is the portion of profits retained by the firms.

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

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

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

Equation 14 describes the demand for loans by firms, eq. 14 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 ($L_{f_{(t-1)}}$) plus the amount of investment not covered by the internal funds ($I - \Pi_r$) .

4.3 The Rentiers Household

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

15) $Y_R^d = w_R + iD \cdot Dd_{Rt-1} + Fb + Div - iL \cdot L_{Rt-1} - \gamma L_{Rt-1}$

Equation 15 describes the disposable income for Rentiers. We assume that after Rentiers receive their income (managerial wage), the interest from the accumulated deposits, the dividends from the banks, from the firms, they pay back the interest and a portion of the principal on the accumulated stock of debt.

16) $c_R = \alpha \cdot Y_{R(t-1)}^d + \beta \cdot W_{R(t-1)} + \xi \cdot H_R^s \cdot P_h$

Equation 16 describes Rentiers consumption as a function of the disposable income of the previous period ($\alpha \cdot Y_{R(t-1)}^d$) and of the accumulated financial wealth ($\beta \cdot W_{R(t-1)}$), in addition, their consumption is affected by the value of their accumulated stock of houses ($H_R^s \cdot P_h$).

17) $W_R = W_{Rt-1} + (Y_R^d - c_R)$

Equation 17 describes the evolution of the stock of financial wealth. Financial wealth is equal to the previously accumulated stock ($W_{R(t-1)}$) plus the new flow of savings ($Y_R^d - c_R$).

18) $Dh_R = Dh_R^e + W_{r(t-1)} \cdot \sigma + P_h \cdot H_s \cdot \sigma_{Rph}$

Equation 18 describes the demand for housing[80]. Rentiers' demand for houses depends on an exogenous parameter (Dh_R^e) plus their wealth ($W_{r(t-1)} \cdot \sigma$) and the price level of the housing market ($P_h \cdot H_s \cdot \sigma_{Rph}$).

19) $DL_R = Dh_R + (c_R - Y_R^d)$

Equation 19 describes the demand for loans for rentiers, our hypothesis in the model, is that households borrow an amount equal to the amount of houses demanded (Dh_r). Like in the model presented in chapter one, when $c_R > Y_R^d$ disposable income does not cover all the consumption expenditure the demand for loans is augmented by the amount of consumption not covered by the disposable income.

20) $M_R^d = W_R$

Demand for deposits is calculated residually and is equal to the financial wealth of the Rentiers.

4.4 Workers households

The Workers household sector is composed by who receives a wage for participating in the production process

21) $Y_w^d = w_w + \mathrm{iD} \cdot Dd_w - \mathrm{iL} \cdot L_w - \gamma L_w$

Equation 21 describes the disposable income of workers households. After they receive their wages and the interest on their deposits, they pay back the principal and interest part of the accumulated stock of debt.

22) $c_w = \alpha \cdot Y_w^d + c_{av} + \beta \cdot W_w + (\varsigma \cdot H_w^s \cdot P_h)$

Equation 22 describes the consumption function of workers households. Households consumption is a function of their current income ($\alpha \cdot Y_w^d$) and of the inherited stock of financial wealth ($\beta \cdot W_w$). The second 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 from the social context, workers households look at what is the average level of consumption when they have to decide how much to consume. The last variable ($\varsigma \cdot H_w^s \cdot P_h$)) shows the impact of the value of the stock of houses held by the workers' household on the decision to borrow to consume more.

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

24) $DL_w = Dh_w + (c_2 - Y_w^d)$

Equation 23 and 24 describe the evolution of the stock of financial wealth and the demand for loans by workers. As for rentiers, the stock of financial wealth for workers is equal to the previously accumulated stock plus the new flow of savings ($Y_w^d - c_w$). The demand for loans is equal to the demand for houses (Dh_w) plus the amount of consumption that exceeds their disposable income.

[80] Demand of houses (both for worker and Rentiers) is modelled as demand of durable goods rather than "investment" in houses. For the Rentiers the price variable ($\varsigma \cdot H_w^s \cdot P_h$) reflects the "investment component" of demand of houses.

26) $Dh_w = Dh_w^e + W_w \cdot \sigma + Dh_{av} \cdot \rho - (\vartheta \cdot P_h \cdot H_s)$

Equation 26 describes the demand for houses by the workers, it depends on an exogenous parameter (Dh_w^e), a portion of their wealth ($W_w \cdot \sigma$) and the average demand for housing in the economy ($Dh_{av} \cdot \psi$), this variable describes the willingness of the workers household to increase or maintain their social status buying more expansive houses. The last product ($\vartheta \cdot P_h \cdot H_s$) shows the negative effect of the price of houses on the demand of workers, since housing is not an investment for all workers, we assume that an increase of the price reduces the demand for houses of workers' household. This is a crucial difference between workers and rentiers in our model. While for Rentiers housing is an investment and an increase in the price of houses means an appreciation for this class of assets, for workers demand for housing has a "social component", for the social status, but they respond negatively to any increases in houses price.

27) $M_w^d = W_w$

Demand for deposits is calculated residually and is equal to the financial wealth of the workers.

4.5 Housing market

Demand for houses have been described in the workers and rentiers sections, now we will deal with the remaining part of the housing market.

28) $H_n = \omega_h(Dh_r + Dh_w) + (P_h \cdot H_{s(t-1)} \cdot \Omega)$

Equation 28 describes the "flow" of new houses built by the portion of firms operating in the housing market. The supply of new houses is a positive function of the demand for houses coming from the households ($\omega_h(Dh_r + Dh_w)$) and a positive function of the general price level of the stock of houses ($P_h \cdot H_{s(t-1)} \cdot \Omega$). With this second parameter, we can detect the twofold effect of houses price on demand and supply; on one hand an increase in the price increases the ability to borrow more (if the credit access is tied to the houses price) both for consumption and to buy new houses, and increase the willingness of Rentier households to buy more houses for "investment" reasons, putting more pressures on prices. On the other and, an increase in prices stimulate the supply of new houses alleviating the demand effect. We make the assumption that there are no unsold houses in the economy.

29) $H_s = H_{s(t-1)} + H_n - DEPh$

Equation 29 describes the stock of existing houses that is equal to the existing stock of houses plus the new flow of built houses minus the amount of houses that have been destroyed.

30)$P_h = (Dh_R + Dh_w)/H_s$

The price of houses is equal to the ratio between the demand for houses by workers and rentiers ($Dh_r + Dh_w$) dived by the total stock of houses in the economy (H_s).

31) $H_w^s = H_{w(t-1)}^s + Dh_w - DEPh$

32) $H_R^s = H_{R(t-1)}^s + Dh_R - DEPh$

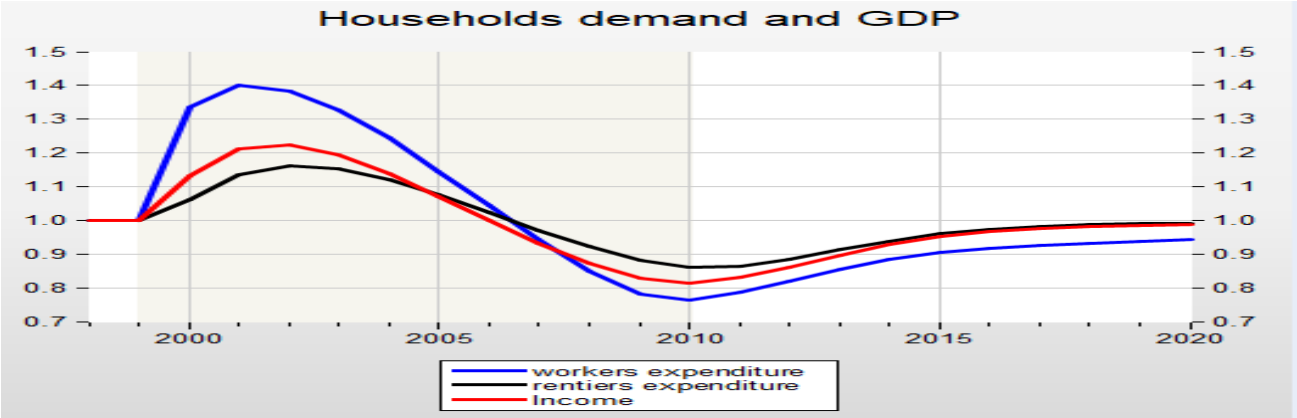
Equation 31 and 32 describe the evolution of the stock of houses owned by workers and Rentiers.

5 Scenario analysis

We perform two different simulations to study how our economy behaves and evolves after a change in the banking sector behavior. Our aim is to study the link between the household sector, the housing market, and the banking sector. In the baseline scenario, workers' households are credit constrained and they cannot borrow as much as they want to finance their expenditure. In the first simulation we shock the amount of credit extended by the banking sector, we explain this increase in the lending practice as an institutional evolution of the banking sector that increase the amount of money lent in periods of economic tranquillity (Minsky). As we explained above the number of loans extended by the banking sector is equal to $SL = L_f + L_R + L_w \cdot \rho$, with ρ playing the role of the willingness of the banking sector to lend to the workers' households sector. In the first simulation, we let ρ change from 0.2 to 0.9, this large increase is in line with the increase in lending practice that the U.S. economy has experienced from the late '90s until the beginning of the financial crisis. We tied the increase in the willingness in lending of the banking sector with an increase in the interest rate that banks charge on loans[81]

5.1 Results

Fig. 1



The first graph shows the impact of the shock on households' expenditure and GDP. Households' expenditure includes both consumption and demand for housing. Workers' expenditure explodes after the shocks, because of the increased ability to borrow. Rentiers' expenditure increases after the shock because of the increase in houses price and because of the increase in their income and wealth. Because of the increase in households' expenditure the GDP of the economy increases. After a few periods workers households' demand begin to collapse, this is due to the increased burden of the stock of debt on the balance sheets of the workers' households sector. While workers' households demand begins to collapse, rentiers demand is more resilient and starts to decline just after the GDP has started to decline. After the collapse, households' demand starts to recover.

One important result of the simulation is the "demand stagnation trap" in which the economy finds itself after the recession. After having reached the lowest point in the "recession", households'

[81] Stiglitz, J.E., and Weiss, A., "Credit Rationing in Markets with Imperfect Information," American Economic Review, 71 (1981), 393 – 410.

expenditure recovers slowly and both are below the pre-shock “steady-state” level in the period that we are considering. This “demand-led stagnation” can be explained by the long-lasting burden of the debt on the balance sheets of the workers, and by the fact that workers have burned a large portion of their wealth during the expansion. this households demand stagnation is to what we have described in section 3.2, households’ demand recovery in the aftermath of the great recession was slow and it returns to the pre-recession level just after a long period.

Fig.2

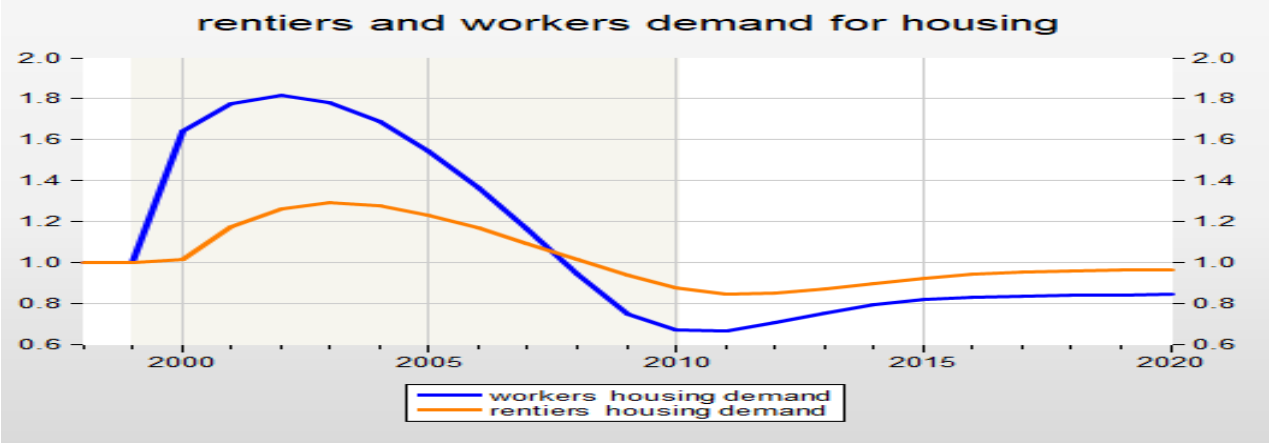
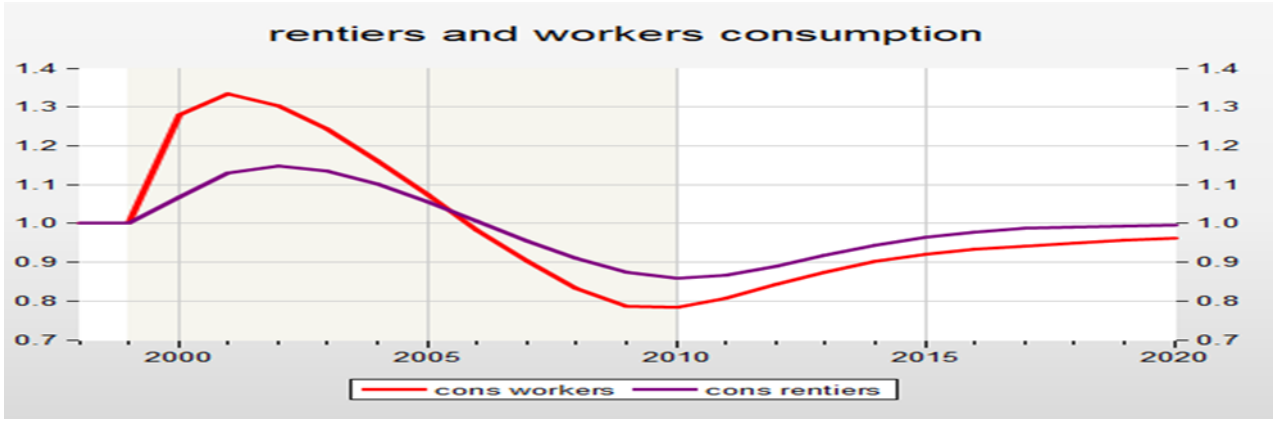


Fig.3

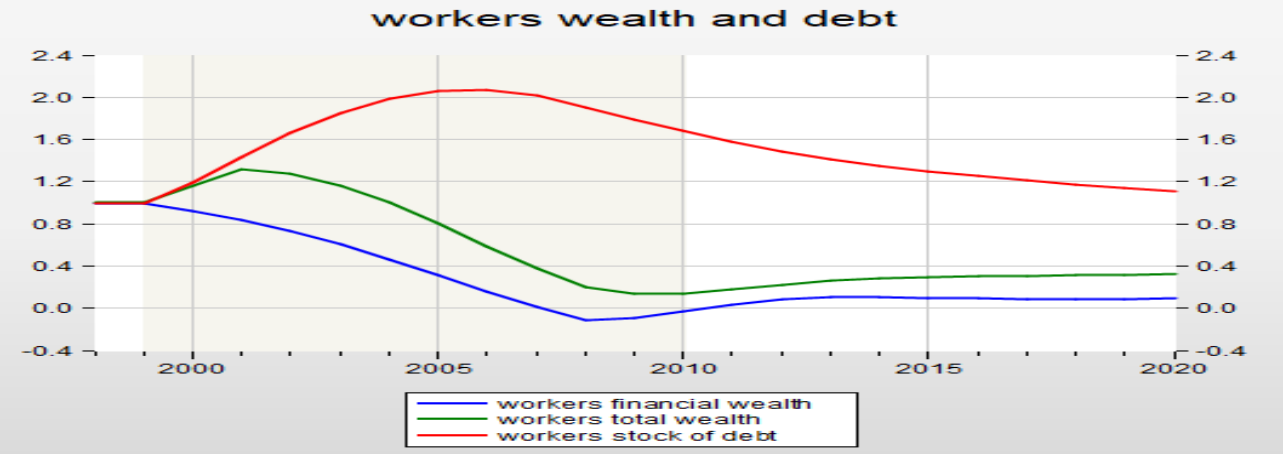


In figures 2 and 3 household demand is disaggregated and divided in demand for consumption and demand for housing. Demand for housing increase more than consumption both for workers and for rentiers after the shock. Rentiers’ expenditure for housing does not increase immediately after the shock; this is because the demand for housing by rentiers is mainly driven by the price of houses and by their wealth, so they start to increase spending for housing just after the expansion begins.

Fig.4

Figures 4 shows the evolution of the stock of financial and total wealth for workers households, the blue line describes the evolution of the financial wealth composed by deposits. Workers households burn their wealth by increasing their expenditure, which decreases their accumulated stock of deposits instantaneously, and by borrowing, which decreases income and wealth in the payback phase. The green line describes the evolution of the sum of financial and real wealth. Real wealth is composed of the stock of houses bought by workers households multiplied by the price. After an initial increase, associated with the boom in the housing market, workers' household wealth collapse and is at a lower level compared to the pre-shock scenario.

Fig.5



Figures 5 shows the evolution of the financial wealth, of the wealth, and the stock of debt. The financial wealth starts to decrease after the shock as a result of the increase in the stock of debt and of the decreasing stock of financial wealth. The total wealth increases at the beginning because of the increase in the stock of bought houses and because the price of houses increases after the shock, pushing up the value of the real assets held by households. After a sharp increase, total wealth collapses because the collapse of financial wealth, the increase in the stock of debt and the collapse of houses prices. The evolution of the stock of debt seems to mirror the evolution of the financial wealth.

Fig.6

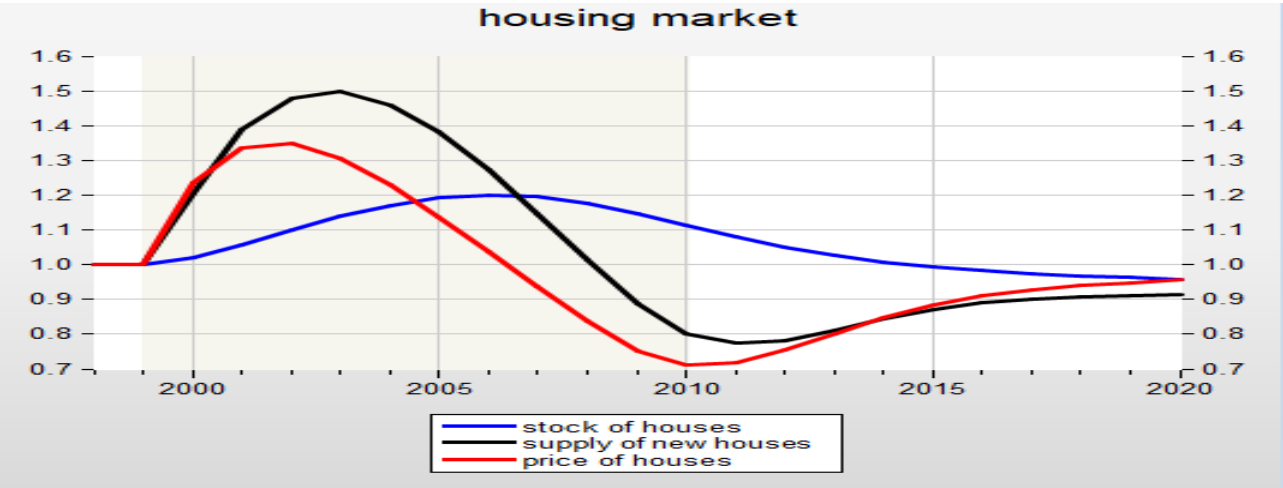
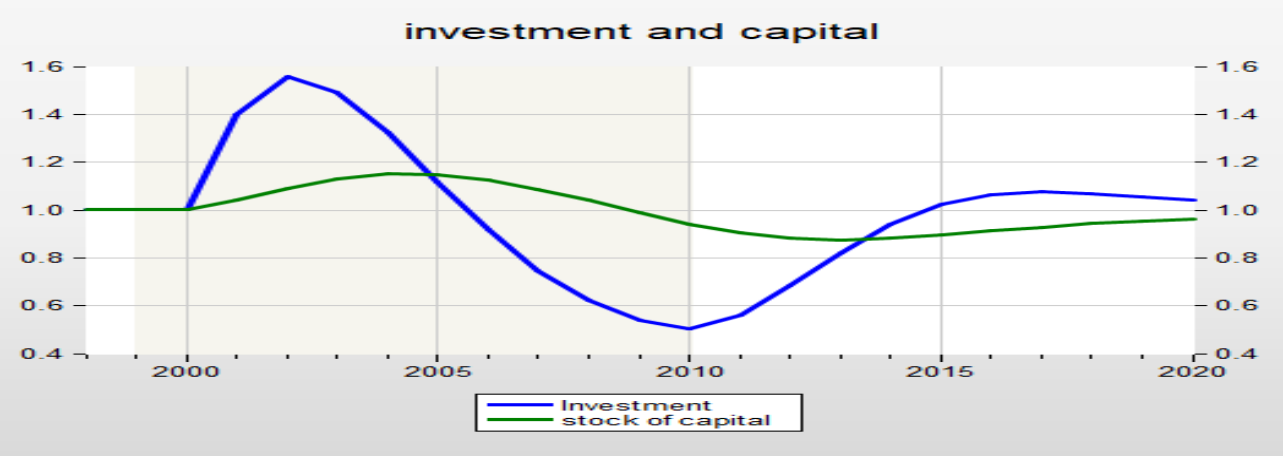


Figure 6 describes the evolution of the housing market. After the shock, the price of housing starts to grow because the pressure of the demand from households on the stock of existing homes pushes the price up. The supply of new houses, in this scenario, is stimulated both by the increase in price and by the increase in the demand coming from the households sector. The price of the houses starts to decline when demand for houses by workers' household starts to decline and when the flow of supply of new houses starts to have an impact on the stock of existing houses. As for the other variables in the simulation, the recovery takes time. The Stock on houses falls below the pre-shock scenario steady state and both the flow of new houses and the prices does not return to the pre-shock level during the period we are considering.

Fig.7



Figures 7 shows the movement of Investment and the accumulation of the stock of capital by the firms' sector. Investment starts to grow after the expansion has already begun, during the recession they collapse, exacerbating the downturn. Investment recovery is stronger if compared to the other component of the aggregate demand. The stock of capital increases during the expansion phase but it decreases during the recession and it reaches a steady-state equilibrium level that is lower if compared to the pre-shock steady state.

Fig.8

The last figure shows only the dynamic of the GDP, as we said above the our experiment display a "boom-bust" dynamic driven by households' expenditure financed by debt. After the collapse the recovery takes time and the income does not return to the pre-shock level in the period that we are considering.

In this experiment, we have tried to show how a credit supply driven expansion can have a persistent effect on the economy for several reasons. The boom-bust dynamic that we have described above is driven mostly by the flow and stock effects of credit. While the first impact of fresh borrowing is to increase households' spending the stock effects are a decrease in workers' disposable income devoted to consumption and a destruction of their financial wealth.

5.2 Financial accelerator scenario

In the second experiment, we introduce an extension to the credit supply behavior of the banking sector. Our aim is to try to describe a financial accelerator-type mechanism where the interaction between households expenditure, the housing market, and the banking sector create a series of feedback loops dynamics that generate a cycle.

In this second experiment, the banks' willingness to lend is tied to the price of the housing market. We can interpret this behavior as a change in the regulation of banks related to the loan-to-value (LTV) ratio used by the banking sector when they make mortgage decisions. As explained by Carlin and Soskice*:*

"A rise in the loan-to-value (LTV) ratio banks are allowed to use in making mortgages leads to a rise in the demand for mortgages. For an individual borrowing to buy a house, the LTV ratio is calculated as the value of the loan received divided by the value of the property purchased. For example, if a borrower took out a loan of $160.000 to buy a house worth $200.000, then the LTV ratio would be 80%. In the USA, mortgages with LTV ratios in excess of 100% became widely available in the mid-2000 this meant that borrowers could receive a loan larger than the value of the property they were buying without providing any down-payment. These looser lending standards made it possible for lower income groups to purchase residential property and consequently boosted mortgage demand. Bank collateral rules can also influence mortgage demand. They specify how a change in the market value of a house affects the ability of a household to borrow. If these rules for home equity loans are

loosened, it becomes easier for households to borrow against their housing assets. As a result, credit constrained households increase their borrowing for both consumption and housing."(p. 197-198)

In order to try to replicate this kind of lenders' and borrowers' behavior we tied the supply of loans of the banking sector to the price of the housing market. The idea behind this choice is that since the value of the house have been increasingly used as a collateral to borrow, both by who already have a house and by who was entering in the housing market for the first time, and the banking sector have increasingly accepted the value of the house as a collateral to extend credit, we decide to tie the credit access of the workers households to the price of the housing market.

The credit supply of the banking sector is now $SL = L_f + L_R + L_w \cdot \rho$ where ρ is the credit access for the working households. Instead of having a given value, ρ is equal to the price of the housing market, multiplied by the willingness of the banking sector to accept the value of the houses as collateral.

In this simulation, we start from a situation in which the banking sector's willingness to accept the value of the house as collateral is low to a situation in which banks extend credit for the entire value of the house used as collateral.

With this extension, we try to replicate the type of feedback loops dynamic that we have described in section 2.4. The interaction between the price of the housing market, the credit access of the working households, the demand for housing by the household sector, the new supply of housing and the accumulation of debt in the balance sheets of the household sector generates a series of feedback loops. The feedback loops create a cycle driven mainly by the price of the housing market and the credit extended by the banking sector.

Fig. 9

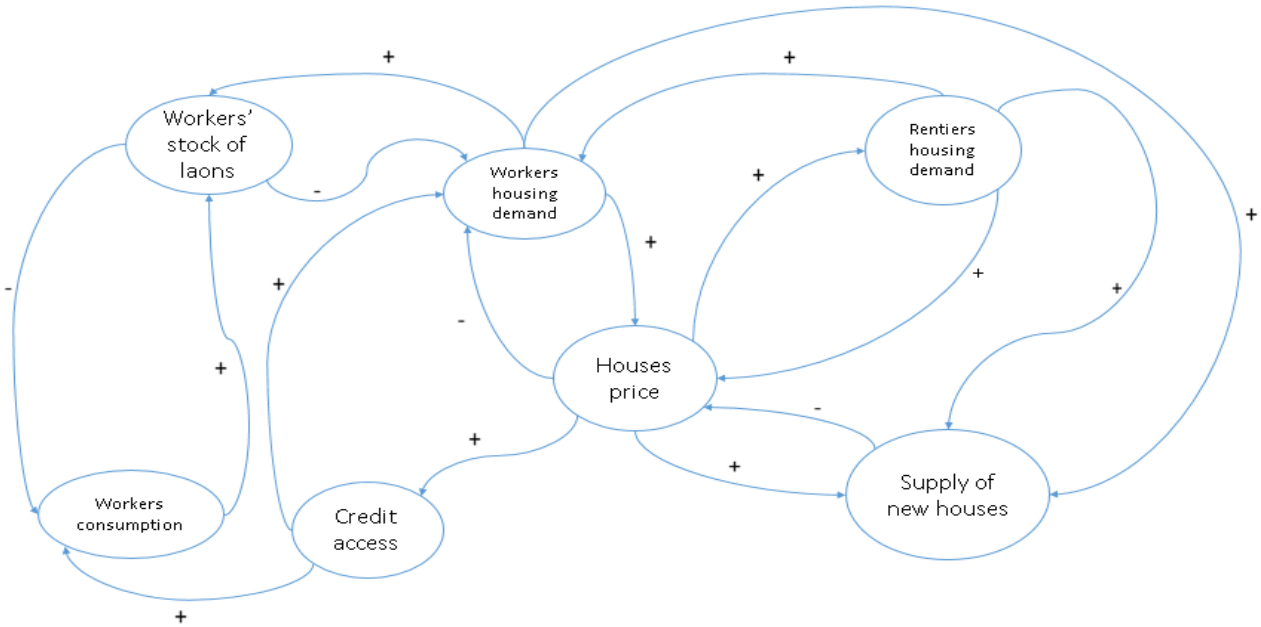


Figure 8 shows the "core" of the feedback loops dynamics generated by the model. Every arrow with a plus indicated that the variable from which the arrow springs has a positive effect on the variable to which the arrow arrives, every arrow with a negative sign means the opposite.

The feedback dynamic can starts from different points; in our simulation, we let it start with an increase in the credit access of the workers' households. Banks decide to accept all the value of the house as collateral when they decide to lend money. The direct impact of the increase in credit access by workers household is an immediate increase in both consumption and demand for houses. The increase in demand for houses pushes up the price of the housing market. With the increase in houses price, we have the first feedback loop. The increase in price generated by the increase in demand for housing feeds back to the credit access increasing the ability of households to borrow and increasing the willingness of banks to lend; this stimulates both consumption and demand for housing. At the same time, the increase of houses price increase the demand by Rentiers households since they see the house as a particular "financial asset". The increase in Rentiers' demand for houses puts additional pressures on the price, which feeds back stimulating the demand for housing by the rentiers. At the same time, it increases the demand for houses by workers, since they try to emulate what is considered the average "consumption" of housing.

Now we must consider the counteractive dynamics of the feedback loops that stabilizes the system. While the increase in the price of the housing market increases the demand for Rentiers' households, it puts downward pressures on the demand for houses by workers households. At the same time, the increase in the price of housing and the increase in demand for housing both stimulate the supply of new houses. The new "flow" of construction of houses puts downward pressures on the price.

As borrowing for workers household increase, the stock of debt in their balance sheets increase as well. While fresh borrowing increases spending, an increasing stock of debt reduces the ability to spend because more resources must be directed to pay back the debt. Therefore, the increasing stock of debt accumulated puts downward pressures on consumption and housing demand by workers.

There are, therefore, some counteractive forces at works, generated endogenously by the feedback loops dynamics. These forces put downward pressures on these dynamics. The result of this interaction is a cycle driven by the price of the houses and the credit extended by the banking sector.

Fig. 10

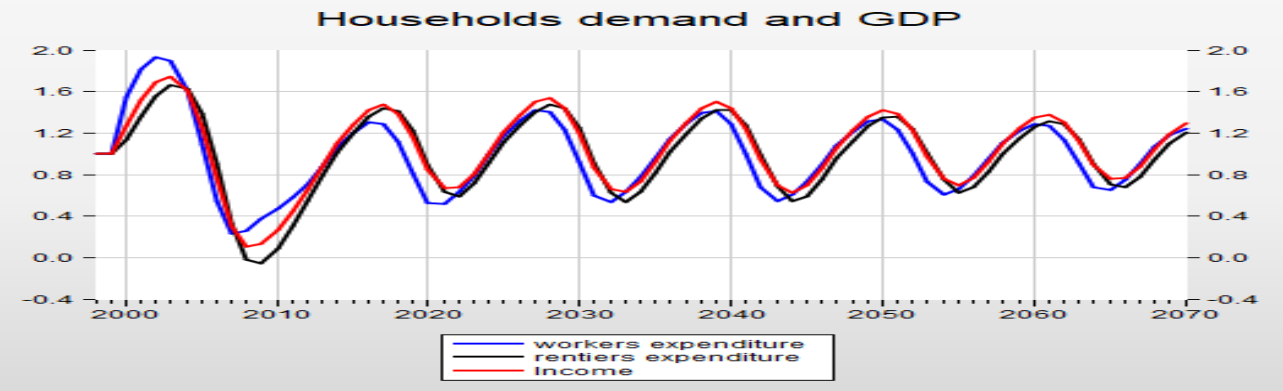


Figure 10 describes the evolution of households' expenditure and of the GDP. Households' expenditure includes both consumption and demand for housing. Workers' household expenditure explodes after the shock. Rentiers' households expenditure increases slowly and the fluctuations are less accentuated if compared to the fluctuations in workers' household expenditure.

Fig. 11

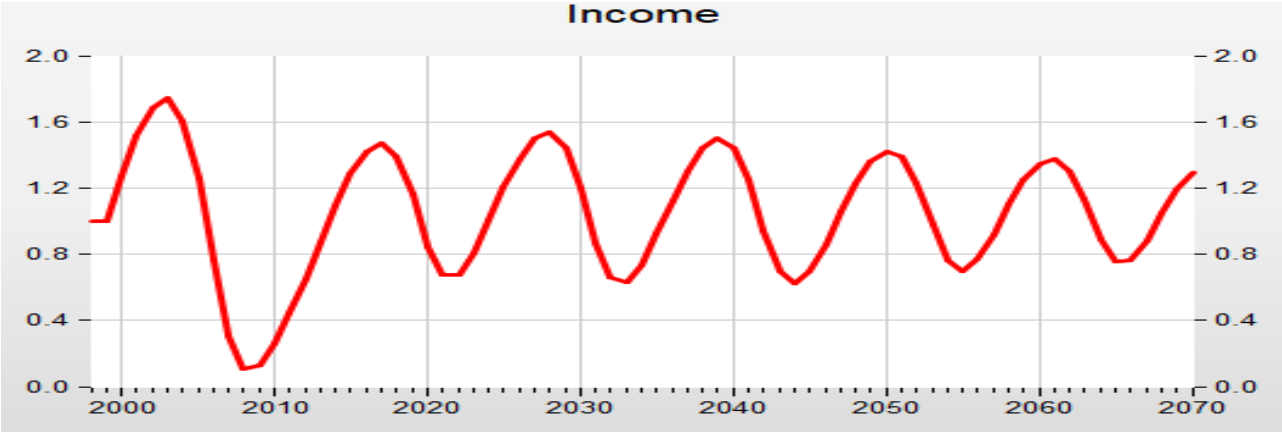


Figure 11 shows the cycle of the GDP, after the shock the economy experience a big first fluctuation. After the first fluctuation, the economy starts to fluctuate regularly. A complete cycle lasts for more than fifteen periods.

Fig. 12

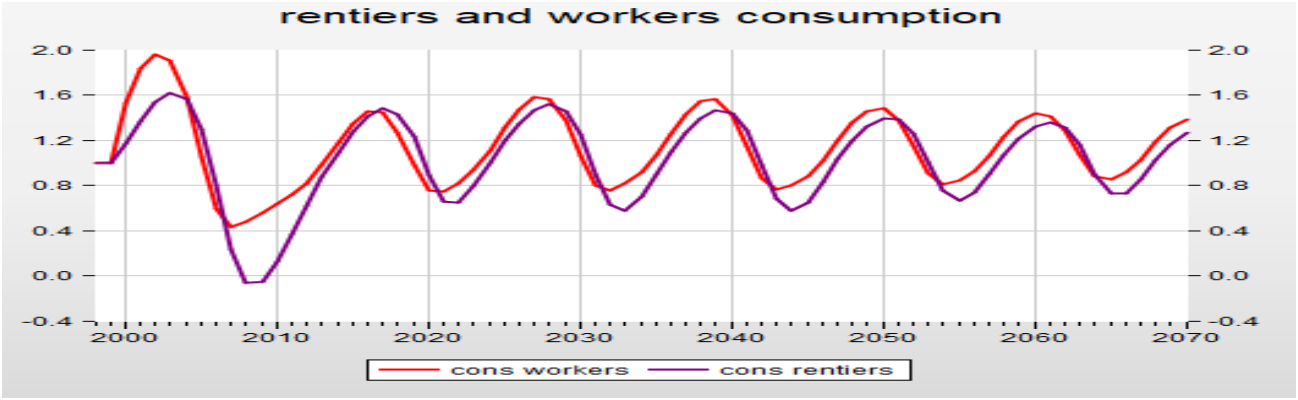
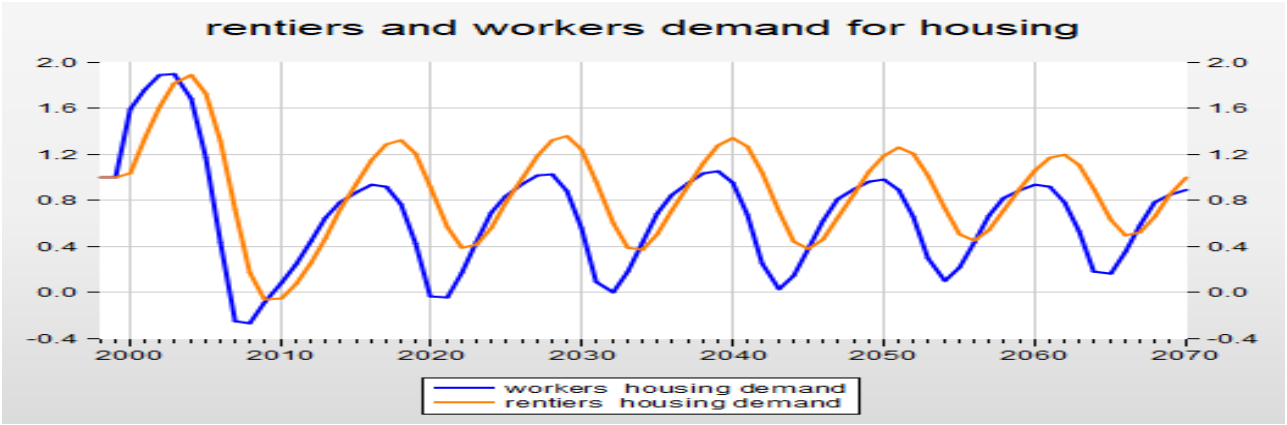


Fig. 13



Figures 12 and 13 show the dynamics of the expenditure of both Rentiers and Workers households. Workers' consumption fluctuations are larger than the fluctuations of Rentiers households, this is because a portion of workers' consumption is related to the credit access so it is influenced by what happens in the credit market. Workers' demand for housing have large fluctuations, it reaches negative values in the first fluctuation, and it is one of the main drivers of the business cycle

generated by the simulation. Rentiers' demand for housing fluctuations are less accentuated, but the downward peak of the GDP are associated with the downward peak of the Rentiers' demand for housing.

Fig. 14

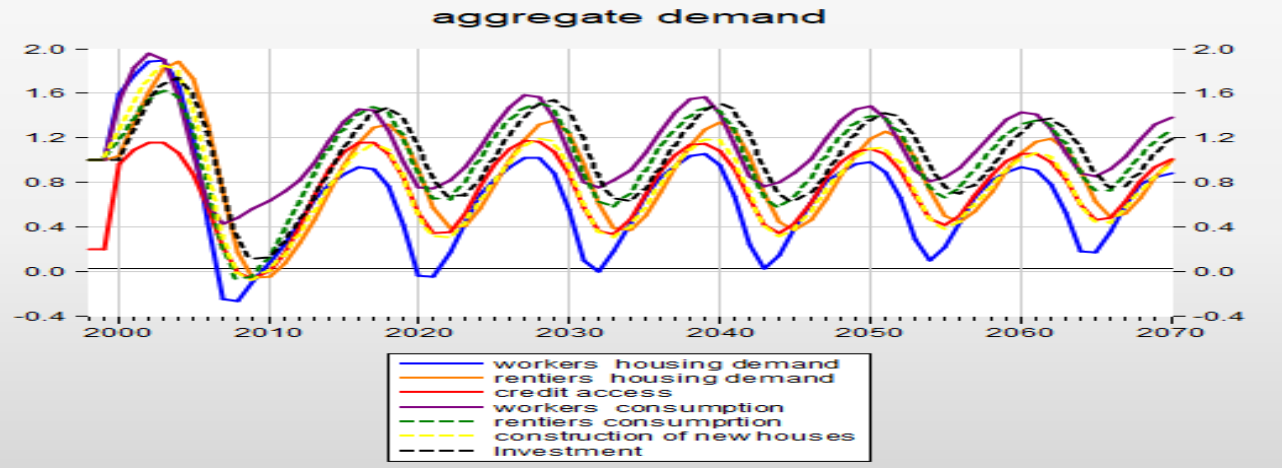


Figure 14 shows all the components of the aggregate demand, the business cycle seems to be driven mainly by fluctuations of housing demand by both types of households, by fluctuations in housing construction and their impact on the credit access.

Fig. 15

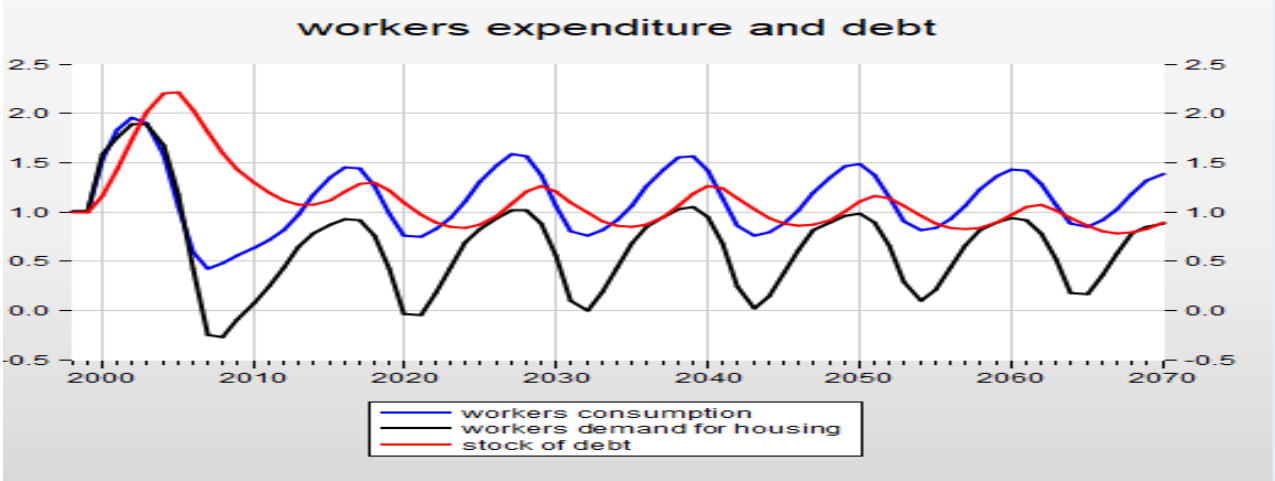


Figure 15 shows how expenditure decisions by worker households are reflected in the accumulation of the stock of debt in their balance sheets. Workers' consumption is related to their demand for housing since they use the value of their house to borrow in order to consume more.

Fig. 16

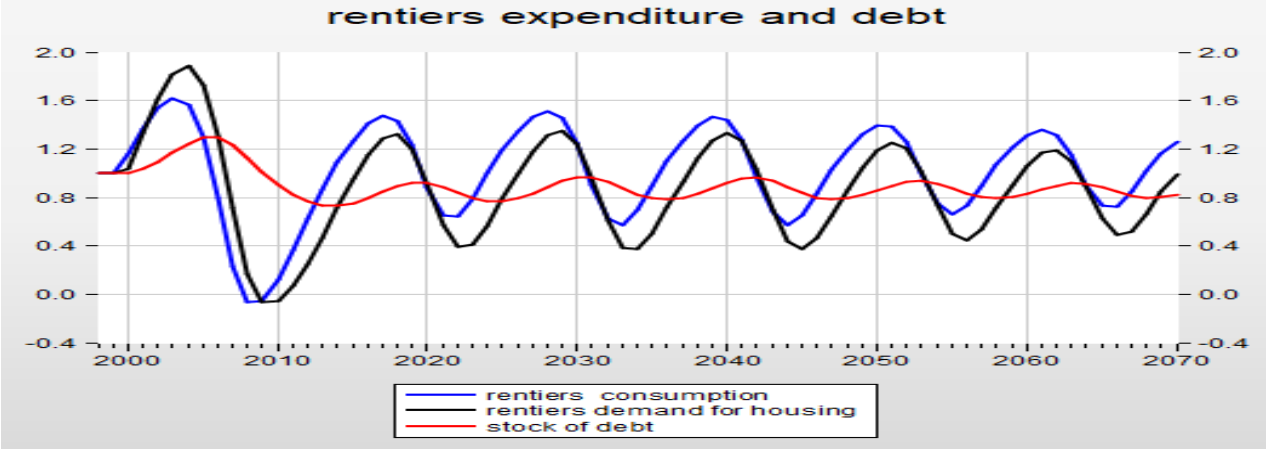


Figure 16 shows how expenditure decisions by Rentiers households affect the accumulation of the stock of debt in their balance sheets. One interesting result is that, since Rentiers households decide to invest in the housing market and to use the house as collateral to borrow more, the stock of debt in their balance sheets shows large fluctuations. This is an interesting result since fluctuations in our economy are not only driven by workers' households expenditure and debt accumulation, Rentiers' expenditure decisions, and debt accumulation plays an important role in feeding the feedback loops dynamic.

Fig. 17

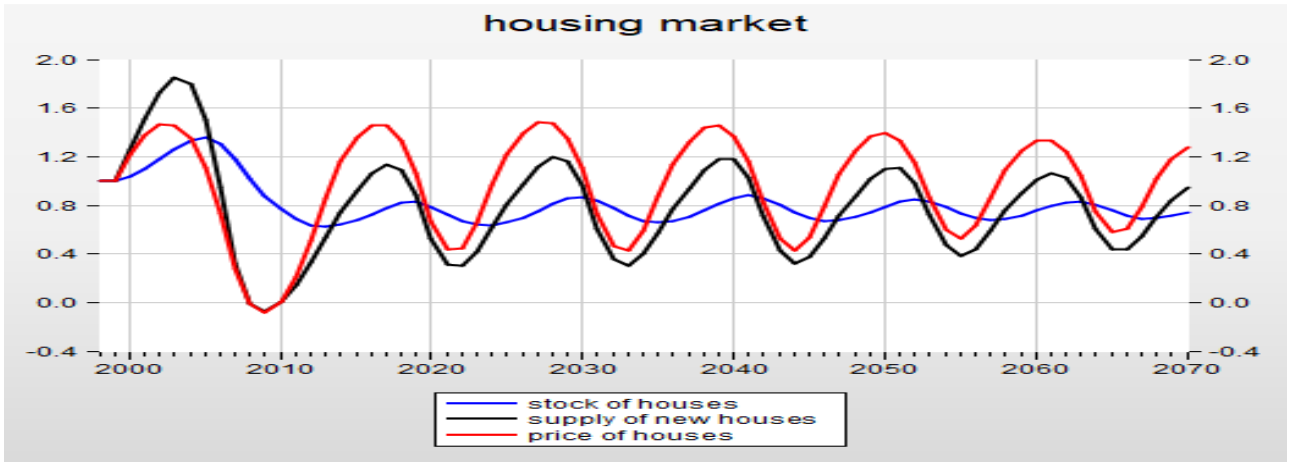


Figure 17 describes the impact of the feedback loops dynamics on the housing market. Housing price increase after the shocks and shows large fluctuations. The peak of the stock of houses precedes the peak of the houses' price, while the peak of the price of houses precedes the peak of the supply of new houses. As we explained above the increase in the houses price stimulates the supply of new houses, at the same time the increase of the supply of new houses puts downward pressures of the prices because it increases the stock of existing houses.

Fig. 18

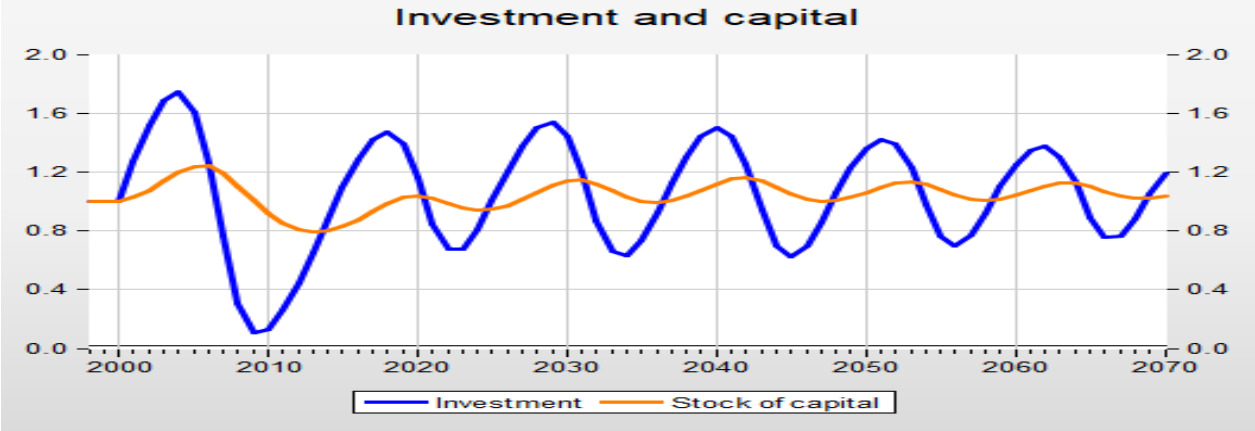


Figure 18 shows the evolution of investment and the stock of capital, as we said above investments shows large fluctuations with the stock of capital that follows the dynamic of the investment.

Fig. 19

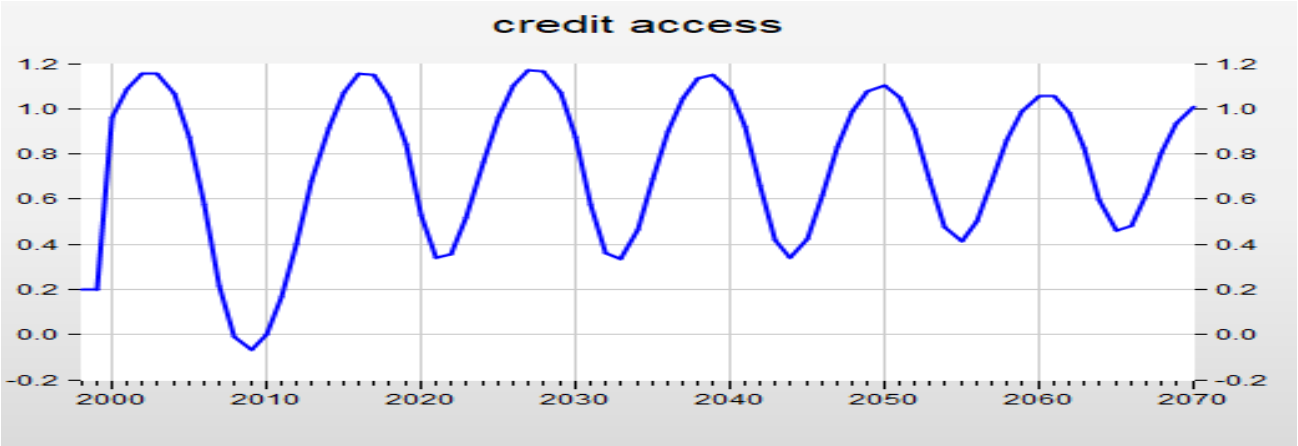


Figure 19 describes the evolution of the credit access of worker households. Before the shock credit access is low. After the shock banks increase their willingness to accept the value of the houses as collateral to borrow. Credit access in this framework is completely driven by the house's price and by the willingness of the banking sector to extend credit. As we explained above, the relation between credit access and the price in the housing market generates a dynamic where an increase of one of these variables feeds back on the other variable generating a self-reinforcing feedback loop.

The simulation is able to show how the interaction between households' expenditure, the banking sector's willingness to lend, and the value of a collateral, such as the value of the houses, can generate a credit-driven business cycle in which the upswings and downswings phases are all generated within the model.

Conclusion

In the paper we have tried to describe how some of the dynamics that were in place during the Great Moderation periods have created, in some particular countries, a growth model based on asset inflation and consumption financed by debt. While this “demand generation” process based on credit expansion and rising prices of financial and real assets allowed Anglo-Saxon economies to perform reasonably well during all the Great Moderation, it is now clear how this model was jeopardizing future growth. A model based on persistent debt build-up to finance expenditure will experience, sooner or later, the contractionary side of a debt-led expansion.

We have tried to describe these dynamics both by looking at the existing literature and by a macroeconomic model. In the model, we build an environment composed of four sectors: firms, banks, households, and a housing market. While the model is very simple, the interaction between the demand for loans by households to finance expenditure, the lending practice by the banking sector, and the price of houses can generate some interesting results. The model can show how a credit supply shock can generate a boom-bust dynamic, the initial increase in borrowing stimulates the economy by the aggregate demand effect, but the stock effect of the accumulation of debt puts contractionary forces reversing the boom into a recession. The interesting result of this dynamics is that the economy does not return to the steady-state equilibrium where it was before the shock, the new steady-state equilibrium is lower. This result shows how a debt-led expansion can have a persistent effect on the economy when the trend is reversed and the contraction begins.

In a second experiment, we try to simulate a financial accelerator dynamic. With the second experiment, we aim to fill the gap between the existing literature on the financial accelerator and post-Keynesian models. We tied the credit access of the workers’ households sector to the price of the housing market. The main result is that the feedback loops generated by the interactions between the households sector, the banking sectors, and the housing market can generate a cycle driven mainly by the demand for housing by households, the level of lending by the banking sector, and the prices of the housing market.

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Appendix

In the appendix we present the value of the parameters for the simulations.

First simulation:

Firms and housing market

ω=0.3 portion of gap between the actual stock of capital and the target level of capital closed by the firms

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

η= 0.2 depreciation rate of capital

Φ =0.75 profits retantion rate by firms

ω_h =0.1 portion of demand of houses affecting the construction of new houses

Ω = 0.1 supply of new houses affected by the price

$\eta_h = 0.1$ depreciation of houses

Rentiers Households

α =0.4 propensity to consume out of income

β=0.2 propensity to consume out of wealth

γ= 0.2 principal repayment portion

iL=0.02 interest on loans

σ_{Rh} =0.03 demand for housing out of wealth Rentiers

σ_{Rph} =0.6 impact of a change in houses price on Rentiers' housing demand

ξ =0.3 consumption out of houses

Dh_R^e =100 exogenous demand for housing rentiers

Workers households

α=0.7 propensity to consume out of income workers

β=0.4 propensity to consume out of wealth workers

γ=0.2 principal repayment portion

iL=0.02 interest repayment on loans

σ_{wh} =0.3 demand for housing out of wealth workers

ϑ =0.1 impact of a change in houses price on workes' housing demand

ς =0.75 consumption out of value of houses

Dh_w^e =50 exogenous demand for housing workers

Ψ= 0.8 demand of houses out for “social status”

Second simulation

Firms and housing market

ω=0.3 portion of gap between the actual stock of capital and the target level of capital closed by the firms

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

η= 0.1 depreciation rate of capital

Φ =0.75 profits retantion rate by firms

ω_h =0.13 portion of demand of houses affecting the construction of new houses

Ω = 0.03 supply of new houses affected by the price

ϕ_h =0.85 profits retention rate housing market

$\eta_h = 0.13$ depreciation of houses

Rentiers Households

α =0.4 propensity to consume out of income

β=0.2 propensity to consume out of wealth

γ= 0.2 principal repayment portion

iL=0.02 interest on loans

σ_{Rh} =0.03 demand for housing out of wealth Rentiers

σ_{Rph} =0.6 impact of a change in houses price on Rentiers’ housing demand

ξ =0.45 consumption out of houses

Dh_R^e =100 exogenous demand for housing rentiers

Workers households

α=0.7 propensity to consume out of income workers

β=0.2 propensity to consume out of wealth workers

γ=0.2 principal repayment portion

iL=0.02 interest repayment on loans

σ_{wh} =0.55 demand for housing out of wealth workers

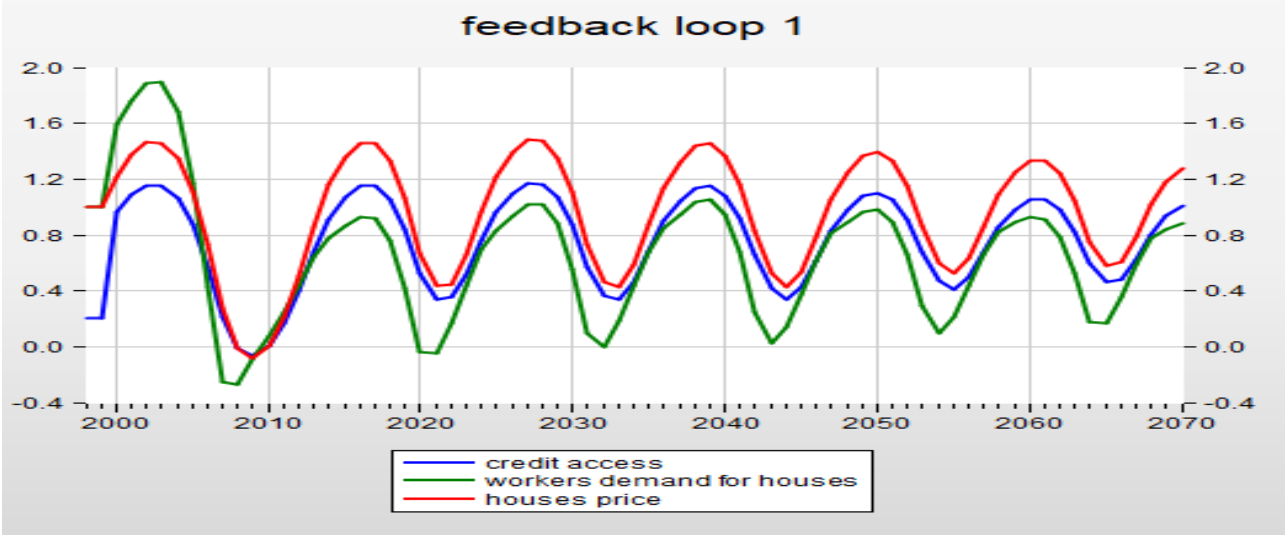
ϑ =0.1 impact of a change in houses price on workes’ housing demand

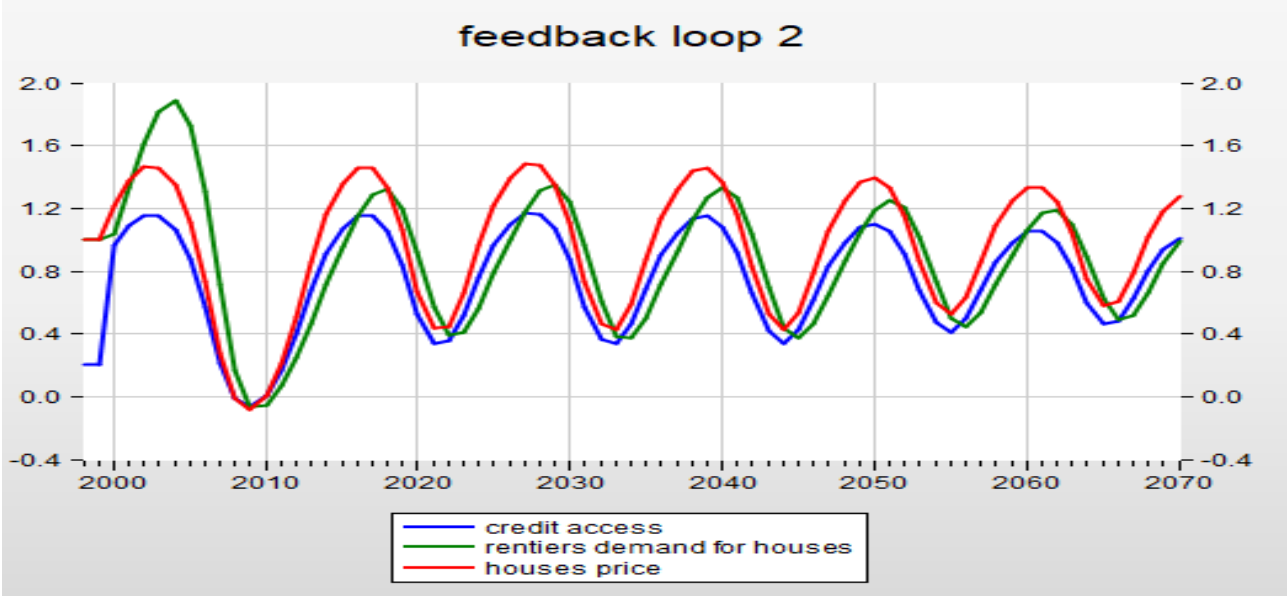
ς =0.5 consumption out of value of houses

Dh_w^e =50 exogenous demand for housing workers

Ψ= 0.7 demand of houses out for “social status”

Additional graphs





CREDIT SUPPLY SHOCKS, INEQUALITY AND LEVERAGE CYCLE IN AN OPEN ECONOMY

Introduction

Since the beginning of the so-called "financialization period" the most advanced countries have seen different structural changes affect their economy. Income distribution has shifted from labor to capital and from low and middle income to high income. Firms have started to be more financial oriented in their behaviour and in their management. Household expenditure has become related to the credit access and to the value of the real and financial assets in their balance sheets. The liberalization of capital flows has increased the possibility of carry-trade and of large capital movements seeking high returns in the international money and capital markets.

Under these structural changes, two main different aggregate demand regimes have emerged. Anglo-Saxon countries, as well as some of the periphery of Europe, have experienced what has been a called debt-led private demand boom regimes. This kind of regime is based on the important role played by the private sector, especially the household sector, in generating the level of demand needed by the economy in order to grow, by borrowing. In these countries, the household sector has seen a constant increase in the stock of debt in their balance sheets. With the increasing dependence on households' debt-financed consumption, these economies have seen both an increasing deterioration of their trade balance and an increase in their vulnerability to any sudden decrease in the supply of credit and consumption.

Other countries have experienced what has been called an export-led demand regime. For these economies, the growth of GDP has been driven mainly by their ability to increase their export in the face of domestic demand stagnation.

These two demand generation process have been interconnected through their external account. Export-led demand regime countries rely on their ability to sell goods to the rest of the world while the debt-led private demand boom regime needs foreign countries to meet the fast growth in domestic demand.

The development of this interconnection has increased the possibility of financial fragility and contagion by different channels of different kind.

After have described all these structural changes and their impact on the macroeconomic performances we develop an open economy Stock-Flow Consistent model.

The model is composed of two economies, each economy has four sectors: households, banks, firms, and a government with its central bank. The household sector is divided into two in order to study differences in income, consumption and investment behavior.

We perform two different experiments, in the first one we let increase the supply of credit in one country in order to detect what is the "international" impact of a credit supply shock. In a second experiment, we study the different effects of an income distribution shift when households have different access to credit.

2 Financialization

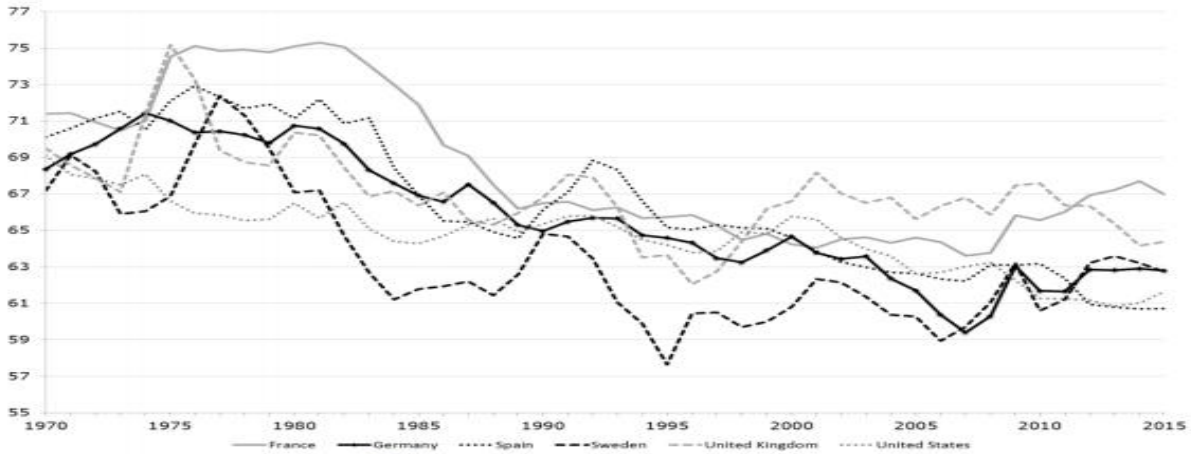
The period from the late '70s until the beginning of the financial crisis of 2007 has been described by some authors as the Financialization period. The term "Financialization" is often associated with the increasing importance played by financial institutions and financial practices.[82]

Besides the increasing relevance of finance in economic life, Financialization has brought some structural changes in most of the advanced economies.

2.1 Distribution of income

With regard to the distribution of income, since the late 1970 and early 1980 until the financial crisis of the 2007/2008 income distribution has seen a shift from labor to capital[83]. The Graph below shows the evolution of the functional distribution of income for some advanced economies

Fig. 1 Adjusted wage share (percentage of GDP at factor costs)



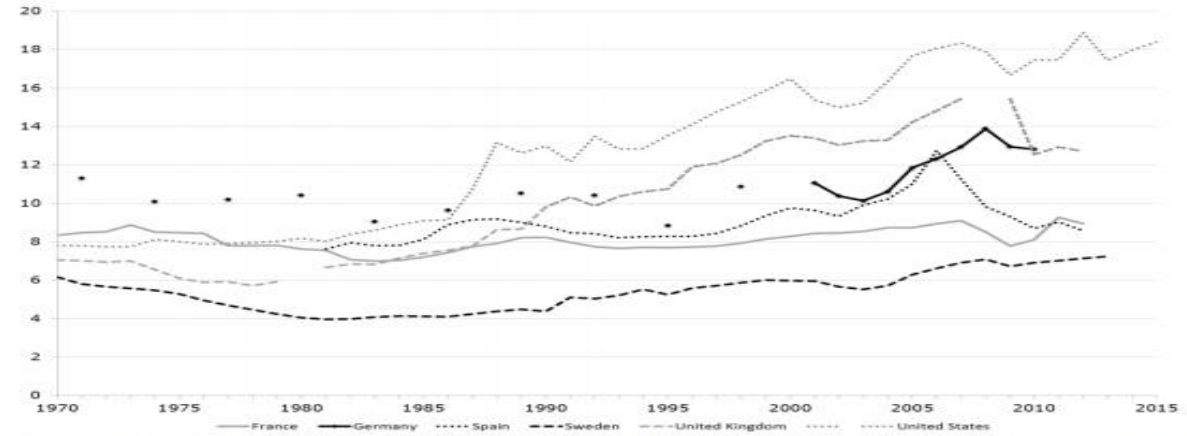
Note: The adjusted wage share is defined as compensation per employee as a share of GDP at factor costs per person employed. It thus includes the labour income of both dependent and self-employed workers, and GDP excludes taxes but includes subsidies.
Source: European Commission (2016), our presentation.

All the countries considered in the graph have experienced a decrease in the wage share since the late '70s, most of the "redistribution" took place during the '80s. At the same time, there was an increase in the Top 1 percent income share. As Hein pointed out:

"In the US and the UK, already starting in the early 1980s, the top income share experienced a remarkable increase until the financial and economic crisis of 2007-9. In the case of the US, the rise was driven by a rise in top management salaries, in particular (Hein 2015). In Spain, Germany, Sweden, and France the top 1 percent income share only started to rise in the 1990s or even the early 2000s, but it increased as well until the crisis 2007-9, but not to the same level as in the US or the UK."

[82] As Epstein (2001) defines it :"Financialization refers to the increasing importance of financial markets, financial motives, financial institutions, and financial elites in the operation of the economy and its governing institutions, both at the national and international level." (p. 2)
[83] Hein, E. Dodig, N. 2015. "*Finance-dominated capitalism, distribution, growth and crises – long-run tendencies*", in: Hein, E. Detzer, D. Dodig, N. eds. The Demise of Finance-dominated Capitalism: Explaining the Financial and Economic Crises. Cheltenham (UK): Edward Elgar

Fig. 2 Top 1 percent income share (percent of pre-tax fiscal income without capital gains)



Note: For France, Germany, Spain, Sweden, and the USA, top income shares relate to tax units; in the case of the UK, data covering the years 1970 until 1989 comprise married couples and single adults and from 1990 until 2012 adults.
Source: The World Wealth and Income Database (2016), our presentation.

More in general: during the financialization period most of the advanced economies have seen, an increase of the gross profit share including dividends, interest payment, and retained profits by firms. As for the personal income distribution, there has been an increase in the inequality between wages and top management and high incomes[84].

Some explanations of this polarization of the distribution of income are:

*"Falling bargaining power of trade unions, rising profit claims imposed in particular by increasingly powerful rentiers, and a change in the sectoral composition of the economy in favour of the financial corporate sector at the expense of the non-financial corporate sector or the public sector with higher labour income shares." (*Hein 2015, p.2)

2.2 Financialization of the firms

Another structural change determined by the process of financialization is the changing relationship between nonfinancial firms and the financial markets.

During all the period of the financialization, nonfinancial firms have been increasingly interested in investing in financial markets, in stocks and bonds, and in creating financial subsidiaries, rather than investing in the acquisition of new machinery[85]. For these reasons the income deriving by these operations has increased during all the period.

Orhangazi 2008 argues that this changing behavior of nonfinancial firms was due to:

"changes in corporate governance, starting with the hostile takeover movement of the 1980s and proceeding to the so-called shareholder revolution of the 1990s"

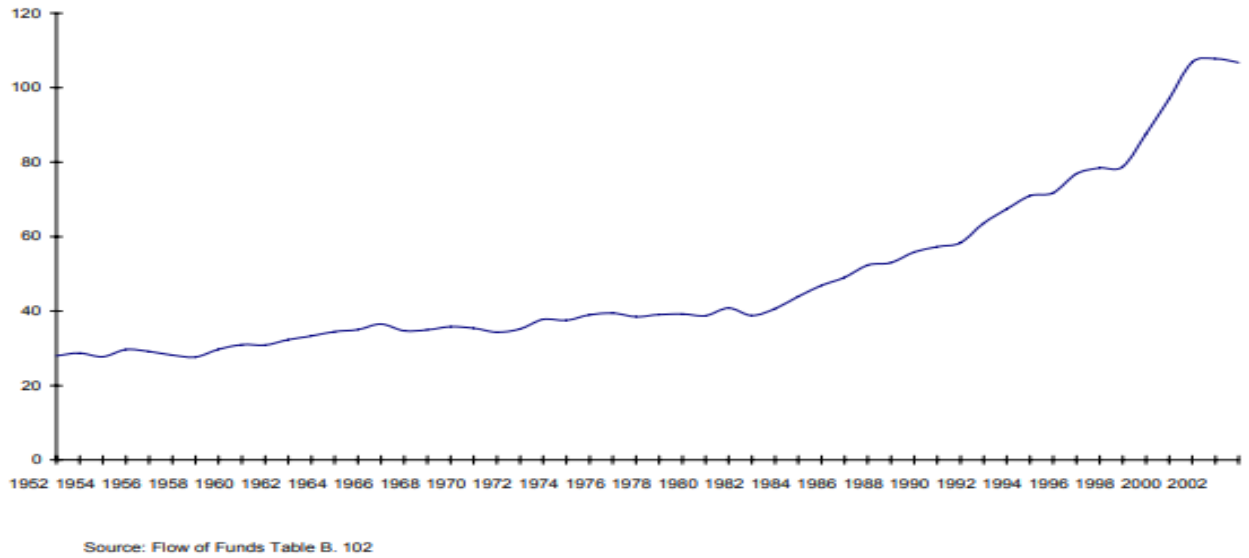
[84] Ibid.
[85] Dodig, Hein and Detzer. Financialisation and the financial and economic crises: Theoretical framework and empirical analysis for 15 countries. Fessud financialization, economy, society and sustainable development Working Paper Series No 110

Figures 3 describes the level of financial assets as a percentage of tangible assets for Non-Financial Corporations. Since the early '80s the level of financial assets held by non-financial corporations has increased constantly compared to the level of tangible assets[86].

Figures 4 shows the level of "financial income" received by non-financial corporations as a percentage of the internal funds held by the firms.

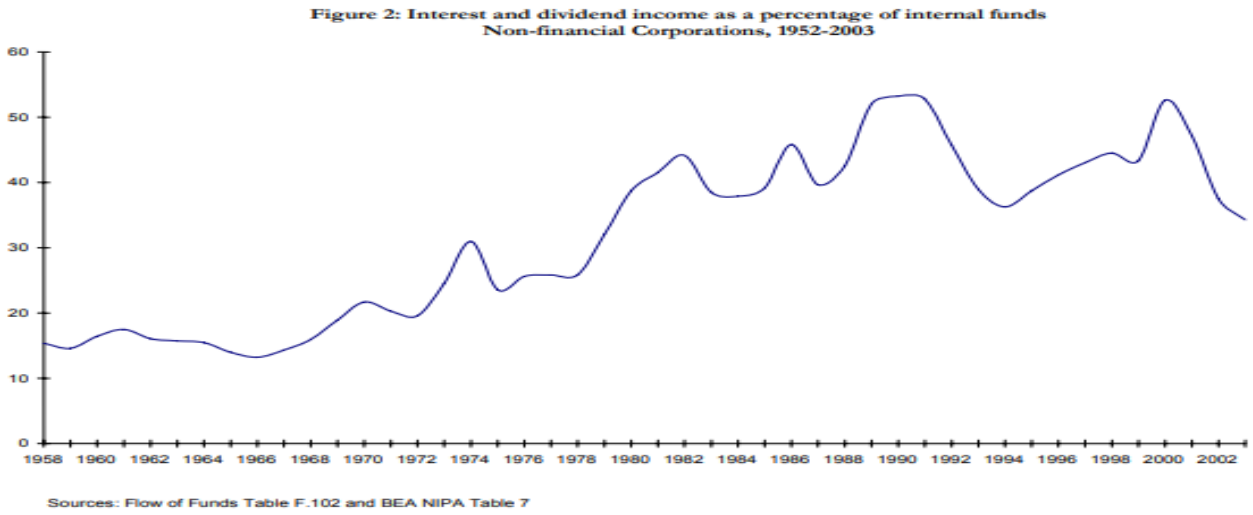
Both figures show how the behavior of non-financial firms was more oriented towards "financial management"[87].

Fig. 3



Financial assets as percentage of tangible assets, Non-financial corporation[88]

Fig. 4



[86] Orhangazi, Ö. (2008): Financialisation and capital accumulation in the non-financial corporate sector: a theoretical and empirical investigation on the US economy: 1973-2003, Cambridge Journal of Economics, 32: 863-886

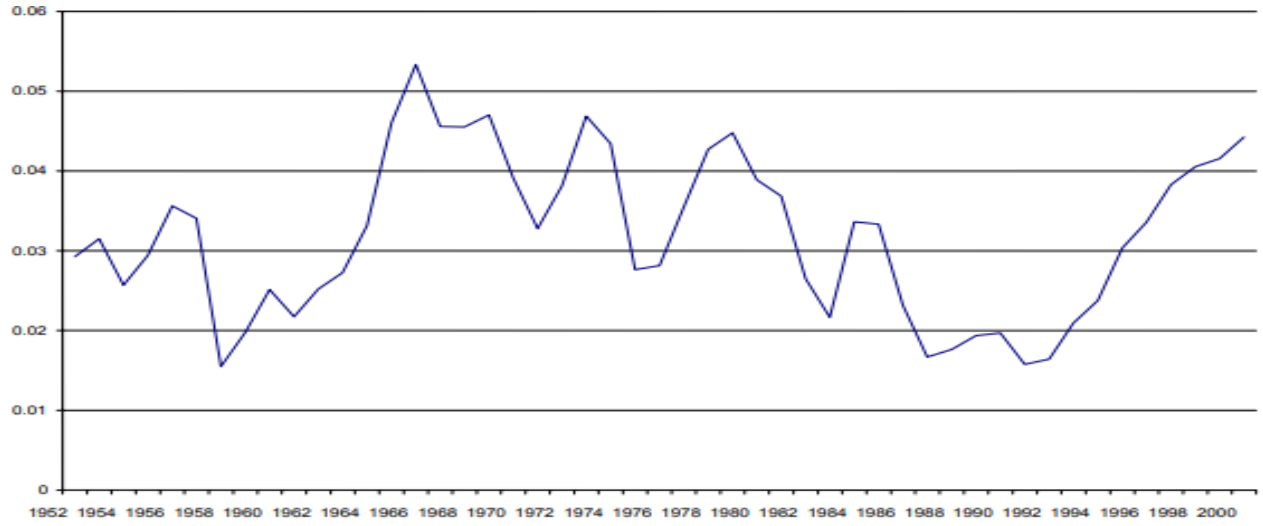
[87] Ibid.

[88] Ibid.

Interest and dividend income as a percentage of internal funds, Non financial corporation [89]

Figures 5 shows the evolution of net investment in non-residential fixed assets by non-financial corporations. The level of net investment during the financialization period was low, with an increase in the period of the high-tech bubble of the mid- '90s.

fig. 5



NFC Net Investment in Nonresidential Fixed Assets (annual percent change) Non-financial corporation

The shift from "real investment" towards investment in financial assets can have different explanations. As Hein 2015 pointed out, the increasing power of the shareholders:

"has imposed short-termism on management and has caused a decrease in management's animal spirits with respect to real investment in capital stock and long-run growth of the firm and increasing preference for financial investment, generating high profits in the short run. On the other hand, it has drained internal means of finance available for real investment purposes from non-financial corporations, through increasing dividend payments and share buybacks in order to boost stock prices and thus shareholder value." (Hein 2015, p. 2)

2.3 Debt-financed consumption and keeping up with the Joneses

Another interesting transformation generated by the financialization has regarded consumption. The increasing availability of credit, besides a constant increase in some particular classes of assets, especially housing and financial assets, has created an environment for a wealth-based debt-financed consumption. At the same time increasing income inequality has increased what has been called "*expenditure cascade*" or "*trickle-down consumption*". The polarization of income in the

[89] Orhangazi, Ö. (2008): Financialisation and capital accumulation in the non-financial corporate sector: a theoretical and empirical investigation on the US economy: 1973-2003, Cambridge Journal of Economics, 32: 863-886

hands of the richer part of the population has increased the willingness of the "poorer" portion of the population to look at those higher in the income scale to decide how much to consume.

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, 1840)

Christen and Morgan (2005) have shown how increasing income inequality has created the need for low and middle-income households to borrow in order to "keep up" their consumption level to what was considered the "norm"[90].

The increasing use of borrowing in order to consume more than the disposable income was enabled by a loosening in banks' credit standards and by the increase in the value of some particular classes of assets in the balance sheets of most of the population.

Increasing asset prices have increased the "notional" wealth of the households. Against this increase of the value of the assets households have started to borrow in order to finance additional spending. This increased ability to spend in the face of rising asset prices can generate feedback loop dynamics. As explained by Bhaduri:

"Rising asset prices result in a wealth effect by enhancing the creditworthiness of the private borrowers in the eyes of lending banks and other institutions who become more solvent, and therefore in a more comfortable position to lend. As a result, both borrowers and lenders reinforce mutually tendencies for credit to expand. The result is a private debt-financed boom, which also differs from the Keynesian policies of public debt-financed economic expansion." (Bhaduri 2011, p. 8)

This increased ability to borrow has been able to lower the contractionary impact of the shift in income distribution in favour of the richer part of the population, and the depressive effect of the decline of net-investment by the firms.

It is important to highlight the fact that the increase in wealth that leads to an increase in consumption is largely notional since at the macroeconomics level large capital gains cannot be realized without putting "*bearish pressures*" on the prices of the assets[91]. The impact of rising asset prices must come necessarily by an increasing willingness of the financial markets to accept these assets as collateral[92].

As showed by several works, during all the period of financialization there have been changes in financial norms of the banking and financial sector which became more willing to lend. New financial instruments were created; new financial practices, like the securitization of mortgages and other

[90] Christen Markus, Ruskin M. Morgan Keeping Up With the Joneses: Analyzing the Effect of Income Inequality on Consumer Borrowing Quantitative Marketing and Economics June 2005, Volume 3, Issue 2, pp 145–173

[91] Amit Bhaduri, Srinivas Raghavendra and Vishwesha Guttal "On the Systemic Fragility of Finance-Led Growth" Metroeconomica 66:1 (2015)

[92] Ibid.

types of debt, have lowered the creditworthiness standards. These changes have made credit increasingly available to the households sector.

2.4 Global dimension of financialization

Another important change brought about by the process of financialization was a growing international interconnection among countries. As Stockhammer pointed out:

"The liberalization of international capital flows has lead to increased volatility of exchange rates, often culminating in violent exchange rate crisis. This has lead to a rich debate on the effects of capital flows liberalization or, more broadly, of financial globalization"(Stockhammer 2010, p. 6-7)

Financialization allowed capitals to move more freely from one country to another. This has created the ability for international investors to engage in what has been called "carry trade" or interest arbitrage. Carry trade involves borrowing in one currency and invest, or lend, in another. This means that assets and liabilities are denominated in a different currency, in this situation exchange rates movement can have a negative effect on international investors, and even firms and banks, balance sheets[93].

Financial globalization has created an environment in which the exchange rate is driven mainly by international capital flows looking for possible profits. The sensitivity of balance sheets on exchange rate movements has created an international financial environment where any perceptions of possible devaluation can lead to large capital outflows. This has caused frequent exchange rate crises created by large capital outflows[94].

The second evolution brought about in the international dimension by the financialization has been an increasing ability for some countries, most of all the US, to run chronical current account deficits and surpluses. The ability to run current account deficit for a long period in some specific countries was due to their ability to attract capital inflows.

As we will show in the paper this international dimension of financialization have created the possibility of different kind of regimes. One of the problems of this international dimension and differentiation of demand regimes is that it can be sustained as long as international financial markets are calm enough to sustain capital flows among countries[95]. By contrast, this has increased the contagion and transmission channels of financial crisis generated in one specific country.

[93] Engelbert Stockhammer "Financialization and the Global Economy" Working Papers from Political Economy Research Institute, University of Massachusetts at Amherst 2010
[94] Ibid.
[95] Ibid.

3 Different demand regimes under financialization

The institutional and structural changes described above have affected advanced economies in different ways. In this section, we analyse how financialization has created different "aggregate demand regimes", how these regimes are interconnected and their contribution to the increasing fragility that has led to the global financial crisis.

In our perspective, the demand generation process is a key dynamic in order to understand the sustainability of the growth path of an economy. With the analysis of the sources of demand for goods and services, we can understand if the expansion of the production is based on a sustainable generation and distribution of income.

The demand regime analysis has been a unifying topic for the Keynesian and post-Keynesian literature. Since the work of Bhaduri and Marglin 1990, the focus on the demand regimes was on the difference between wage-led and profit-led growth. If, after a rise in the wage share, the expansionary effect on consumption is greater than the negative effect on investment and export, a country is considered wage-led. If the net effect on aggregate demand for an increase in the wage share is negative the country is considered to be profit-led.
More in general, the literature on the demand regimes takes into account the contribution to the growth of the main demand aggregates: consumption by households and by the public sector, investment by firms and demand for goods and services from abroad.

During the financialization period, there have been identified two additional demand regimes, the debt-led private demand boom regimes, and the export-led demand regimes[96]. These two new "types" of capitalism are complementary since the debt-led private demand boom regimes are characterized by current account deficits and the export-led demand regimes rely on current account surpluses in order to grow. In this section, we analyze these two demand regimes and show how they are interconnected.

3.1 debt-led private demand boom regime

The debt-led private demand boom regime is characterized by a strong deficit position of the households sector, in some countries accentuated by corporate sector deficits. The deficit position of the households sector is a natural consequence of the constant use of borrowing to finance expenditure on consumption and investment in housing[97].

[96] Dodig, Hein and Detzer. Financialisation and the financial and economic crises: Theoretical framework and empirical analysis for 15 countries. Fessud financialization, economy, society and sustainable development Working Paper Series No 110
[97] Ibid.

In this kind of demand regime, the GDP is led primarily by household consumption and investment in real estate by the household sector. What happened to the U.S. economy in the years before the financial crisis is a typical example of a debt-led private demand boom regime. By 2006 consumption, was over 70% of U.S. aggregate demand, during the twenty-five years (1982-2007) before the recession consumption accounted for 70.8 percent of real GDP. The consumer share of U.S. GDP on average during the '80s, '90s, '00s grew from 64.6% to 67.3% and 70.0% while investment decreased from 20.3% to 18.9% and 18.6%. During the 10 years until the "pre-recession" quarter personal consumption expenditure (PCE) grew at a continuously compounded rate of 3.47 % while overall inflation annual growth of gross domestic product (GDP) averaged 2.91%. During the same period the remainder of the economy, Investment, net export, and government expenditure grew at only 1.70.[98]

Table 1: Changes in the financialization of households, 2000-2016

	Δ Household debt (%GDP)		Real house prices, growth	
	2000-2008	2008-2016	2000-2007	2007-2016
Austria	14.4	1.8	-0.3%	37.8%
Germany	-17.1	-6.0	-12.8%	18.2%
Netherlands	74.0	-4.4	23.2%	-17.8%
Mean (northern Europe)	23.7	-2.9.8	3.3%	12.7%
Greece+	56.8	31.3	52.4%	-43.8%
Ireland*+	118.9	-51.9	70.8%	-33.1%
Italy	27.1	6.6	45.1%	-26.1%
Portugal	42.1	-11.7	-10.5%	-13.8%
Spain	66.0	-32.9	106.6%	-36.6%
Mean (southern Europe)	62.2	-11.7	52.9%	-30.7%
Czech Republic+~	37.2	9.0		-1.2%
Hungary+	59.8	-28.7		-10.9%
Poland+#	39.7	12.7		-9.9%
Slovakia+	23.7	26.4		-4.7%
Slovenia*+	20.5	3.5		-24.5%
Mean (eastern Europe)	36.2	4.6		-10.2%
United Kingdom	63.2	-18.2	85.7%	-5.0%
USA	32.3	-24.6	35.2%	-8.3%
Mean (Anglo-Saxon countries)	47.7	-21.4	60.5%	-6.6%
Total mean	43.9	-5.8	39.5%	-12.0%

Stockhammer and Kohler 2019

Looking more broadly, following the empirical works of Stockhammer and Kohler 2019, in the period from the early 2000 and the beginning of the financial crisis, household debt as a percentage of the net disposable income increased by 23.7% in northern Europe, by 36% in Eastern Europe, by 47.7% for Anglo-Saxon countries and by 62.2% in southern Europe countries[99].

Stockhammer and Kohler 2019 divide the countries geographically. In their work they show how Northern Europe experienced a "weak financialization" of the household sector since the debt of

[98] Emmons William R "Don't Expect Consumer Spending To Be the Engine of Economic Growth It Once Was" Federal Reserve Bank of St. Louis

[99] Stockhammer Engelbert & Karsten Kohler, 2019. "Financialization and demand regimes in advanced economies," Working Papers PKWP1911, Post Keynesian Economics Society (PKES).

this sector was growing slowly in comparison to other countries[100]. The real house price growth did not increase in Northern Europe countries. The only exception for Northern Europe was the Netherlands, which experienced a massive increase in household debt and an increase in real house prices.

Tab 2. Real GDP growth, in percentage point, and growth contribution, in percentage point, average value

	USA *2001-2008*	UK *2002-2008*	Spain *2002-2008*	Estonia *1999-2008*	Greece *2002-2008*	South Africa *2000-2008*
Real GDP growth	2.1	2.5	3.1	5.8	3.5	4.2
Contribution to the increase of GDP of:						
Private consumption	1.7	1.7	1.6	3.8	2.6	3.0
Public consumption	0.3	0.5	0.9	0.5	0.7	0.9
Investment	0.2	0.4	1.1	2.8	1.1	1.6
Balance of goods and services	-0.1	-0.1	-0.7	-1.5	-0.8	-1.2

Source: European Commission (2015), World Bank (2015) for South Africa, own calculations

In their empirical work Dodig, Hein and Detzer 2015 analyzed different countries in order to detect if they belong to the debt-led private demand boom regime. In the graph above, they show the growth contribution of the aggregate demand component for the last trade cycle before the financial crisis. The six countries that have been taken into consideration show a strong contribution of household consumption to the GDP, relatively low contribution of the public sector expenditure and a negative balance of goods and services[101].

Tab. 3 sectoral financial balances as a share of nominal GDP, in percentage, average values for the trade cycle

	USA *2001-2008*	UK *2002-2008*	Spain *2002-2008*	Estonia *1999-2008*	Greece *2002-2008*	South Africa *2000-2008*
External sector	4.7	2.2	6.3	9.6	10.4	3.2
Public sector	4.3	-3.4	0.0	-0.3	-5.3	-0.5
Corporate sector	0.4	1.5	-4.2	-4.4	3.9	-2.8*
Private household sector	0.5	-0.3	-2.1	-4.9	-9.1	

** Financial balance of the private sector (corporate and private household sectors)*

Source: European Commission (2015), own calculations, Hein and Mundt (2012) for South Africa

The contribution of private investment is very low in countries like U.S.A and U.K. but high for countries like Spain and Estonia. The different strength of investment as a component of the aggregate demand shows the possibility of different debt-led private demand boom regime[102]. In Anglo-Saxon countries, the aggregate demand generation process was mainly driven by household expenditure fuelled by fresh credit and by rising housing prices. In countries like Spain, Greece, and Estonia business investment component has played an important role in generating the expenditure needed by the economy to grow.

[100] Ibid.
[101] Dodig, Hein and Detzer. Financialisation and the financial and economic crises: Theoretical framework and empirical analysis for 15 countries. Fessud financialization, economy, society and sustainable development Working Paper Series No 110
[102] Ibid.

Dodig, Hein and Detzer (2015) provides an analysis of the sectoral financial balances of the countries taken into consideration. For the trade cycle before the financial crisis, we see how in these countries the household sector was recording, on average, negative or very close to zero financial positions. For all the countries, the average financial position of the external sector was positive. This is one of the most important characteristics of this demand generation process. All the countries where demand, and consequently growth, was driven mainly by accumulation of private debt experienced a chronic and prolonged current account deficit. This current account deficit was mirrored by capital inflows from the surplus countries that abled the deficit countries to finance the deficit in the current account[103].

The negative position in the current account suggests that the countries where final demand was generated by fresh credit and explosions of asset prices were the source of demand for the rest of the world. Cynamon and Fazzari have highlighted this point in their extensive work on the consumption debt-financed source of growth in the US:

"Other countries siphoned off a significant portion of the U.S. consumption boom as indicated by the massive and rising U.S. trade deficit, a non-trivial portion of which went to Europe and Japan. Thus, the American consumption boom not only raised U.S. growth, it also raised foreign growth. Analysis of world economic conditions in the press supports this view. For example, the Wall Street Journal "Outlook" column (March 20, 2006, page A1) states that global growth has depended on "the American consumer, whose willingness to borrow and spend has been a primary driver of world growth for the past five years." (Cynnamon and Fazzari 2008, p. 20-21)

Stockhammer and Kohler (2019) show the dynamic of the current account and the growth of GDP in a number of countries. The countries that have experienced an increase in the household debt and of the housing prices have experienced a stronger increase of the GDP and at the same time, these countries have experienced a strong current account deficit for the period before the crisis. Southern Europe on average displays a negative current account position of -5.5% of the GDP, while the real GDP growth was growing at 3.4% point. Anglo-Saxon countries had a current account deficit of -3.3% of the GDP with a growth of the GDP of 2.7%[104].

[103] Ibid.
[104] Stockhammer Engelbert & Karsten Kohler, 2019. "Financialization and demand regimes in advanced economies," Working Papers PKWP1911, Post Keynesian Economics Society (PKES).

Tab. 4 External sector and GDP growth 2000-20016

	Current account (%GDP), average		Real GDP growth (%), average	
	2000-2007	2008-2016	2000-2007	2008-2016
Austria	1.7	2.4	2.4	0.7
Germany	2.8	6.8	1.6	1.1
the Netherlands+	7.7	8.1	2.3	0.6
Mean (northern Europe)	4.1	5.8	2.1	0.8
Greece*	-9.8	-6.4	4.0	-3.3
Ireland#	-1.7	-0.1	6.0	2.2
Italy	-0.6	-0.5	1.5	-0.8
Portugal	-9.4	-4.2	1.5	-0.4
Spain	-6.0	-1.7	3.8	0.0
Mean (southern Europe)	-5.5	-2.8	3.4	-0.4
Czech Republic	-4.1	-1.2	4.5	1.3
Hungary	-7.3	1.1	3.8	0.8
Poland+	-4.6	-3.2	4.2	3.2
Slovakia+	-7.2	-2.1	5.7	2.3
Slovenia	-1.7	1.8	4.3	0.2
Mean (eastern Europe)	-5.0	-0.7	4.5	1.6
United Kingdom	-1.9	-3.6	2.8	1.0
USA	-4.7	-2.7	2.7	1.3
Mean (Anglo-Saxon countries)	-3.3	-3.2	2.7	1.2
Total mean	-3.1	-0.4	3.4	0.7

Stockhammer and Wildauer 2019

As we said above, the Anglo-Saxon and Southern European countries exhibit similar demand regimes. These countries experienced a strong GDP growth, if compared to the countries with a low level of household debt and low level of the housing prices. The problem of this demand generation process is that it gives rise to macroeconomic instability. A country that relies on a debt-led demand generation process, augmented by property prices bubble, is more prone to the possibility of a debt crisis and is more vulnerable to the bubble burst[105]. At the same time, since these countries experienced chronical current account deficits and persistent capital inflows, the probability of a crisis driven by international debt exposure and reversing capital inflows is high. The international contagion became reality as the sub-prime crisis in the U.S. spread to the international financial markets. Countries like Greece, Spain, and Ireland have seen a reverse of the capital inflows that allowed them to run persistent current account deficits.

The fragility of a demand regime driven by household consumption and debt build-ups have been studied by Enisse Kharroubi and Emanuel Kohlscheen. They have studied a sample of 18 advanced economies since 1991, the results of their study are:

[105] Dodig, Hein and Detzer. Financialisation and the financial and economic crises: Theoretical framework and empirical analysis for 15 countries. Fessud financialization, economy, society and sustainable development Working Paper Series No 110

"Strong consumption growth today could induce subsequent economic weakness through a number of possible mechanisms. First, if increased consumption is financed by debt, this may constrain spending in the future. Recent research (eg Jordà et al (2015) and Lombardi et al (2017)) has found that past credit growth tends to hinder future growth, either because a financial crisis occurs or simply because agents have over-borrowed relative to their repayment capabilities and need to deleverage. It could, therefore, be that a consumption-led expansion financed through borrowing ends up hurting future demand because households need to devote a larger fraction of their income to debt servicing. Second, consumption-led growth may be driven by wealth effects, in particular housing wealth effects. When real house prices go up, property owners may decide to consume part of their capital gains, which boosts consumption and hence GDP. Yet if incomes do not grow in line with house prices, or if house price increases reverse, households have to cut back on consumption, thereby lowering GDP growth. Another interpretation is that stronger house price growth, to the extent that it implies pouring more resources into housing, can act as a drag on resources that could be employed in more productive uses." (Kharroubi and Emanuel Kohlscheen, 2017, p.30)

Kharroubi and Kohlscheen show how this demand regime has been adopted by a growing number of countries since 2012. This result shows how the financial crisis did not end this dynamics but some countries have turned to this kind of growth model[106]. Their results present new challenges for policymakers that must address the build-ups of imbalances and fragility created by this growth model.

3.2 Export-led demand regime

The second demand regime that has characterized the period of the financialization period is the "export-led" demand regime. In contrast with the debt-led private demand regime, export-led regime countries did not see a rise in the indebtedness of the household sector or in general of the private sector. The sector financial balances of the countries that experienced this demand regime were characterized by positive financial balances of the private sectors, with the exception of the Netherlands where the household sector was running a deficit. The external sector ran negative financial balances; this reflects the presence of current account surpluses for all these countries. The financial balances of the public sector were negative for countries like Germany and Japan before the crisis and positive for countries like Sweden[107].

The contribution of consumption to growth was relatively small or negative in some specific years. The contribution of private domestic demand is, in general, small in these countries. Growth is mainly driven by the contribution of export. While most of the countries that experienced this demand regime were already net exporter, during the financialization period they managed to increase their net exports and become increasingly dependent on this component of aggregate demand.

Changes in income distribution can have a positive impact on the exports, especially if there is a decline in the wage share. A Declining wage share can translate into an increase in price

[106] Kharroubi and Kohlscheen Consumption-Led Expansions BIS Quarterly Review, March 2017
[107] Dodig, Hein and Detzer. Financialisation and the financial and economic crises: Theoretical framework and empirical analysis for 15 countries. Fessud financialization, economy, society and sustainable development Working Paper Series No 110

competitiveness with the rest of the world, at the same time a decrease in the wage share can lower the domestic demand. Low domestic demand means low import and a stronger financial position with the rest of the world[108].

Some authors have differentiated between "strong export-led mercantilist countries" and "weakly export-led countries". The strong export-led countries are countries like Germany, Japan, and Sweden. These countries are characterized by positive financial balances of the private sector, in particular of the household sector; negative financial balances of the external sector, a positive position in the balance of goods and services, a positive and strong contribution of the export to the growth of the GDP, in general, the contribution of export to the GDP growth is higher than 5%.

Weakly export-led countries can be of two types, those countries that are very similar to the "strong export-led mercantilist countries" but the contribution of export to the growth rate is lower. Are considered "weakly export-led" even those countries with negative but improving financial position with the rest of the world. For this category we have: negative but improving financial balances of the private sector, negative but improving net export and a positive and strong contribution of export to the growth of GDP[109].

Hein and Mundt 2012 insert Canada, Argentina, Brazil, Russia, and Saudi Arabia in the weakly export-led countries and they explain:

"Although these countries, in particular the fossil energy exporting countries of Russia and Saudi Arabia, have seen considerable surpluses in their balances of goods and services and in their current accounts, and thus negative financial balances of their respective external sectors, growth contributions of net exports were negative throughout. These countries have therefore experienced falling net exports on average over the trade cycle prior to the Great Recession. This was due to dynamic domestic demand in all of these countries with significant growth contributions of private consumption and gross fixed capital accumulation, and to loss of price competitiveness in the cases of Brazil, Canada and Russia, whereas Argentina and Saudi Arabia managed to increase competitiveness through nominal devaluation"(p.12)

Tab. 5 Real GDP growth, in percentage point, and growth contribution, in percentage point, average value

	Germany *2003-2008*	Japan *1998-2008*	Sweden *2001-2008*
External sector	-4.9	-3.0	-6.9
Public sector	-2.0	-5.6	1.0
Corporate sector	1.2	5.5	3.2
Private household sector	5.7	2.8	2.4

Source: European Commission (2015), own calculations

[108] Hein, E., Mundt, M. (2012): Financialisation and the requirements and potentials for wage-led recovery – a review focussing on the G20, Conditions of Work and Employment Series No. 37, 2012, Geneva: ILO.
[109] Ibid.

The table above describes the sectoral financial balances of three strong export-led countries, Germany, Japan, and Sweden. As we said above, those countries have a strong positive position of the household sector and of the corporate sector; the private sector runs positive financial balances as a whole. The public sector runs a deficit in Germany and Japan while is in surplus in Sweden. The external sector runs large negative financial balances for all countries, reflecting the strong external positions of the export-led mercantilist countries[110].

Tab. 6 sectoral financial balances as a share of nominal GDP, in percentage, average values for the trade cycle

	Germany *2003-2008*	Japan *1998-2008*	Sweden *2001-2008*
Real GDP growth	1.5	0.8	2.6
Contribution to the increase of GDP of:			
Private consumption	0.3	0.4	1.0
Public consumption	0.2	0.3	0.2
Investment	0.4	-0.3	0.9
Balance of goods and services	0.6	0.4	0.5

Source: European Commission (2015), own calculations

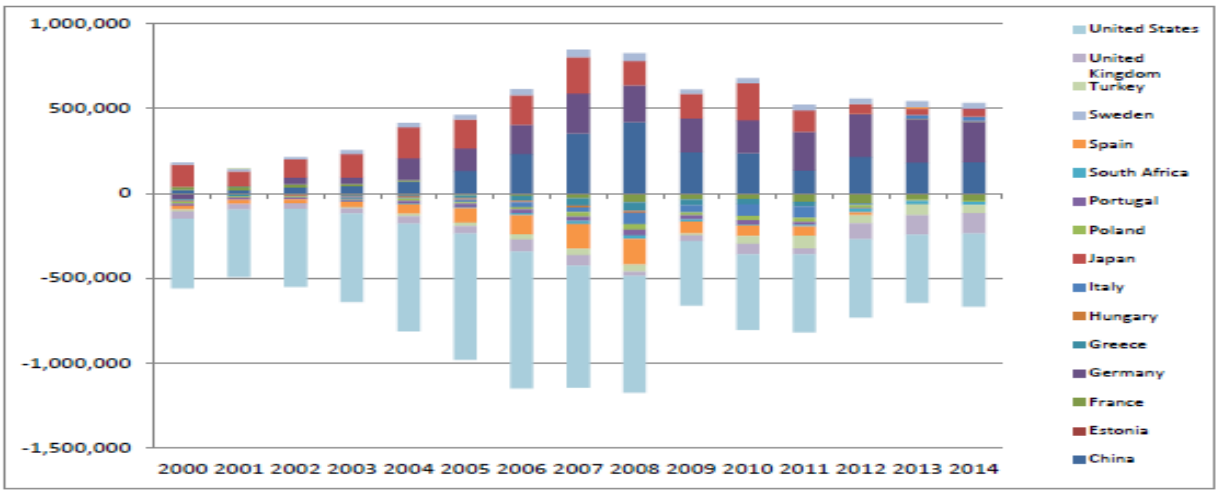
Germany and Japan show very similar dynamics of the contribution of private and public consumption to the growth of GDP. Investments play a positive role in Germany and a negative role in Japan. The balance of goods and services plays a major role in both countries. The real GDP growth in both Japan and Germany is low if compared to the GDP growth of the debt-led private demand boom regime countries. Sweden represents an interesting case among the strong export-led countries. During the cycle taken into consideration, Sweden experienced an increase in the price of the housing market and an increase in the debt level of the private sector. The contribution of private consumption and investment were stronger if compared to the other two countries[111]. This Stronger contribution of private domestic demand has allowed Sweden to have a Real GDP growth stronger than in Japan and Germany.

[110] Dodig, Hein and Detzer. Financialisation and the financial and economic crises: Theoretical framework and empirical analysis for 15 countries. Fessud financialization, economy, society and sustainable development Working Paper Series No 110
[111] Ibid.

3.3 Global imbalances, transmission, and contagions of the crisis

As we said above, during the period before the financial crisis we have seen an explosion of current account imbalances at a world level.

Fig. 6: Current account balance, in billions of US dollars



Source: IMF (2015), own illustration

The graph above, from Hein et all. (2015) shows the level of the current account balance in the US. Dollars in different countries. The countries that were running chronical current account deficits were, in large part, the "debt-led private demand boom" countries, while the "export-led" countries were running chronical current account surplus. These two demand regimes are interdependent and this connection is showed by the two sides of the current account imbalances that have emerged during the years before the crisis. The debt-led private demand boom countries rely on an ever-increasing role of consumption in order to grow. Growing consumption has not only raised the demand for domestic goods but has increased the demand for foreign goods. Thus, those countries where debt-financed consumption was the main driver of growth needed other countries ready to run current account surpluses[112]. On the other hand, in "export-led" countries domestic demand was too low to absorb all the production, so these countries have to rely on the demand coming from the external sector in order to grow. In this situation, both the two types of countries have been connected by their "mutual needs". The debt-led private demand boom countries have created the foreign demand needed by the export-led countries, while the export-led countries have provided the current account surpluses, and the financial outflows to finance the current account deficit of the deficit countries, needed by the debt-led private demand boom countries in order to acquire more goods than the ones produced domestically[113].

Thus, household expenditure has been the driver for growth not only domestically in the "debt-led private demand boom", but it has become the driver for the growth of "export-led" countries.

As the figures show, after the financial crisis, most of the "export-led" countries have continued to run current account surpluses. Some countries like Germany have increased their external position

[112] Ibid.
[113] Hein, E., Mundt, M. (2012): Financialisation and the requirements and potentials for wage-led recovery – a review focussing on the G20, Conditions of Work and Employment Series No. 37, 2012, Geneva: ILO.

pursuing "mercantilist" policies, while other countries have seen their current account surplus decline[114]. For the debt-led private demand boom, we have different situations, countries like the USA and UK have continued to run current account deficits even after the financial crisis. For some of the Eurozone countries, like Ireland and Spain, the financial crisis has changed their demand regimes, the pursuit of austerity measures and policy to increase international competitiveness have reduced domestic demand and imports leading to a shift towards an "export-led" demand regimes[115].

The connection between the two types of demand regimes has increased the fragility of the global system by channels of contagions and transmission of different kinds of "shocks". The first source of fragility comes from the possibility of contagions through the international goods market. If a group of countries is chronically dependent on the external demand for goods coming from the foreign sector, the growth of those countries will be dependent on international trade. Any shocks that can lower the level of import of the current account deficit countries will spread in the current account surplus via a decrease of export and consequently a decrease of the GDP. Since the current account deficit countries rely on an ever-increasing accumulation of debt in order to finance spending for domestic and foreign goods, the possibility of a decline of consumption, and thus in import from foreign countries, depends on the level of "debt-ceiling" of the private sector.

Other sources of fragility at a global level come from the international financial markets. Problems in the international financial markets can emerge by a sudden stop of capital inflows from surplus countries to deficit countries. The direct impact of a stop in capital inflows is a deterioration of the banking sector of the "destination countries". When capital inflows start to reverse banks can see their balance sheets deteriorate because of the decreasing value of the assets in which the inflows were directed. A deterioration of banks' balance sheets can have different impacts on the economy; first, it can lead to a decrease in the willingness of the banks to extend credits, with a direct impact on expenditure and GDP. Deterioration of banks' balance sheets can also lead to a bank run, with investors moving their liquidity to safer financial institutions. Both of these effects can generate self-reinforcing dynamics that can create a crisis.

Another source of fragility can come from financial contagions due to toxic financial instruments originated by the debt-led countries[116], especially the U.S. economy, and held globally by different financial institutions. The spread of these exotic financial instruments in the global financial markets has increased the possibility of contagion of financial shocks in a single country to the rest of the world. This is what happened during the financial crisis of 2007-2008 when a shock in the U.S. real estate market and the default of the Leman Brothers quickly spread in the global financial markets affecting, in different ways, most of the advanced economies.

For the debt-led private demand boom countries, the transmission of the crisis was mostly due the contagion of the financial markets from the crisis originated in the U.S. financial markets and by a reversing of the capital inflows. Both these contagion effects directly affect the banking sector

[114] Dodig, Hein and Detzer. Financialisation and the financial and economic crises: Theoretical framework and empirical analysis for 15 countries. Fessud financialization, economy, society and sustainable development Working Paper Series No 110
[115] Ibid.
[116] Ibid.

creating a stop on the lending activity of banks and a devaluation of the assets held in the balance sheets of the financial institutions. This credit crunch has a direct impact on the GDP of these countries, lowering the level of credit available for expenditure, and can easily create a series of negative feedback loops between the banking sectors and the debtors.

As we said above, the main channel of contagion for the export-led countries was the international trade channel, when global demand collapsed during the financial crisis export of these countries declined[117]. Another source of contagion was the financial markets contagions due to the fact that the banking sector of the export-led countries bought financial instruments from the debt-led countries, especially from the USA. When the financial crisis began these instruments have created problems for the entire financial sectors of these countries.

4 Literature review on model dealing with consumption debt-financed expansions, inequality, and global imbalances.

After the financial crisis, there has been an increasing number of works trying to formalize, what happened in the period preceding the financial crisis. Most of the models focused on the relations between income inequality, the build-up of household debt to finance consumption and the "natural" instability that this kind of dynamics imposes on the economy. Kapeller and Schutz (2014) for example have built a stock-flow consistent model where the interaction between a conspicuous consumption "norms" followed by the workers household sector and the loosening of credit standard of the banking sector can generate instability and a cycle that they call "*Minsky-Veblen cycle*", in their work they are able to show how an increase in income inequality can increase debt-financed consumption demand, leading to an increase in financial fragility in the household sector[118]. While their work is one of the most accurate in tracking these dynamics, it deals with a closed economy, without any concern about the international effect of such a "demand regime".

Cardaci and Saraceno (2016) developed an Agent-Based Stock Flow consistent model with a heterogeneous household sector in order to analyze the impact of increasing income inequality on the balance sheets of the household sector and on the likelihood of a crisis. Their results is that, under the condition of rising income inequality a "*Scylla and Charybdis*" problem emerges, if credit access is low inequality will put contractionary pressure on household spending and thus on aggregate demand and output; at the same time, a high credit access can create an environment of increasing level of debt in the balance sheets of the household sector generating instability and a debt-driven boom-bust cycle[119].

Kumhof et. All (2012) have developed an "open economy" Dynamic Stochastic General equilibrium model where current account imbalances can arise as a response to rising domestic income inequality. The model presents an economy with two classes of households, investors who own the

[117] Dodig, Hein and Detzer. Financialisation and the financial and economic crises: Theoretical framework and empirical analysis for 15 countries. Fessud financialization, economy, society and sustainable development Working Paper Series No 110

[118] Kapeller, Jakob and Bernhard Schutz. Debt, boom, bust: a theory of Minsky-Veblen cycles Journal of Post Keynesian Economics, 2014, vol. 36, issue 4, 781-814

[119] Cardaci, A., Saraceno, F. 2016. Inequality, Financialization and Credit Booms: a Model of Two Crises. SEP Working Papers 2016/2. Rome (Italy): LUISS School of European Political Economy

capital stock of the economy and that lend in the financial markets and workers who borrow in the financial markets to finance spending that is greater than the income that they receive[120]. They are able to study the transmissions mechanism from increasing income inequality to increasing domestic and foreign indebtedness.

Detzer 2018 uses a Stock Flow consistent open economy model to study how the interaction between income inequality and different institutional structures can generate different economic patterns. In the model different scenarios are analyzed to show how, in an open economic context, the attitudes towards the debt of both households and banks can offset income inequality, but at the same time can generate instability and foreign debt problems.

Belabed, Theobald and Van Treeck 2017 is one of the most complete works on inequality, household debt, and current account imbalances. The model presented in their paper is a stock-flow consistent model with 3-countries with differences in both functional and personal distribution of income. The model is calibrated on the USA, China, and Germany. The results are able to show that the increase in household debt and the worsening of the current account deficit for the US economy can be explained by an increase in household income inequality and the need by low-income households to borrow in order to consume[121].

The model presented here follows partially the literature presented above.

[120] Kumhof, M. Rancière, R. and Winant, P. 2015. Inequality, leverage and crises. American Economic Review. 105(3), pp. 1217–1245.
[121] Belabed, C. A. Theobald, T. van Treeck, T. 2018. Income distribution and current account imbalances. Cambridge Journal of Economics. (42)1, pp. 47–94.

5 The Model

In this section, we present a stock-flow consistent model that tries to replicate some of the stylized facts described above. The present work comes from a collaboration with Emilio Carnevali. We embarked in the study of households' debt dynamics in an open economy environment.

The model is based on the OPENFLEX [122] model presented in chapter 12 of the book of Godley and Lavoie. The model describes two-separated economies that trade with a flexible exchange rate. Both the economies have two different class of households that differs for the level of income their receive, for their consumption behavior and for the financial assets that they hold. With different experiments, we study how credit-driven consumption demand expansions can have permanent effects in an international environment where the economies are connected both by trade and by financial relations.

Although the model is based on the OPENFLEX model it differs in some respect with the benchmark model. In the OPENFLEX model there is just one kind of households in each economy; adding another household sector for each economy allows us to detect differences in expenditure and financial behavior and study how distribution of income can play a role in debt-build dynamics and how a debt-led demand regime impacts on the level of inequality. Another difference is about the financial side of the economy. In the OPENFLEX model there are no banks and credit money, the model works around the liquidity of the Central Banks. In the model presented here, there is a banking sector for each country, banks create money endogenously following the demand for credit of the household sectors. While the price level in the OPENFLEX model is determined by a mark-up on unit costs we have a fixed price level normalized at one. With a fixed price level we are able to determine an easier function for both import and export and therefore of the exchange rate.

Another difference with the OPENFLEX model is in the determination of the exchange rate. In the OPENFLEX model, the exchange rate is determined as the ratio between the supply of U.S. bills for U.K. households and the demand for U.S. bills by U.K. households. In our model, we present a different mechanism for the exchange rate that targets explicitly the demand for and the supply of currency for international transactions. We, therefore, target explicitly the balance of payment at the core of the exchange rate mechanism.

As in the OPENFLEX model we did not develop consider the firm sector in a detailed way; we assume that in the economy there are no domestic and foreign investments in fixed and working capital.

The model is composed of 76 equations. Every economy described in the model has six sectors: Rentier Households, Worker Households, firms, banks, Central Bank and Government. The table below shows the Transaction flow matrix of the model

[122] Godley, W. and Lavoie, M. 2007. Monetary Economics: an integrated approach to credit, money, income, production and wealth. London: Palgrave MacMillan

	A Rich House.	A Poor House.	A Firms	A Gov.	A Banks	A C.B.		B Rich House.	B Poor House.	B Firms	B Gov.	B Banks	B C. B.	Sum
	all in A currency						Exch. rate	all in B currency						
Consumption	$-C_r^A$	$-C_w^A$	$+C^A$					$-C_r^B$	$-C_w^B$	$+C^B$				0
Gov. Expend.			$+G^A$	$-G^A$						$+G^B$	$-G^B$			0
Trade			$-IM^A$				xr^A			$-IM^B$				0
			$+X^A$				xr^A			$+X^B$				0
GDP/Income	$+Y_r^A$	$+Y_w^A$	$-Y^A$					$+Y_r^B$	$+Y_w^B$	$-Y^B$				0
Taxes	$-T_r^A$	$-T_w^A$		$+T^A$				$-T_r^B$	$-T_w^B$		$+T^B$			0
Interes paym.	$+r^A B_A^A$			$-r^A B^A$	$+r^A B_{bank}^A$	$+r^A B_{cbA}^A$	xr^A	$+r^A B_B^A xr^B$						0
	$+r^B B_B^B xr^B$						xr^A	$+r^B B_B^B$			$-r^B B^B$	$+r^B B_{bank}^B$	$+r^B B_{cbB}^B$	0
		$-r^A L^A$			$+r^A L^A$				$-r^B L^B$			$+r^B L^B$		0
CB profits				$+F_{cb}^A$		$-F_{cb}^A$					$+F_{cb}^B$		$-F_{cb}^B$	0
Banks profits	$+F_{bank}^A$				$-F_{bank}^A$			$+F_{bank}^A$				$-F_{bank}^A$		0
Flows of funds (changes in assets)														
Money	$-\Delta H_r^A$	$-\Delta H_w^A$				$+\Delta H^A$		$-\Delta H_r^B$	$-\Delta H_p^B$				$+\Delta H^B$	0
Deposits	$-\Delta Dep_r^A$	$-\Delta Dep_w^A$			$+\Delta Dep_{bank}^A$			$-\Delta Dep_r^B$	$-\Delta Dep_p^B$			$+\Delta Dep_{bank}^B$		0
A Bills	$-\Delta B_A^A$			$+\Delta B^A$	$-\Delta B_{bank}^A$	$-\Delta B_{cbA}^A$	xr^A	$-\Delta B_B^A xr^A$				$-\Delta B_{bank}^B$		0
B Bills	$-\Delta B_A^B xr^A$						xr^A	$-\Delta B_B^B$			$+\Delta B^B$		$-\Delta B_{cbB}^B$	0
A Loans		$+\Delta L^A$			$-\Delta L^A$				$+\Delta L^B$			$-\Delta L^B$		0
Advances					$+A^A$	$-A^A$						$+A^B$	$-A^B$	0
Sum	0	0	0	0	0	0		0	0	0	0	0	0	0

The two economies described in the model are equal; they have the same number of sectors and the same amount of financial assets and financial liabilities. As we will show below the behavioral equations are almost the same. The two economies are connected by international trade and by international investment. The exchange rate is flexible; no intervention of Central Banks is modelled.

As is showed by the transaction flow matrix differences between households within the country depends on the type of income that they receive and how they allocate their wealth.

5.1 Household sector

Households are split into two portions for both the economies, this heterogeneity concerns the level and the type of income that they receive. We call the portion of the population that receives a greater part of the income Rentiers Households and the rest of the population as Workers Households. Rentiers Households are composed of managers, who receive an income for their managerial work in the firms, and by people who do not work and receive a financial income in the form of dividends by firms sectors and the banking sector. Rentiers households also receive interest from the domestic and foreign bills in which they invest their wealth.

1) $YD_r^A = Y_r^A + F_{bank}^A + r_{-1}^A B_{As-1}^A + r_{-1}^A B_{As-1}^A xr^A - T_r^A$

Equation 1 describes the disposable income for Rentiers households, as we said above, they receive a portion of the total income as a "wage", they receive profits by the banking sector and interest for the owing of domestic and foreign bills in their balance sheets. After they receive their income they pay taxes to the government.

2) $YD_w^A = Y_w^A - r_{-1}^A L_d^A - T_w^A$

Equation 2 describes the disposable income for Workers households, their income is composed only by the wage that they receive for taking part in the production process, they pay interest on the stock of accumulated debt and they pay taxes to the government.

3) $YD_{hsr}^A = YD_r^A + (\Delta xr^B) B_{As-1}^B$

Equation 3 describes the Haig-Simons disposable income for Rentiers Households, which is derived by adding to the standard disposable income the capital gains (capital losses). In the model, the movement of the exchange rate determines capital gains or losses, an appreciation (depreciation) of the foreign currency leads to a revaluation(devaluation) of the foreign bills held by the Rentiers Households.

4) $\Delta V_r^A = YD_{hsr}^A - C_r^A$

Equation 4 describes the evolution of the stock of wealth of Rentiers households calculated as the difference between the Haig-Simons disposable income and consumption.

5) $\Delta V_w^A = YD_w^A - (C_w^A - \Delta L_w^A)$

Equation 5 describes the wealth of Workers households, which is equal to the disposable income of the workers minus their consumption, we subtract from total consumption the portion that is financed by credit. We subtract the level of credit financed consumption from total consumption

because that portion will not affect savings, and thus wealth, at the moment of the expenditure. Workers can decide to borrow even if they have positive cash balances, this behavior is in line with the idea that households want to hold a buffer of deposits for "precautionary" motives. For instance if a household wants to buy a new car and it has a wealth of 10000 dollars in deposits, the household will choose to borrow the entire amount of money to buy the car while it has positive financial balances because it wants to have a certain level of idle cash as a buffer in case of necessity. Alternatively, it can use just a portion of the accumulated deposits, say half of the price of the new car, and finance the rest by borrowing.

6) $NW_w^A = V_w^A - L_w^A$

Equation 6 shows the net wealth of Workers households, calculated as the difference between the stock of financial wealth and the stock of accumulated debt.

7) $Y_r^A = ic^A Y^A$

8) $Y_w^A = Y^A - Y_r^A$

Equations 7 and 8 describe the share of income going to Rentiers and Workers, Rentiers receive a share of income and the workers take what is left.

9) $C_r^A = \alpha_{1r}^A YD_r^A + \alpha_2^A V_{r-1}^A$

Equation 9 defines Rentiers' consumption, it depends on disposable income and wealth

10) $C_w^A = \left(\alpha_{1w}^A YD_w^A + \alpha_2^A NW_{p-1}^A\right) + \rho^A C_{av}^A$

Equation 10 describes the consumption behavior for Workers Households that is similar to the Rentiers' but it is augmented by a parameter that describes the "relative income hypothesis". Workers households when deciding how much to consume do not look just their income and their accumulated wealth, they look at how much is consumed on average in the economy to decide the standard of consumption that they want to follow.

11)$DEP_w^A = V_w^A \; depsh^A$

Equation 11 shows the demand for deposits by workers; we assume that workers' wealth takes the form of cash or deposits, the proportion of cash and deposits held is given by the parameter $depsh^A$ that describes the "social norms" in the use of deposits in the economy.

12) $H_{wh}^A = V_w^A - \; DEP_w^A$

Equation 12 describes, residually, the demand for cash by workers households, calculated as what is left in the wealth after workers demand deposits.

13) $g_{con}^A = 1 \; iff \; (C_w^A - YD_w^A) > 0$

Equation 13 shows the borrowing parameter for workers households, given the consumption decisions g_{con}^A takes the value of 1 when workers households want to consume more than their disposable income and 0 otherwise.

14) $\Delta L_d^A = \left(C_p^A - YD_w^A\right)(1 - bo^A) g_{con}^A$

Equation 14 defines the demand for loans by workers. We assume that workers do not want to finance all the amount of expenditure that exceeds the disposable income by borrowing. The parameter bo^Adetermines the share of the expenditure greater than the disposable income financed by borrowing. For the simulations that we will present bo^A is set at the value of 0.5, so when workers want to consume more than their disposable income they finance this additional expenditure for 50% using accumulated wealth and they borrow for the remaining part.

16) $B_{Ad}^A = V_r^A(\lambda_{10} + \lambda_{11} r^A - \lambda_{12} r^B)$

17) $B_{Ad}^B = V_r^A(\lambda_{20} - \lambda_{21} r^A + \lambda_{22} r^B)$

Equations 16 and 17 describe the demand for domestic and foreign bills by Rentiers households. Demand for financial assets follows the standard Tobin's portfolio model. In this simplified environment, we made the assumption that Rentiers' demand for domestic and foreign bills are a function only of the rate of returns of these assets.

18) $DEP_r^A = (V_r^A - B_{Ad}^A - xr^B B_{As}^A)\, depsh^A$

19) $H_{rh}^A = V_r^A - B_{As}^A - B_{As}^B xr^B - DEP_r^A$

Equations 18 and 19 describe the demand for deposits and for cash by Rentiers. The two demands are calculated residually, demand for deposits is a portion of the wealth which is not allocated in domestic or foreign bills. Demand for cash is the remaining portion of wealth that have been not allocated in bills or deposits. As for workers $depsh^A$describes the social norms that drive the demand for deposits in the economy.

20) $H_h^A = H_{rh}^A + H_{wh}^A$

21)$DEP_{bank}^A = DEP_w^A + DEP_r^A$

Equation 20 and 21 shows the total amount of cash and bank deposits held in the economy, the amount is equal to the demand for cash and for deposits coming from the households sectors.

5.2 Public Sector

The public sector is composed of the Government and the Central Bank. The behavior of the government is simple. The government tax the households and spend by purchasing goods from the firms sector.

22) $T^A = \theta^A(Y^A + r_{-1}^A B_{As-1}^A + r_{-1}^B B_{As-1}^B xr^B + F_{bank}^A)$

Equation 22 describes the amount of taxes paid to the government, they are equal to a share of total income received by the households sectors. For the sake of simplicity of the model we decide to do not model government and to leave it as exogenous variables

23) $\Delta B_s^A = G^A - T^A + r_{-1}^A B_{As-1}^A - F_{cb}^A$

Equation 23 shows the budget constraint for the Government sector. When taxes and the profits of the central banks are not able to cover government expenditure and the interest rate on the stock of bills the government must borrow using new bills.

24) $B_{cb£s}^A = B_s^A - B_{As}^A - B_{Bs}^A$

Equation 24 describes the purchases of domestic bills by domestic central banks. The C.B. plays the role of lender of last resort, the amount of bills purchased is equal to the number of bills issued by the government and not purchased by the household sector of both countries. Central Banks pay these bills by issuing money, this is one of the channels by with money is created in the economy.

25)$A_s^A = A_d^A$

Equation 25 describes the supply of advances from the Central Banks to the Banking sectors. Central Banks accommodates the demand for advances by the banking sector because it wants to control the short-term interest rate.

26) $H_s^A = B_{cb£s}^A + A_s^A$

The total supply of high-powered money is described in equation 26, the total supply of money by the central banks is equal to the sum of the bills bought by the central bank and the amount of advances supplied to the banking sector.

27) $F_{cb}^A = r_{-1}^A B_{cb£s-1}^A$

Equation 27 shows the profits of the Central Bank that are made by the interest from the stock of bills held.

5.3 Banking Sector

The banking sectors in our economy are modelled following the standard endogenous money approach followed by the Stock-Flow consistent modelling. Banks' supply of loans follows the demand for loans by workers. It is the demand for credit that drives the supply as in the standard endogenous money approach. We introduce a credit constraint in the supply of credit that can describe different constraints on the willingness of the banking sector to extend credit to everyone in the households sector, it can be a public constraint imposed by the government or a self-imposed ceiling on the number of loans extended to the economy.

28) $L_s^A = L_d^A \theta$

Equation 28 defines the supply of credit by the banking sector to the workers' households sector which is equal to the demand for loans coming from the workers multiplied by θ which identified the credit constraint.

29) $B_{bnot}^A = DEP_{bank}^A - L_s^A$

As we said above, banks can buy government bills. We made the restriction that banks can buy just domestic bills. Banks' balance sheets are composed on the assets side by loans to the workers and domestic government bills, on the liabilities side is composed of the deposits of the households sectors. Since the level of loans follows the demand coming from the households the stock of bills is calculated residually. Equation 29 describes the notional demand for bills by the banking sector. We assumed that banks' demand for bills is conditional on the “room” that they have in their balance sheets. If the quantity of deposits is greater than the quantity of loans banks can demand bills. The demand for bills is related to the balance sheet position of the banking sector.

30) $z^A = 1 \; iff \; B^A_{banknot} > 0$

Equation 30 describes the room in the balance sheets of the banking sector. If the value of the deposits in the balance sheets is greater than the value of the loans $z^{£}$takes the value of 1 and it means that there is space for the banking sector to buy government bills.

31) $B^A_{bank} = z^A B^A_{bnot}$

Equation 31 shows the actual level of government bills demanded by the banking sectors, the amount of bills purchased is equal to the notional level of government bills demanded multiplied by $z^{£}$.

31) $A^A_d = -B^A_{bnot}\,(1 - z^A)$

As we said before, if the amount of deposits is greater than the number of loans in their balance sheets, banks demand government bills, if the amount of deposits is lower than the amount of loans banks have to cover the difference in their balance sheets with advances from the central bank. The Central Bank must meet the demand for advances if it wants to control the short-term interest rate. Equation 31 describes the demand for advances from the banking sector, which is equal to a "negative value" of the notional level of domestic bills.

32) $F^A_{bank} = r^A_{-1} B^A_{bank-1} + r^A_{-1} L^A_{s-1}$

Equation 32 shows the profits of the banking sectors, banks inflows are equal to the interest on the government bills and the interest on the loans. Since we assume that neither banks' deposits nor advances from the central banks require interest payment, banks have no outflows coming from the structures of their balance sheets.

5.4 Income, trade and exchange rate

In this section, we can show the equations that describe the general income of the economy, the determinants of international trade and of the exchange rates.

33) $Y^A = C^A_r + C^A_w + G^A + X^A - IM^A$

Equation 32 describes the total factor income, that is equal to all the component of the aggregate demand in the economy, as we previously explained firms do not invest in capital stocks, so in the economy described there are no investments. Income is equal to consumption made by rentiers and workers, the expenditure made by the government, goods exported abroad minus imported goods.

34) $\boldsymbol{X^A} = \varepsilon_0 - \varepsilon_1 \boldsymbol{xr}^A_{-1} + \varepsilon_2 \boldsymbol{Y^B}$

35)$\boldsymbol{IM^A} = \mu_0 + \mu_1 \boldsymbol{xr}^A_{-1} + \mu_2 \boldsymbol{Y^A}$

Equation 34 and 35 show how export and import are determined in the economy. Export (equation 34) is a negative function of the exchange rate of the domestic currency and a positive function of the income of the foreign country. The more the domestic currency appreciates the less competitive the country is in international trade. The more the foreign country increase its income, the more it will import. Equation 35 shows the dynamics of imported goods, the import is a positive function of the exchange rate of the domestic currency and a positive function of the domestic income. The more domestic currency will appreciate and income will increase the more the domestic economy

will be able to import goods. The exchange rate enters in both the equations with a lag, this behavior reflects the delay of the answer of consumers in the change in the exchange rate.

36) $xr^{\$} = \frac{-X^A + IM^A + r_{-1}^A B_{\$s-1}^A - \Delta B_{Bs}^A}{r_{-1}^A B_{As-1}^B - \Delta B_{As}^B}$

37) $xr^A = 1/xr^B$

Equations 36 and 37 describe the exchange rate of both economies. The exchange rate is the closure of the system of equations. Market forces determine the value of the exchange rate, as in every flexible exchange rate regime, more specifically is determined by the demand and supply of money in international markets. In the model, every international payment for a good or for an asset must be done in the currency of the country which produced the good or issued the asset. Every country can find the currency needed for international trade in two ways: from the interest on the foreign bills bought by domestic rentiers and banks, and from the foreign exchange rate market, at the current exchange rate level, as long as the foreign country needs the local currency in order to trade. To understand the dynamics of the exchange rate let assume that the domestic country, in this example the UK, has a current account deficit with a foreign country, in this example the U.S.

$$CA^A = X^A - IM^A - r_{-1}^A B_{Bs-1}^A + r_{-1}^A B_{As-1}^B$$

In this situation, the equation above is negative for the domestic country; this means that the dollars needed by the UK households sector for international transactions are greater than the quantity of Pounds needed by the U.S. household sectors. In this situation, it appears to be impossible for UK households to acquire the number of dollars needed. Another source of dollars can come from the international transaction of financial assets, which is the acquisition of domestic bills from non-residents.

$$FA^A = \Delta B_{Bs}^A - \Delta B_{As}^B xr^B$$

The equation above shows the dynamics of the financial account for the domestic economy. The first term on the right-hand side of the equations is the capital inflows from abroad, that is the amount of money coming from the U.S. in order to buy UK bills, and the second term on the right hand side determines the capital outflows, the amount of U.S. bills bought by the U.K. If the amount of inflows coming from the U.S. to buy UK bills is greater than the outflows going to the U.S. to buy foreign bills, UK households are able to acquire the amount of dollars needed to finance the current account deficit. Let assume that the financial account is in equilibrium so that the net sum of the entries is zero.

In this situation, UK households cannot finance the current account deficit. The demand for dollars is greater than the dollars offered by the US in the foreign exchange market. Since the demand is greater than the supply, the dollar will appreciate and the pound will depreciate. Depreciation will not affect the trade balance immediately because the exchange rate enters with a lag in the import and export equations. The first impact of the depreciation will be on the financial accounts in two ways. After the depreciation, if the U.S. households do not change their willingness to hold UK bills, the first term of the financial account will rise; this is because with the same amount of dollars US households now can buy more UK bills. Let assume that US households want to allocate 30% of their wealth UK bills, they will allocate 30 $ out of 100$ in UK bills, given an exchange rate of 1 it will

translate in 30£ of UK bills bought by US households. If the pound depreciates with the same amount of US dollars US households will be able to buy more UK bills. Therefore, the first right term in the financial account equation will rise for the UK. At the same time with the depreciation of the pound, the amount of US bills that UK residents can buy is lower than before, this leads to a decrease of the second term on the right side of the financial account equations. The depreciation brings a decrease in the number of dollars demanded and an increase in the amount of pounds demanded. This process of devaluations will continue until the two currencies will reach a new equilibrium, more specifically, until the balance of payments for both countries will reach the zero. So, adding the two-equation together we have:

$$CA^A + FA^A = X^A - IM^A - r_{-1}^A B_{Bs-1}^A + r_{-1}^A B_{As-1}^B + \Delta B_{Bs}^A - \Delta B_{As}^B xr^B = 0$$

From this equation, we can arrive to equation 36 with only $xr^{\$}$on the left-hand side.

$$xr^{\$} = \frac{-X^A + IM^A + r_{-1}^A B_{Bs-1}^A - \Delta B_{Bs}^A}{r_{-1}^A B_{As-1}^B - \Delta B_{As}^B}$$

Consequently, the exchange rate for the UK is the inverse of the exchange rate of the US.

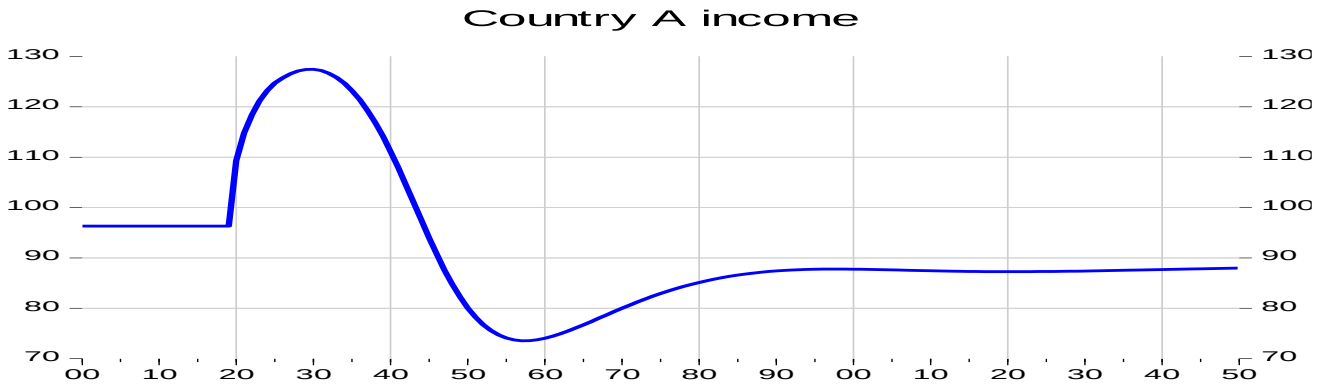
$$xr^A = 1/xr^B$$

The new stationary state will not be reached instantaneously, in the next period the trade balance will be affected by the chain of events described above with a new equilibrium. The new stationary state will be found only when the current account of the UK will be in equilibrium and the economy will not need the financial account to adjust.

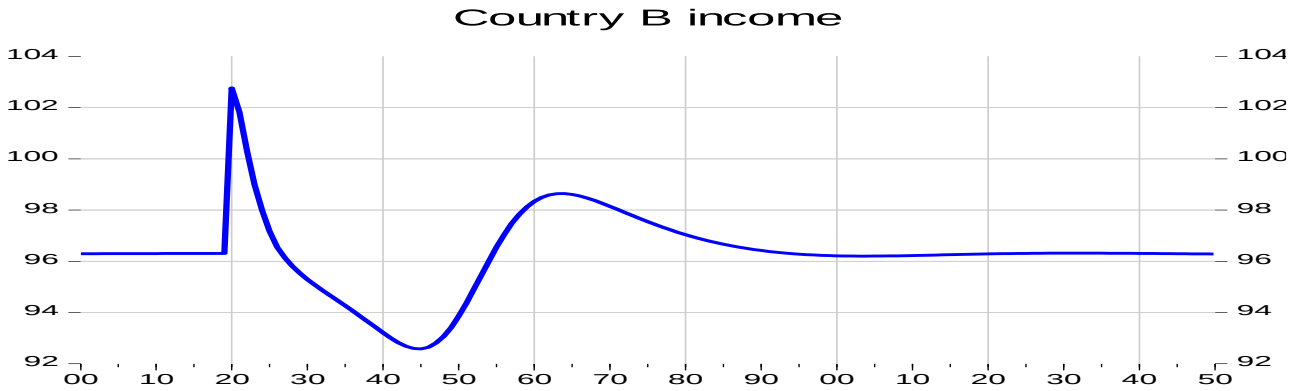
5.5 Simulation: Credit supply shock

We perform a simulation where one of the two economies is hit by a credit supply shock. We assume that the banking sector lowers the standard of credit and Workers households can increase their borrowing for consumption in order to keep up with the rest of the economy. With this kind of shock, we can study the double effect of credit, the flow effect, and the stock effect, in an open economy. Given the trade relation between the economies described, the increase in borrowing and spending affects not only the economy that receives the shock; an increase in household spending has an international effect because of the increase in import and the consequent capital movements needed to finance the increase in import. The results of the shock are very interesting because they are able to show the permanent effect of a credit supply shock in an open economy scenario.

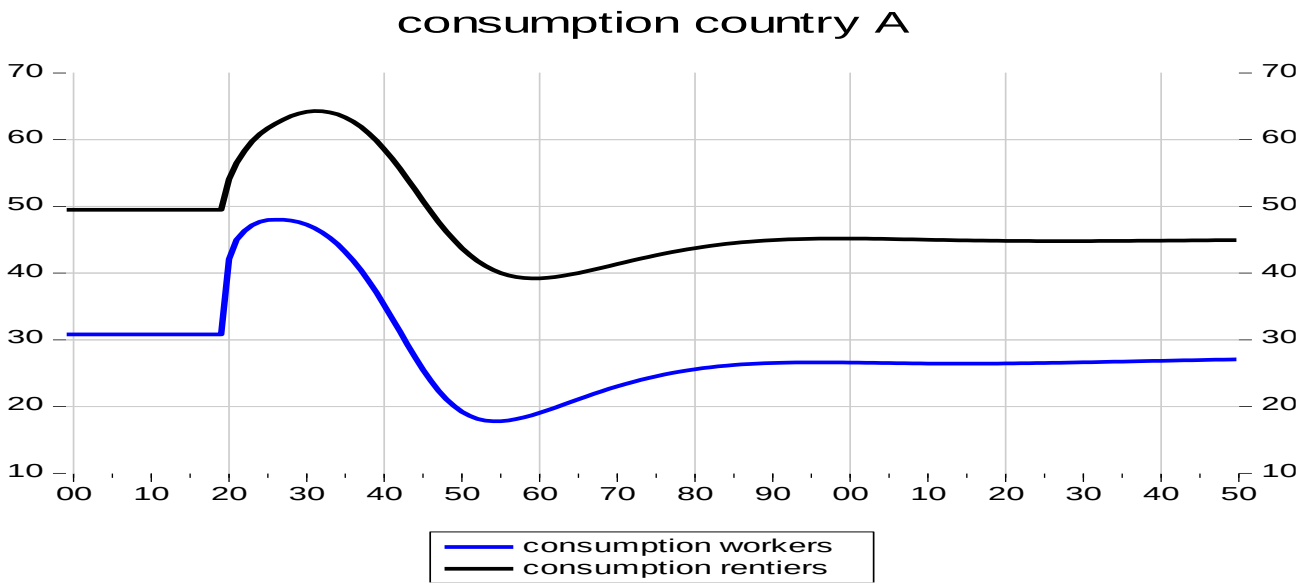
The level of loans supplied by the banking sector in the model is equal to the demand of loans by the workers multiplied by an institutional parameter that describes the willingness of the banking sector to extend credit on demand. $L_s^A = L_d^A\theta$ The θ can reflect a self-imposed constraint of the banking sector or a constraint imposed by the public authority. In the scenario that we want to study, we let the θ to increase its value, reflecting a loosening of the credit standard of the banking sector. We named country A the country that receives the shock and country B the foreign economy that trade with country A.



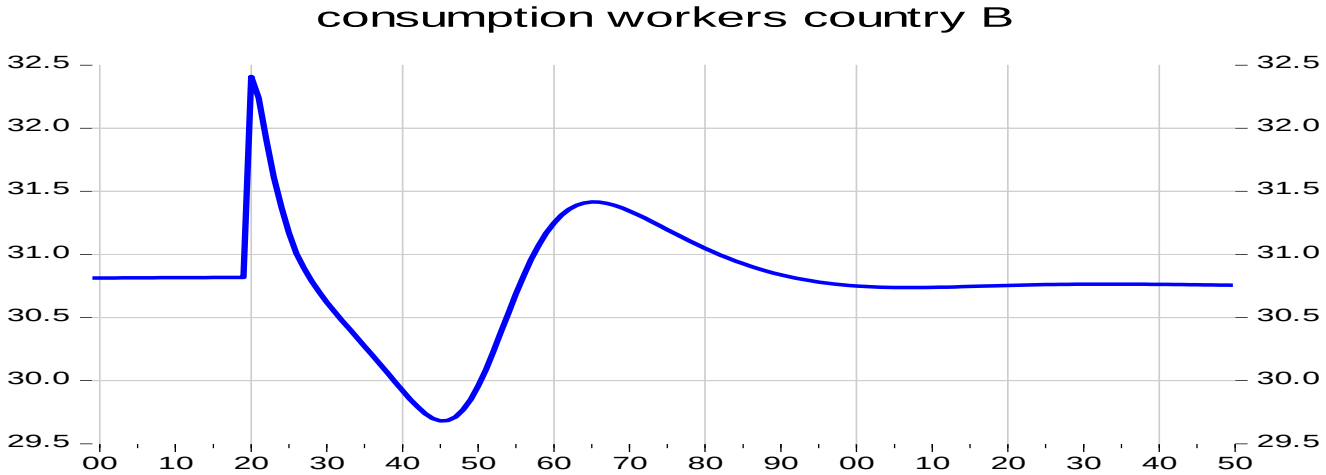
The effect of a credit supply shock on GDP of country A is straightforward, after an increase in the willingness of the banking sector to extend credit to the households sector, the GDP of country A explodes because of the increase in workers' households expenditure. The expansion lasts for 10 periods before reversing. After the expansion, the GDP starts to decline rapidly and hit the lowest point 40 periods after the shock. The recovery is slow and the economy does not return to the previous level of GDP. This is an interesting result, after a credit supply shock the economy displays a boom-bust dynamic with a slow recovery and the GDP after the shock is not at the same level of the pre-shock economy. Credit supply-driven expansions have a permanent effect on the economy.

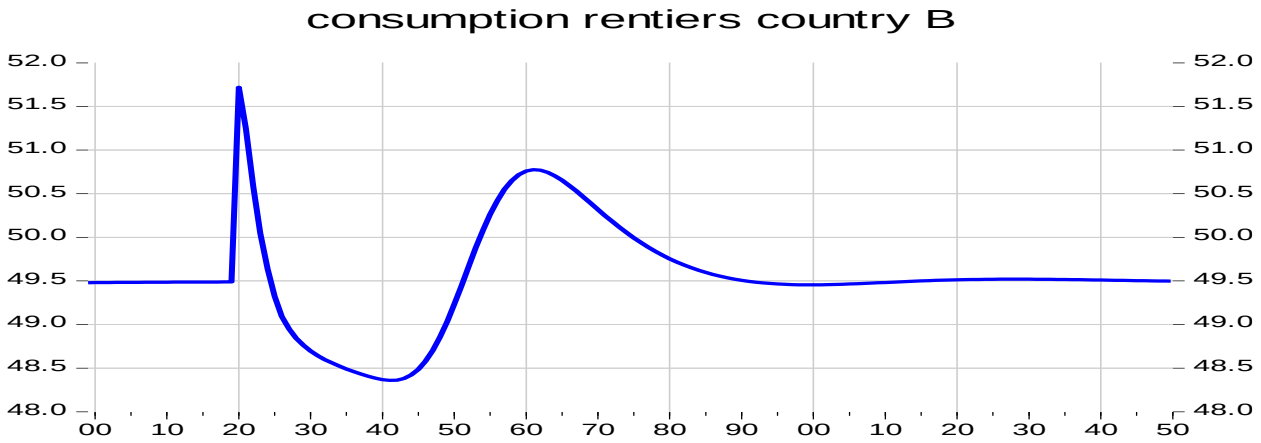


The shock has an effect on country B by international trade channels. The GDP of the foreign economy increase after the shock, the expansion is smaller if compared to the one in country A, after few periods the GDP starts to decline and hit its lowest point 25 periods after the shock, the recovery is quick and the economy “overshoot” the level of GDP before the shock. The strong expansion after the recession ends after 20 periods, after the expansions the GDP decline again but it stabilizes after a few periods at the same level before the shock. The interesting results are that, while credit supply shocks in country A have an effect on country B, the size of the fluctuations is smaller for the foreign country and the effect of an expansion of credit is not permanent for country B.

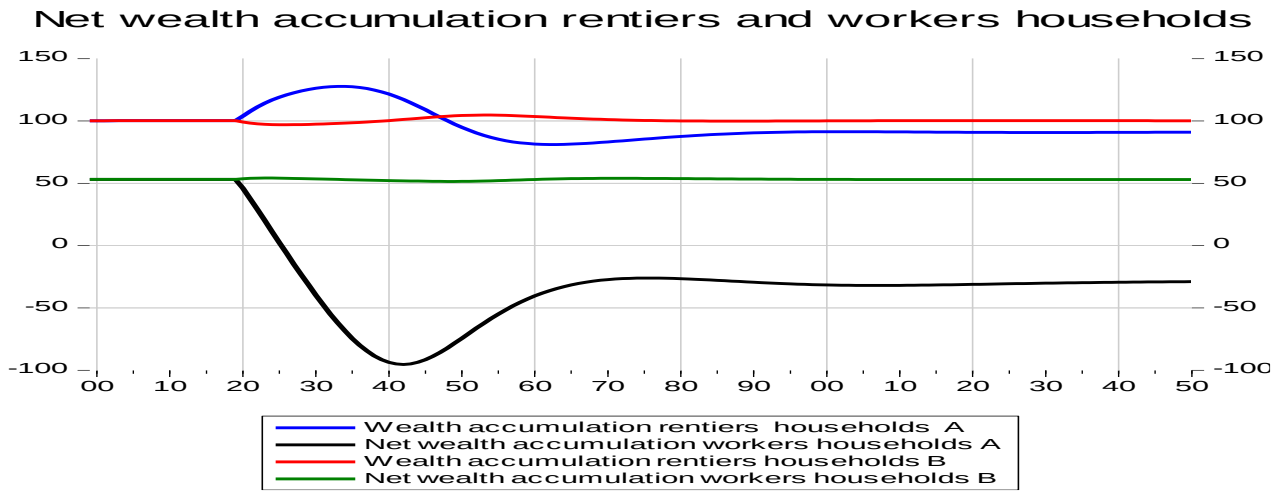


As we said above, the first direct impact of a credit supply shock is an increase in the consumption of workers households that can use the funds borrowed from the banking sector to close the gap between their consumption and the average consumption in the economy. After the shock, workers' consumption increases rapidly, the expansion lasts for 6 periods, after that consumption starts to decline. Workers' expenditure hits the lowest point after 28 periods and then starts to recover but it does not return to the level before the shock. Rentiers' expenditure displays a similar pattern to the workers' expenditure, after the shock Rentiers increase their spending, this increase is due to increase in rentiers' disposable income and wealth during the expansion of the GDP driven by the increase in workers' expenditure. The increase for the rentiers lasts for 12 periods, after that it starts to decrease and hit the lowest point after 27 periods. The recovery is slow and rentiers' expenditure does not return to the level before the shock.





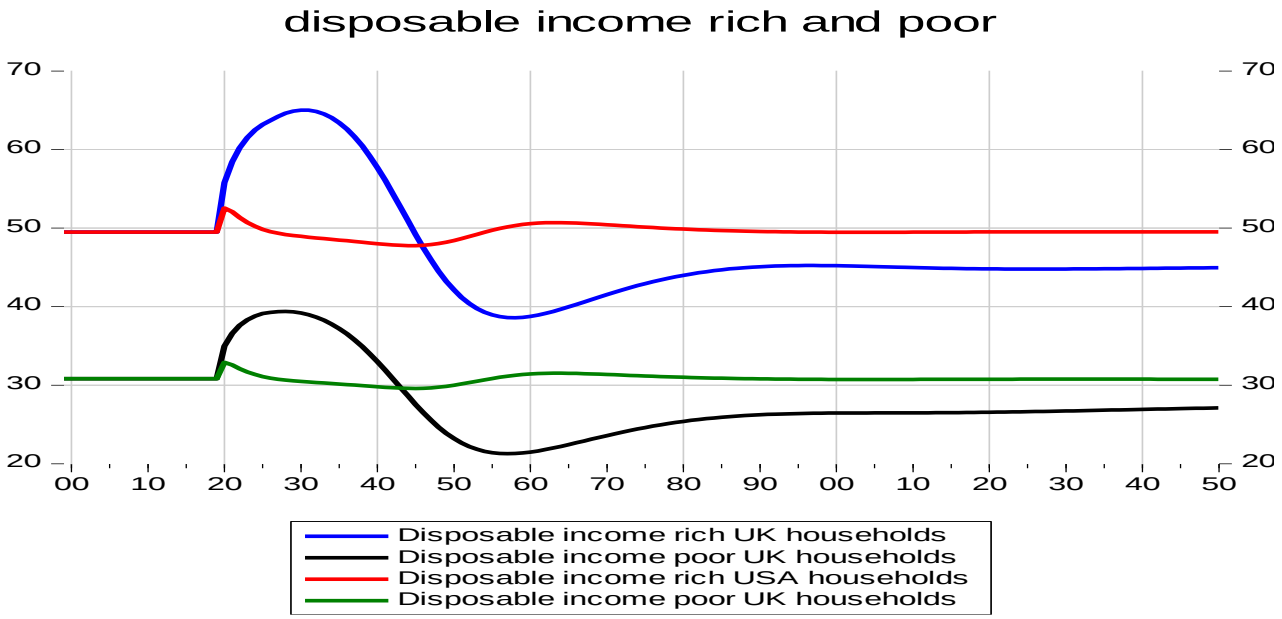
For country B the effect on consumption for both type of households is smaller if compared to country A. As for the GDP consumption in country B display a rapid increase after the shock followed by a quick collapse, the recovery overshoot the pre-shock level but it declines again and stabilizes at the pre-shock level.



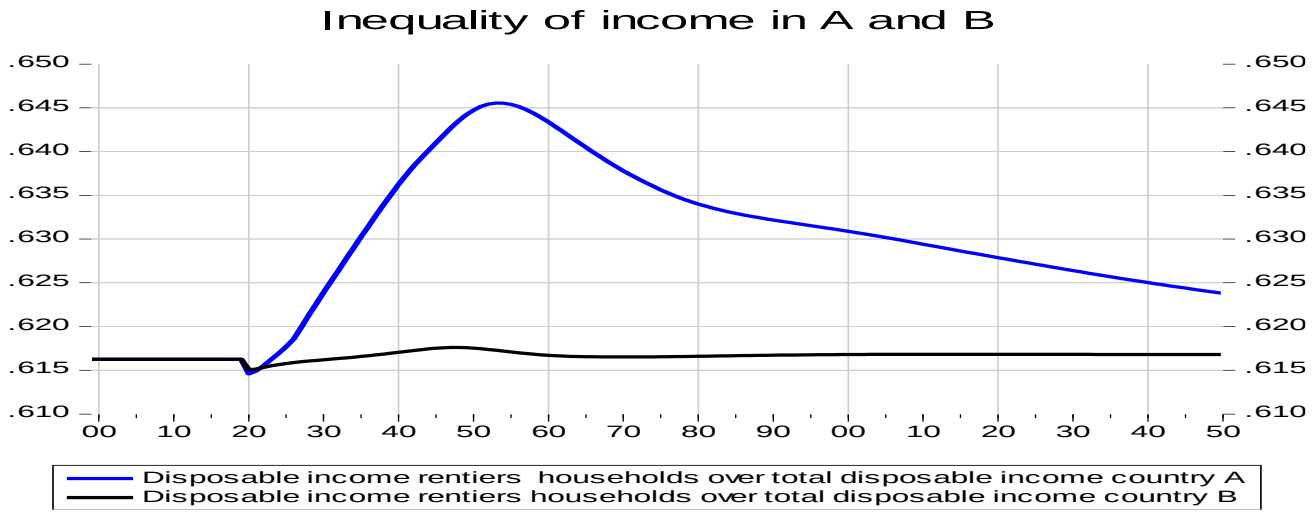
The impact of the shock on the Wealth and Net Wealth of the households sector can explain part of the dynamic that the model has displayed so far. Workers net-wealth in country A decrease rapidly after the shock and become negative, the reason of this brutal reduction in net-wealth lies in the expansion of the stock of debt in the balance sheets of the workers households and on the negative pressures that the stock of debt plays on workers' disposable income by the interest and principal repayment. After a small recovery, workers' net-wealth stabilizes at a negative level. This is one of the explanations of the low level of workers households' expenditure in the model. After the shock workers households have their balance sheets completely underwater, means that they must direct a larger part of their disposable income to pay back the stock of debt. At the same time, since in the workers' consumption function we find their net-wealth, negative values of this variable have a direct negative impact on workers' household expenditure. Wealth accumulation for Rentiers households in country A increases during the expansionary phase, when the economy is growing

due to the expansion of the expenditure of both workers and rentiers, it decreases when the GDP declines and it stabilizes at a lower level than the one before the shock.

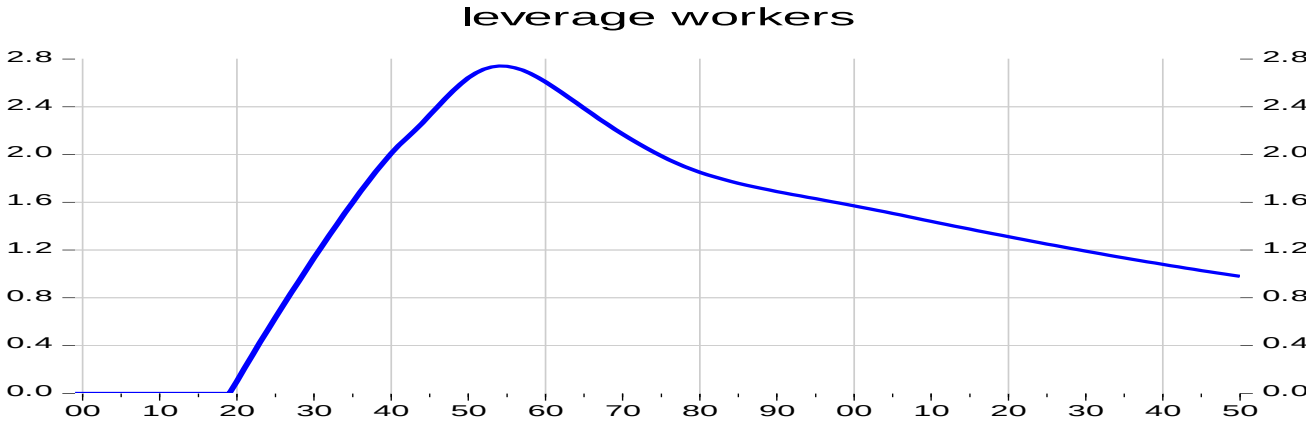
For country B households' wealth does not fluctuate as in country A, the level of wealth for country B stays basically the same during the fluctuations of the GDP and remains at the same level as the pre-shock scenario.



Household disposable income shows some fluctuations in both countries. After the shock disposable income for both Rentiers and Workers in country A increases, this is due to the expansion of the GDP that drives an increase in the income received by both Workers and Managers. When the GDP started to decline disposable income decline rapidly and reached its lowest level. While the decline of disposable income for Rentiers Households is due to the decline of GDP, for the workers the effect of the decline of GDP is augmented by the stock of debt that decreases the disposable income by the interest and principal repayment. For both types of households, disposable income does not recover completely and stays below the pre-shock level. Disposable income for country B displays some small fluctuations but then returns to the pre-shock level.

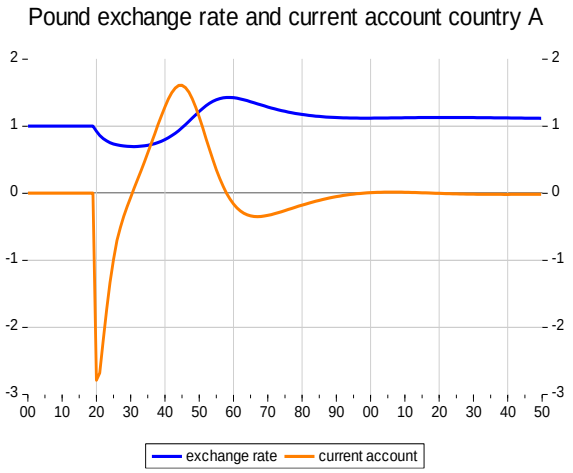


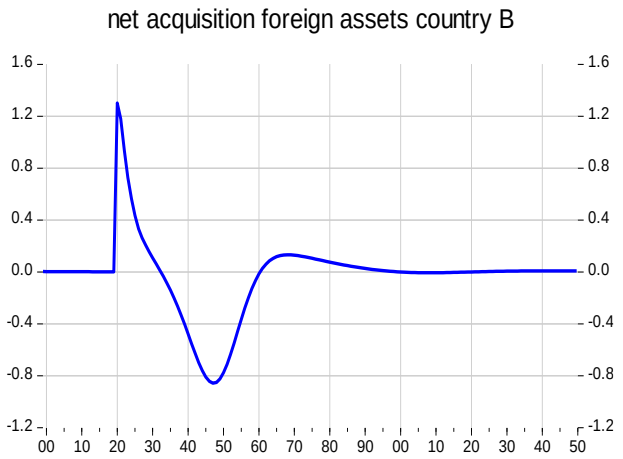
As we said above, for country A both workers and Rentiers end up with a lower level of disposable income and wealth, Everyone in country A ends up with lower income and wealth. At the same time, the distribution of income between the two types of households is affected by the shock. The ratio between the disposable income of Rentier households and the total disposable income shows how the distribution of income shifts towards the rentiers. After the shock, for country A, the ratio sees a small decrease but then starts to increase rapidly reaching its maximum during the recession. After having reached the maximum it starts t decline slowly and does not stabilize in the period of time we are considering.



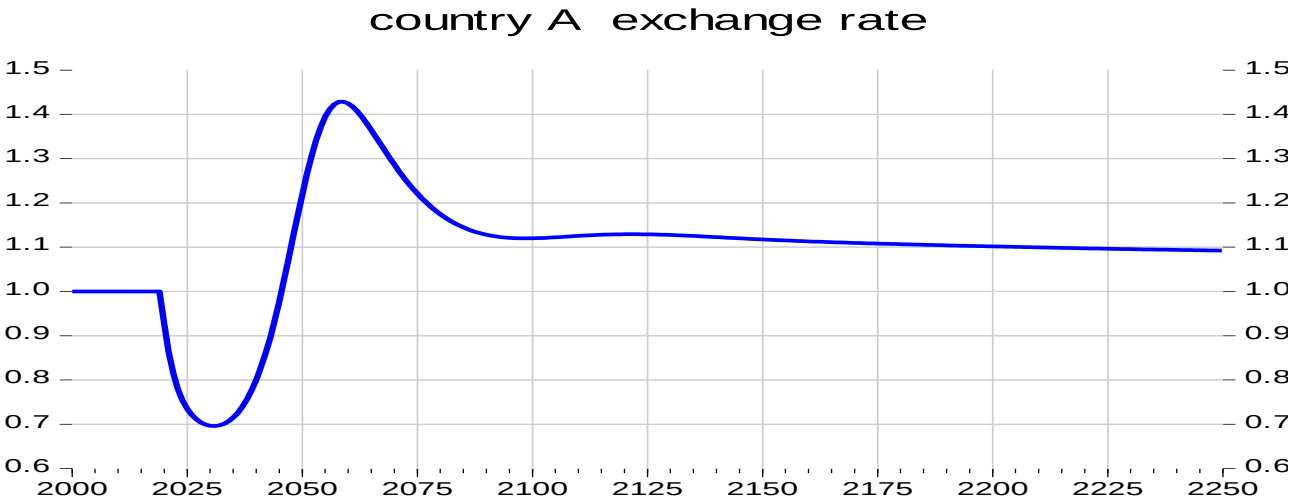
The shift in income distribution reflects the increasing burden of debt in the balance sheets of the workers and the consequent redistribution of income from who pays the interest on the loans (workers households) and who receives the profits of the banking sectors (rentiers households). The leverage of the workers explodes after the shocks as the stock of debt starts to become sizeable. This means that a larger part of workers' disposable income will be directed to interest payments and will become income for the rentiers when they receive the dividends from the banking sector. After reaching the maximum during the recessions, the deleverage begins and the level of debt in households' balance sheets starts to decline. Here we have the double effect of credit. The first impact is due to the "flow effect", fresh borrowing increases the purchasing power of households, this has an expansionary effect on GDP. At the same time fresh borrowing increase the stock of debt, this has a contractionary effect on consumption because there is a redistribution of income

from high-propensity to consume agents (workers) to low propensity to consume agents (banks and rentiers). The negative effect on consumption has a direct impact on GDP. This is the " stock effect" of credit.





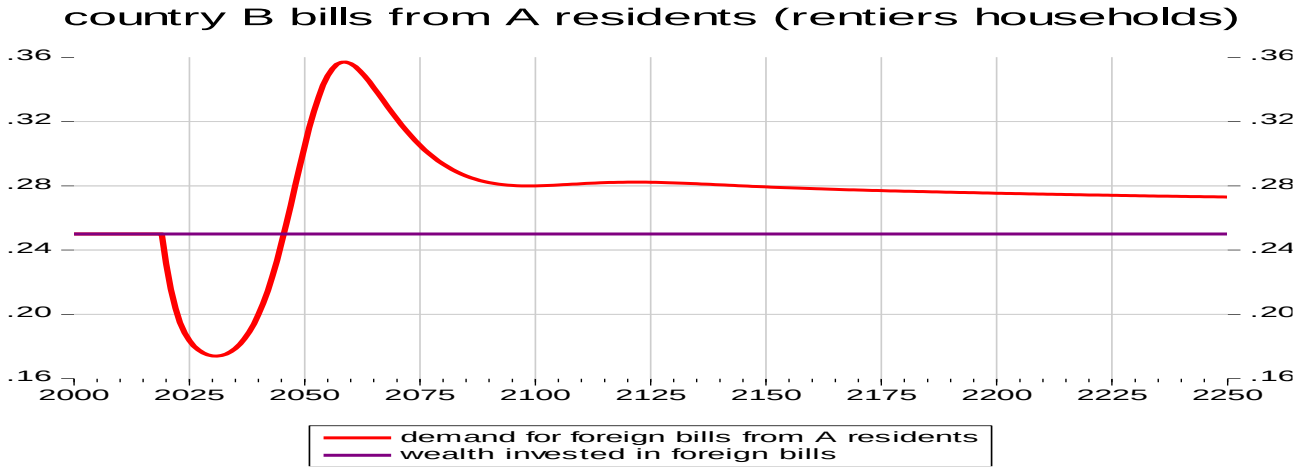
The relations between the countries play an important role in the evolution of the dynamics of the experiment. After the shock the current account of country A becomes negative because of the increase in import, this is due to the fact that import for country A is a function of total income. When the current account becomes negative the currency of country A depreciates. At the same time, greater inflows of capital from country B to country A are needed to finance the current account deficits, this means that country A starts to accumulate foreign debt, which increases the burden of debt on total income. The dynamic of the current account of the country is mirrored by the dynamic of the net acquisition of foreign assets of country B. The depreciation of the currency helps economy A to recover from the current account deficit as in every flexible exchange rate situation



As we said before, the exchange rate of country A depreciates during the expansions, helping the economy to reduce the current account deficit. When households' consumption declines, reducing

the level of imports, the exchange rate starts to rise, overshooting the level before the shock and depressing country's A export.

Since the burden of debt decreases the level of consumption of workers households in country A for a long period of time, both domestic demand and demand for foreign goods are lower than in the previous level. This means that even if the exchange rate is rising, imports for country A do not rise and the current account remains in equilibrium. At the same time the revaluation of the exchange rate allows country A to buy more treasury bills from country B with the same amount of wealth, this means that the inflows from country A to country B increases. In this situation, with an equilibrium in the current account balance and positive interest inflows from country B to country A the new exchange rate for country A must be greater than the one before the shock.



As shown by the figure above the demand for foreign bills by A residents decreases when the currency depreciates, because Rentiers can buy less country's B bills with the same amount of money, and increases when the exchange rate rises. It starts to stabilize with the rest of the economy but the adjustment process takes more time. As we said above the higher value of the exchange rate helps country A to "close" its balance of payment.

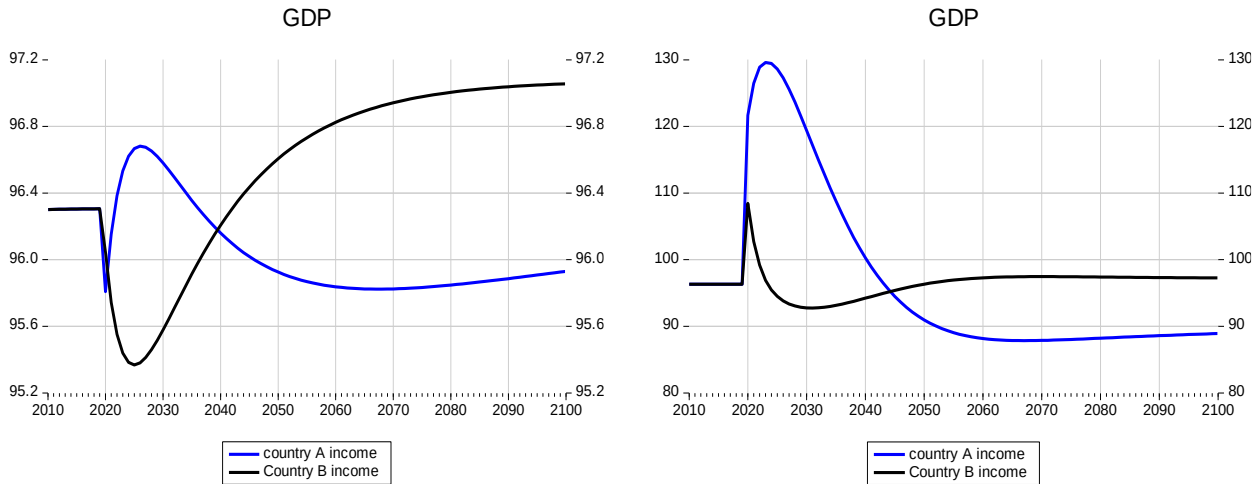
The revaluation of the currency of country A is good or bad for the economy? The revaluation decreases the competitiveness of country A and reabsorbs the trade balance position. At the same time, since Rentiers households from country A hold country's B treasury bills, a revaluation of the exchange rate for country A cause capital losses for the rentiers. This has an impact on their spending decisions since wealth is in the consumption function. So, revaluation has a twofold negative effect, on the external demand and on domestic demand.

Domestic demand is lowered by four different channels, the accumulation of debt in the workers's households balance sheets, the lower level of wealth and disposable income of both types of households, the capital losses of the rentiers due to the revaluation of the exchange rate, the indirect impact of the decrease of rentiers' expenditure on the "emulative" component of the workers.

The simulation we have performed shows how a credit supply shock can have a permanent effect on an open economy environment. The shock has an effect on the structure within the country and on the international relations between the two countries. The impact within the country regards the level of income and wealth and the distributive effect of the credit supply shocks. As have been shown before everyone in country A after the shock is with less wealth and with less level of disposable income. At the same time, the level of indebtedness affects the distribution of income between rentiers and workers, increasing the level of income inequality in the economy. The impact on international relations regards the distance of the two economies after the shock. Before the increasing level of indebtedness, the performances of the two economies were almost the same, they started the simulation with the same level of GDP, consumption, level of disposable income and wealth. After the shock, country A is in a worse situation for most of the variables respect of country B. The credit shock creates a distance between the two economies which is reflected by the level of the exchange rate that closes the model.

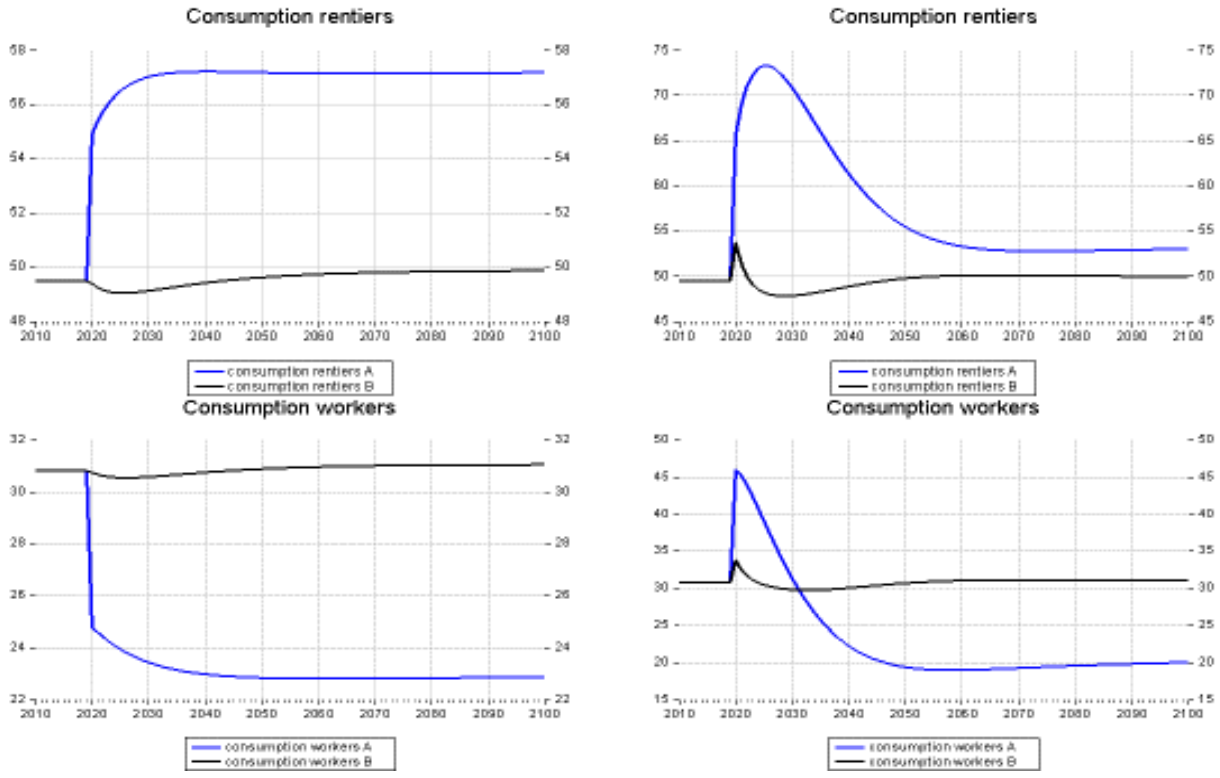
Income distribution experiment

In this section, we analyse the impact of a shift in income distribution. We look at the differences in the effect of an increase in income inequality between workers and rentiers in one country when workers do not have access to credit to increase their expenditure and when the banking sector is ready to lend to the workers in order to finance their expenditure. We assume that the economy is hit by a redistribution of income; as we have shown above the distribution of income is determined by the equation: $Y_r^a = ic^a Y^a$ that shows how rentiers' income is determined. Rentiers receive a portion of the income of the economy determined by ic^a. In the following experiment, we let ic^aincrease from the value of 0.6 to the value of 0.7. this increase reflects the shift in income distribution that we have described above from labor to capital and from low and middle incomes to high incomes. In what follows we will present, on the left side, the effects of a shift in income distribution when households do not have access to credit and on the right side, the effect of the same shift in income distribution when households can borrow in order to finance their expenditure.



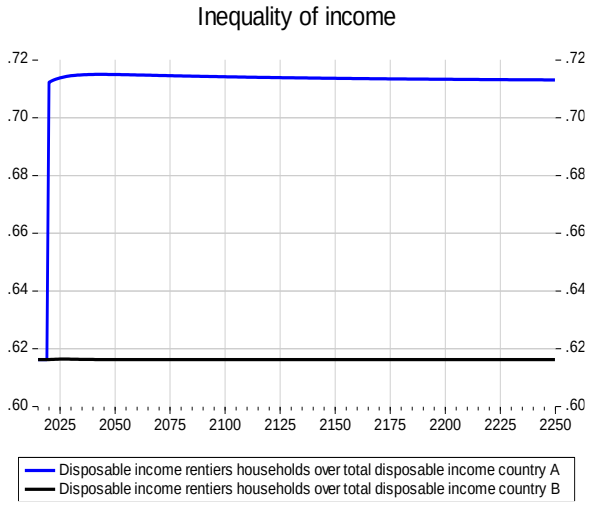
The impact of a shift on income distribution on GDP for the scenario with no credit access is a first decrease of GDP for both the countries followed by a rapid recovery that overshoot the level of GDP of before the shock, the collapse of GDP is stronger for country B. The recovery is very quick for country A while takes longer for country B. Country A after a rapid recovery displays another decline of GDP, after this last fluctuation the recovery towards the pre-shock level is slow and takes time and the economy does not recover completely. Country B after the first decline in GDP displays a strong recovery that overshoots the pre-shock level of GDP and stabilizes at a higher level.

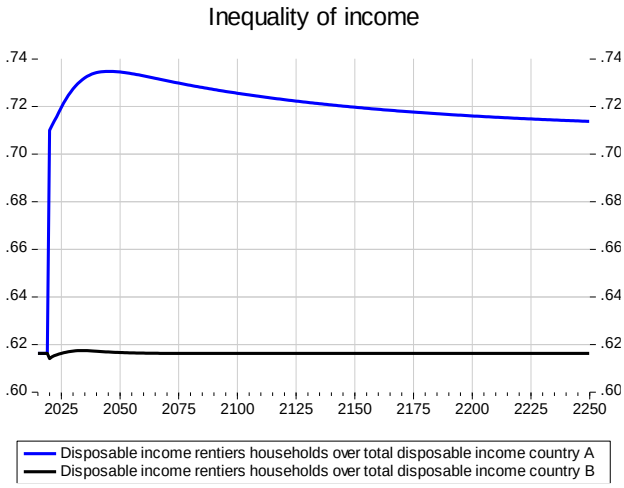
In the scenario with credit access by the workers' households, the situation is different. After the shift in income distribution GDP for both countries increase. The increase is followed by a rapid slowdown for country B and a large decrease in GDP for country A. For country B the GDP stabilize at a higher steady-state while for country A the GDP is lower than the pre-shock level and it does not stabilize around a new "steady state" but slowly starts to increase but for all the period that we are considering its below the pre-shock level.



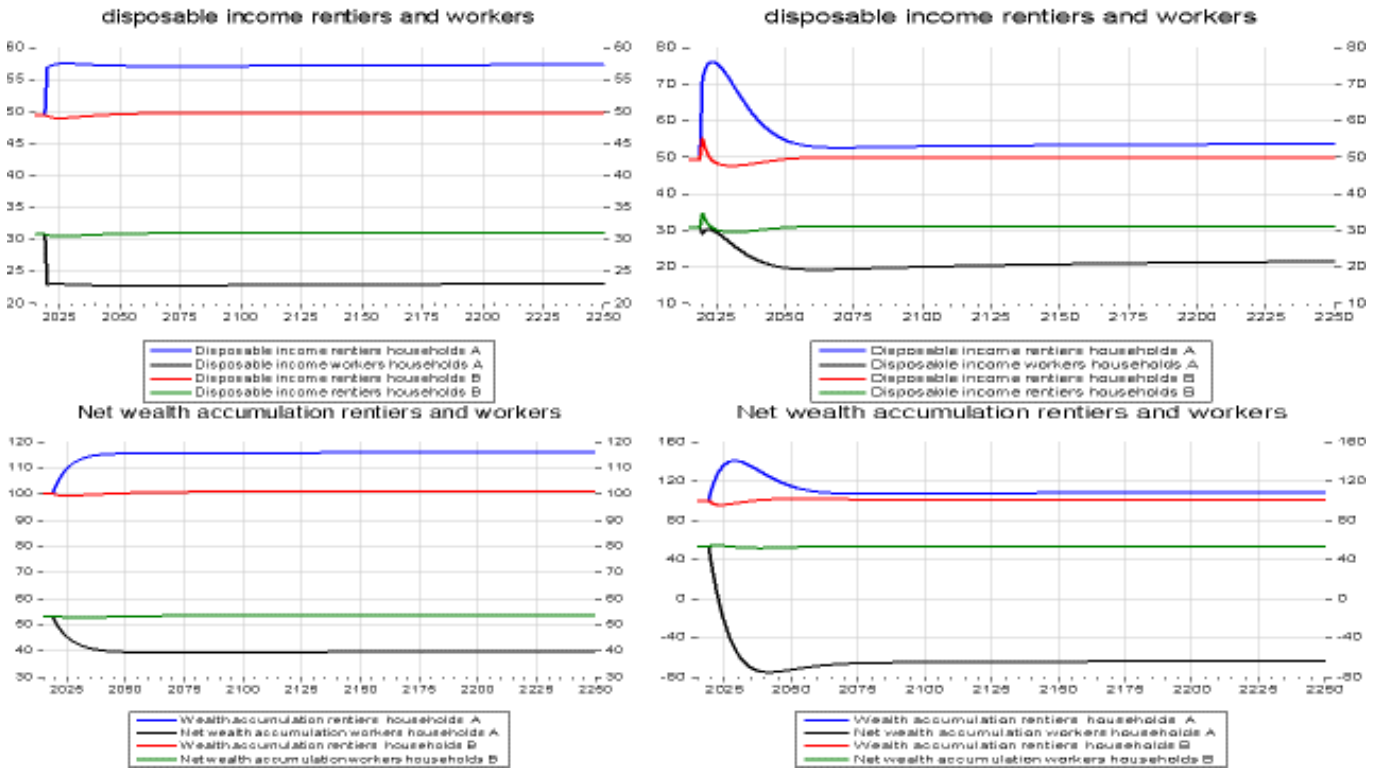
The effect of the sock on households' consumption changes dramatically in the two scenarios. When workers households cannot borrow to finance their expenditure the shift in income distribution means lower purchasing power for them and more purchasing power for the rentiers. The result is a jump of rentiers consumption, due to the increase in their income, and a decrease in workers consumption, due to the decrease in their income. Consumption of rentiers and workers of country B in the credit constraint scenario displays a very small decrease after the shock but after a few periods, it stabilizes at a higher level than before the shock.

In the scenario with credit access, both consumptions for Rentiers and Workers in country A display a jump after the shock. For Rentiers, this is due to the shift in income distribution and the subsequent increase in their disposable income. For the workers the increase in consumption is due to the fact that when the shock to income distribution hit the economy they increase demand for loans to cover the distance between their consumption and rentiers' consumption, this leads to an increase in borrowing and an increase in consumption. The rapid increase in consumption for workers lasts for a few periods, after that worker's expenditure collapse and stays below the pre-shock level for all the period we take into consideration. For rentiers households the increase in consumption lasts for a longer period than the workers, it decreases during the slowdown and stabilizes on a higher value than before the shock. For country B the impact on consumption for rentiers and workers display a similar pattern, after a rapid increase during the expansion in country A there is a small contraction followed by a recovery, the new steady-state level is higher than the one before the shock.



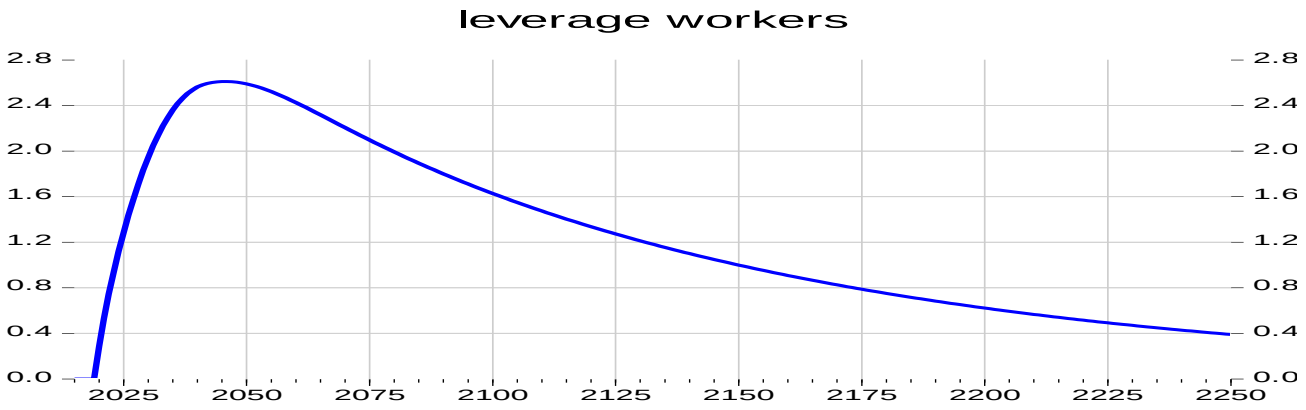


The shift of the distribution of income in the simulation with no credit access causes a jump of rentiers' disposable income. After the exogenous increase, the level of disposable income of rentiers over total disposable income stabilizes at the new level. For country B there is no change in the level of rentiers' disposable income over the total. When households can borrow the impact on a shock of income distribution is larger at the beginning, the increase in rentiers' disposable income is larger in this scenario, but it does not stabilize at the new level and starts to decline over time.

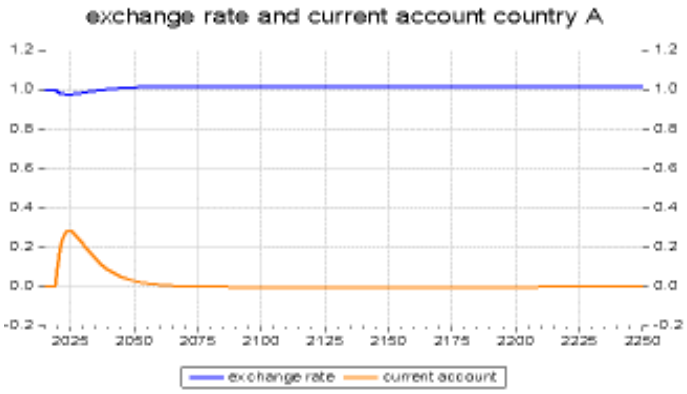


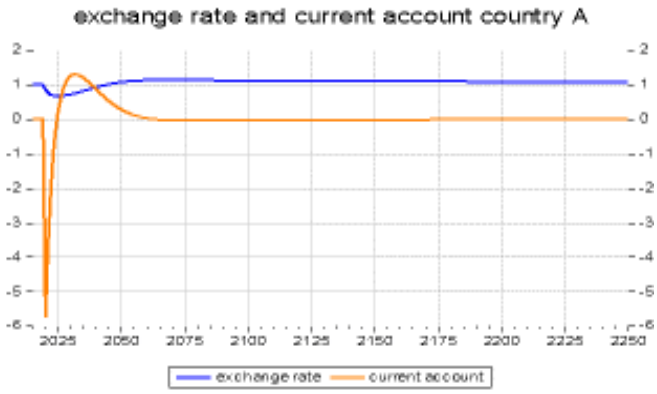
As shown by the previous figures, the impact of the shift in the distribution of income has different effects on the scenarios we are analyzing. The impact on workers' and rentiers' disposable income in the first scenario is a sudden increase in rentiers' disposable income and a decrease in workers' disposable income. After this rapid jump income for both households stabilizes at the new level. The change of the net wealth takes longer to stabilize but follows the same pattern of disposable income. Country B basically does not see any change in the distribution of income.

As we said above the increase in Rentiers' disposable income is larger in the credit access scenario. Rentiers saw their income jump, but after a few periods, it started to decline and stabilize at a new level, higher than the pre-shock level. For workers, the decline in their disposable income is slower than the scenario with no credit access but the magnitude of the decline is larger. For country B the disposable income increase for both Rentiers and workers after the shock, after this small increase, it displays a decline and then it stabilizes at a higher level than before. The net-wealth follows the same dynamics of the disposable income for rentiers households, for the workers the presence of a large stock of debt in their balance sheets brings the net-wealth in negative territory.

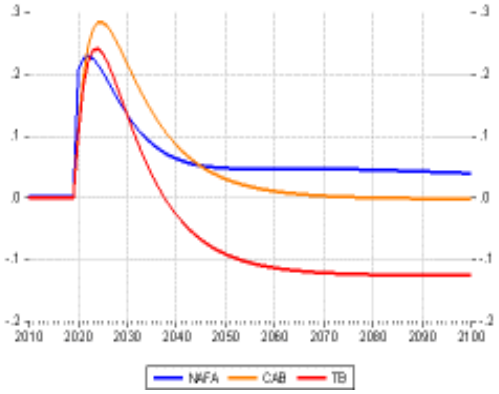


The level of workers' leverage in the credit access scenario increase after the shock as workers borrow to increase their spending in the face of a decrease in their disposable income and because of the disposable income of workers declines after the shock on income distribution and during the recession. The increase of leverage last for all the periods during the boom in consumption and of the collapse of GDP, this is due to the fact that while during the boom workers are borrowing, increasing the numerator of the ratio, during the recessions both the stock of debt and the collapse of GDP decrease the level of the disposable income, decreasing the denominator.

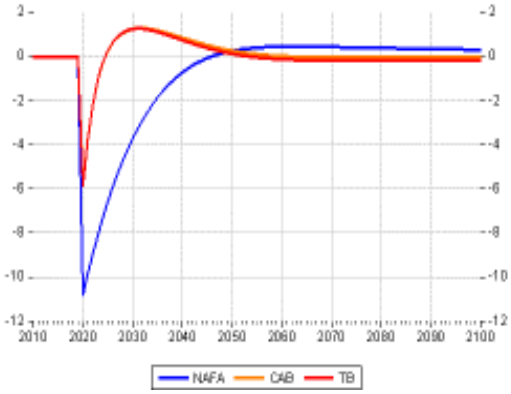




A net acquisition of foreign assets, current account balance and trade balance



A net acquisition of foreign assets, current account balance and trade balance



The international effect of the shock allows us to detect some of the dynamics in place in both scenarios. As we said before, in the credit constraint scenario the shock brings a decrease in workers' consumption and a subsequent decrease in GDP. The collapse in workers' consumption and GDP decreases the level of export from B to A, this has a negative effect on B's GDP and a positive effect on A's current account. The positive trade balance of country A does not translate in an appreciation of the currency but, instead, we see a depreciation of country's A currency. The depreciation can be explained by the distribution shift of the shock. The shock brings an increase in the disposable income of rentiers and indirectly on an increase in their savings; part of this increase in saving will be directed to the country's B treasury bills. The results is that: while the trade balance and the current account of country A are positive, pushing up the value of the currency, the outflows from A to B looking for treasury bills more than compensate the pressure of the trade balance and this pushes down the level of the currency.

The devaluation of the country's A currency explains the short recession; when the capital gains from foreign bills start to boost rentiers' consumption the economy starts to recover and overshoot

the pre-shock level. This overshoot is due to the “paradox” of a positive current account and weakening of the currency.

So far seems that an unequal shift in the distribution of income can be beneficial for both economies. But, the situation revers when the outflows from country A to country B looking for treasury bills closes and there is no more outflow of capital that offsets the position in the trade balance. At this point, the currency starts to appreciate causing a slow down of the economy.

The new steady-state of the exchange rate of country’s A currency is higher than the pre-shock level; this is due to the large number of foreign treasury bills accumulated by country’s A rentiers that generate a constant inflows of interest from country B to country A, this implies a constant demand from country B of the currency of country A, the results is a constant upward pressure on country’s A currency that sustains the higher value in the new steady state. The final results are that the current account of country A is zero even if the trade balance is in a negative position. The overvaluation of the currency is responsible for the stagnation and slow recovery of country A.

For the credit access scenario, the dynamic is the same that we have seen in the first experiment. After the shock the increase in consumption and GDP brings a deterioration in the trade balance and in the current account because of the increase in import; as a result, the currency depreciates, this helps the economy to mitigate the current account negative position. When consumption starts to declines because of the burden of debt in workers' households balance sheets import decline as well; this brings a recover of the current account that overshoots the pre-shock level. Positive positions in the current account put positive pressures on the exchange rate that appreciates and overshoots the pre-shock level. Since the stock of debt continues to be a burden in workers' households balance sheets and their consumption does not recover, the level of import does not rise enough in order to bring down the level of the currency. The result is a new steady-state level for the exchange rate for country A higher than the pre-shock level.

The difference between this scenario and our first simulation is that since there has been a shift in income distribution the new steady-state state level of disposable income and wealth of rentiers is higher than before the shock. The level of wealth would be even higher in the absence of capital losses from foreign bills due to the revaluation of the exchange rate.

With these last simulations, we are able to show how a shift in income distribution can have different effects on the economy if households can rely on borrowing or not.

In the credit constraint scenario, the shift on income distribution has negative effects on the country that see its distribution deteriorates: the new steady-state level of the GDP and workers' consumption are lower than the pre-shock level, the level of inequality is higher and the trade balance is in negative territory. By contrast, country B seems to gain from the shift in income distribution in country A. The level of GDP, households’ consumption and trade balance are all higher than the pre-shock levels.

In the scenario with credit access, the effect of the shock lowers the GDP and workers’ consumption of the country hitten by the shock, while rentier consumption is higher than before. Country B’s GDP is higher as well as households’ consumption. The effect of credit access can lower the effect of a

shift in income distribution only temporarily, then the stock effect of the burden of debt added to the increase in inequality lowers the performance of the economy.

Conclusions

The paper presented here has tried to show how the institutional changes during the "financialization" period have created some specific dynamics, domestically and internationally, that have increased the financial fragility of the global economy. These institutional changes are: increasing income inequality, the financialization of firms' behavior, the increasing willingness of the households sector to use credit and asset-based borrowing to increase their expenditure in the face of stagnating disposable income, and the integration of international trade and financial markets. All these transformations have created an environment were growth, in a considerable group of countries, was driven mainly by private domestic demand financed by credit or by foreign demand coming from the external sector. The interactions between these two growth models were essential to the existence of both of them, but this has increased the fragility of the global system and the channels of contagion and transmission of financial crisis or any kind of shock.

In the second part of the paper, we develop an open Stock-Flow Consistent model to test the effect of two different shocks. In the first shock, we let the credit access of the workers' households to increase. With this shock, we can study how an increase in the willingness of banks to lend can have a domestic and international effect when workers want to increase their spending for consumption to keep up with the rest of the economy. The results of this first experiment are that: credit supply shock and debt builds-up in the hand of workers households have a permanent effect on the economy, the steady-state level of GDP after the shock is lower than before, the level of inequality has increased and workers households find themselves with their balance sheets completely underwater. The international dimension plays an important role in the stagnation of the country hit by the shock because of the capital losses of rentiers households due to the exchange rate movements.

In the second experiment, we compared the effects of a shift in income distribution when workers households do not have credit access and when they can borrow to consume as much as they want. The results of this second experiment show how credit access can offset, just temporarily, the impact of a shift in income distribution. The ability of workers household to borrow cover the decrease of their disposable income in the short run enabling them to keep up with the rest of the economy, but the accumulation of the stock of debt on their balance sheets will constrain their spending exacerbating the negative effect of the shift in income distribution. The final result is that, while credit access allows workers to increase their spending after the increase in income inequality, the steady-state levels of consumption and GDP of the credit access scenario are lower than the credit constraint scenario, in the new steady state of both the scenarios the new level of GDP is lower than before the shock, but the economy where banks lend aggressively to the households sector has a larger difference with the pre-shock level. At the same time, the foreign country is affected positively by the shocks in both the experiments.

The results of these experiments show the ability of private debt, more specifically households debt, to generate fluctuations in the short run and to have a permanent effect on the economy. Given the

current level of increasing inequalities and the increasing level of households' debt in some advanced economies, these results would suggest that policymakers and economist pay attention to the possible effects of these dynamics.

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Values of model's parameters

θ^A = 0.2

θ^B = 0.2

ε_0 = -2.1

ε_1= 0.5

ε_2 = 1.228

μ_0 = -2.1

μ_1 = 0.5

μ_2 = 1.228

α_{1r}^A= 0.73

α_{1p}^A= 0.77

α_{1r}^B = 0.73

α_{1p}^B = 0.77

α_2^A = 0.13333

α_2^B = 0.13333

λ_{10}= 0.7

λ_{11}= 5

λ_{12}= 5

λ_{20}= 0.25

λ_{21}= 5

λ_{22}= 5

λ_{40}= 0.7

λ_{41}= 5

λ_{42}= 5

λ_{50}= 0.25

λ_{51}= 5

λ_{52}= 5

emu^A = 0

emu^B = 0

$ic^A = 0.6$

$ic^B = 0.6$

$depsh^A = 0.7$

$depsh^B = 0.7$

$bo^A = 0.5$

$bo^B = 0.5$

Additional equation of the model

$$B_{As}^A = B_{Ad}^A$$

$$B_{As}^B = B_{Ad}^B xr^A$$

$$B_{Bs}^B = B_{Bd}^B$$

$$B_{Bs}^A = B_{Bd}^A xr^B$$

$$YD_r^B = Y_r^B + F_{bank}^B + r_{-1}^B B_{Bs-1}^B + r_{-1}^A B_{As-1}^A xr^A - T_r^B$$

$$YD_w^B = Y_w^B - r_{-1}^B L_d^B - T_w^B$$

$$YD_{hsr}^B = YD_r^B + (\Delta xr^A) B_{Bs-1}^A$$

$$\Delta V_r^B = YD_{hsr}^B - C_r^B$$

$$\Delta V_w^B = YD_w^B - (C_w^B - \Delta L_w^B)$$

$$NW_w^\$ = V_w^\$ - L_w^\$$$

$$T^B = \theta^B (Y^B + r_{-1}^B B_{Bs-1}^B + r_{-1}^A B_{As-1}^A xr^A + F_{bank}^B)$$

$$C_r^B = \alpha_{1r}^B YD_r^B + \alpha_2^B V_{r-1}^B$$

$$C_w^B = (1 - emu^B)(\alpha_{1w}^B YD_w^B + \alpha_2^B NW_{w-1}^B) + emu^B C_r^B$$

$$Y^B = C_r^B + C_w^B + G^B + X^B - IM^B$$

$$Y_r^B = ic^B Y^B$$

$$Y_w^B = Y^B - Y_r^B$$

$$X^B = IM^A xr^A$$

$$IM^B = X^A xr^A$$

$$B_{Bd}^B = V_r^B(\lambda_{40} + \lambda_{41} r^B - \lambda_{42} r^A)$$

$$B_{Bd}^A = V_r^B(\lambda_{50} - \lambda_{51} r^B + \lambda_{52} r^A)$$

$$DEP_r^B = (V_r^B - B_{Bd}^B - xr^A B_{Bs}^A) depsh^B$$

$$H_{rh}^B = V_r^B - B_{Bs}^B - B_{Bs}^A xr^A - DEP_r^B$$

$$DEP_w^B = V_w^B \, depsh^B$$

$$H_{wh}^{B} = V_{w}^{B} - DEP_{w}^{B}$$

$$B_{As}^{A} = B_{A\,d}^{A}$$

$$B_{As}^{B} = B_{Ad}^{B} xr^{A}$$

$$B_{Bs}^{B} = B_{Bd}^{B}$$

$$B_{Bs}^{A} = B_{Bd}^{A} xr^{B}$$

$$DEP_{bank}^{B} = DEP_{p}^{B} + DEP_{r}^{B}$$

$$g_{con}^{B} = 1\ iff\ \left(C_{p}^{\$} - YD_{p}^{\$}\right) > 0$$

$$\Delta L_{d}^{B} = (C_{w}^{B} - YD_{w}^{B})(1 - bo^{B}) g_{con}^{B}$$

$$L_{s}^{B} = L_{d}^{B}$$

$$B_{bnot}^{B} = DEP_{bank}^{B} - L_{s}^{B}$$

$$H_{h}^{B} = H_{rh}^{B} + H_{wh}^{B}$$

$$z^{B} = 1\ iff\ B_{banknot}^{B} > 0$$

$$B_{bank}^{B} = z^{B} B_{bnot}^{B}$$

$$A_{d}^{B} = -B_{bnot}^{B}\,(1 - z^{B})$$

$$A_{s}^{B} = A_{d}^{B}$$

$$F_{bank}^{B} = r_{-1}^{B} B_{bank-1}^{B} + r_{-1}^{B} L_{s-1}^{B}$$

$$H_{s}^{B} = B_{cb£s}^{B} + A_{s}^{B}$$

$$B_{cbBs}^{B} = B_{s}^{B} - B_{£s}^{B} - B_{Bs}^{B}$$

$$F_{cb}^{B} = r_{-1}^{B} B_{cbBs-1}^{B}$$

$$\Delta B_{s}^{B} = G^{B} - T^{B} + r_{-1}^{B} B_{Bs-1}^{B} - F_{cb}^{B}$$

$$H_{h}^{A} = H_{s}^{A}$$

$$H_{h}^{B} = H_{s}^{A}$$

YD_{r}^{A} = Regular disposable income Rentier households A

YD_{r}^{A} = Regular disposable income Workers households A

YD_{r}^{B} = Regular disposable income US rich households

YD_{p}^{B} = Regular disposable income US poor households

YD_{hsr}^{A} = Rentiers households Haig-Simons disposable income A

YD_{hsr}^{B} = Rentiers households Haig-Simons disposable income

V_{r}^{A} = Rentier households' private wealth A

V_{p}^{A} = workers households' gross private wealth A

NW_p^A = workers households' net private wealth

V_r^B = Rentiers households' private wealth B

V_p^B = Workers households' gross private wealth

NW_p^B = Workers households' net private wealth

T^A = Taxes paid by households A

T^A = Taxes paid by households B

C_r^A = Value of consumption of rentiers households A

C_p^A = Value of consumption of workers households A

C_r^B = Value of consumption of rentiers households B

C_p^B = Value of consumption of workers households B

Y^A = A GDP

Y^B = B GDP

Y_r^A = Share of A GDP earned by rentiers households A

Y_w^A = Share of A GDP earned by workers households

Y_r^B = Share of B GDP earned by rentiers households B

Y_w^B = Share of B GDP earned by workers households

X^a = exports A

X^B = exports B

IM^A = imports A

IM^B = imports B

B_{Ad}^A= Demand for A bills by A rentiers households

B_{Ad}^B= Demand for B bills by A rentiers households

B_{Bd}^B= Demand for B bills by B rentiers households

B_{Bd}^A= Demand for A bills by B rentiers households

DEP_r^A = Demand of bank deposits by rentiers households A

DEP_w^A = Demand of bank deposits by workers households A

DEP_r^B = Demand of bank deposits by rentiers households B

DEP_w^B = Demand of bank deposits by workers households B

H_{rh}^A = Cash held by rentiers households A

H_{wh}^A = Cash held by workers households A

H_{rh}^B = Cash held by rentiers households B

H_{wh}^{B} = Cash held by workers households B

H_{h}^{A} = Total cash held by households A

H_{h}^{B} = Total cash held by households B

B_{As}^{A} = A bills held by A rentiers households (bills supply)

B_{As}^{B} = B bills held by A rentiers households (bills supply)

B_{Bs}^{B} = B bills held by B rentiers households (bills supply)

B_{Bs}^{A} = A bills held by B rentier households (bills supply)

DEP_{bank}^{A} = Total level of deposits in A

DEP_{bank}^{B} = Total level of deposits in B

g_{con}^{A} = Borrowing 'parameter' of workers households A

g_{con}^{B} = Borrowing 'parameter' of workers households B

L_{w}^{B} = Demand for loans by workers households A

L_{d}^{B} = Demand for loans by workers households B

L_{s}^{A} = Supply of loans by banks A

L_{s}^{B} = Supply of loans by banks B

B_{bnot}^{A} = Notional level of domestic bills held by the A banking sector

B_{bnot}^{B} = Notional level of domestic bills held by the B banking sector

z^{A} = Trigger for notional A bills bought by A bank

z^{B} = Trigger for notional B bills bought by B bank

B_{bank}^{A} = Actual level of domestic bills held by the A banking sector

B_{bank}^{B} = Actual level of domestic bills held by the B banking sector

$A_{d}^{A} =$ Advances demanded by the A banking sector to A central bank

$A_{d}^{A} =$ Advances demanded by B banking sector to B central bank

$A_{s}^{A} =$ Advances supply by A central bank

$A_{s}^{B} =$ Advances supply by B central bank

F_{bank}^{A} = Profits of the A banking sector

F_{bank}^{B} = Profits of the B banking sector

$B_{cb£s}^{A}$ = A bills held by A central bank

$B_{cb\$s}^{B}$ = B bills held by B central bank

H_{s}^{A} = A money supply

H_{s}^{B} = B money supply

F_{cb}^{A} = A Central Bank's profits

F_{cb}^{B} = B Central Bank's profits

B_{s}^{A} = A public debt (total A bills issued)

B_{s}^{B} = B public debt (total B bills issued)

xr^{A} = A exchange rate (value of the pound in B dollars)

xr^{B} = B exchange rate (value of the dollar in the A)

Exogenous variables

G^{A} = A government expenditure

$G^{£}$ = pure government expenditure

r^{A} = Interest rate on A bills

r^{B} = Interest rate on B bills

Model Parameters

α_{1r}^{A} = Propensity to consume out of income of A rentiers households

α_{1w}^{A} = Propensity to consume out of income of A workers households

α_{1r}^{B} = Propensity to consume out of income of B rentiers households

α_{1w}^{B} = Propensity to consume out of income of B workers households

α_{2}^{A} = A propensity to consume out of wealth

α_{2}^{B} = B propensity to consume out of wealth

emu^{A} = Emulation parameter in the A

emu^{B} = Emulation parameter in B

θ^{A} = A Tax rate

θ^{B} = B Tax rate

ε_{0} = Constant of the A export equation

ε_{1}= Elasticity of A exports with respect to A exchange rate

ε_{2} = Elasticity of A export with respect to B output

μ_{0} = Constant of A import equation

μ_{1} = Elasticity of A imports with respect to A exchange rate

μ_{2} = Elasticity of A import with respect to A output

α_{1}^{A} = A propensity to consume out of income

α_1^B = B propensity to consume out of income

α_2^A = A propensity to consume out of wealth

α_2^B = B propensity to consume out of wealth

λ_{ij} = Portfolio equations parameters

ic^A = A inequality parameter (portion of A GDP earned by A rentiers households)

ic^B = B inequality parameter (portion of B GDP earned by B rentiers households)

$depsh^A$ = Portion of money held in the form of bank deposits by A households

$depsh^B$ = Portion of money held in the form of bank deposits by B households

bo^A = Share of shortfall of A workers households expenditure funded by loans

bo^B = Share of shortfall of B workers households expenditure funded by loans

Conclusions

This work addresses the important role of household debt in generating fluctuations. Household debt has become an important driver of aggregate demand both at the domestic and at the international level. Given the high level of inequality and the relatively small level of government expenditure around the world, a large portion of advanced economies have started to rely, and are still relying, on household debt to generate the level of aggregate demand needed to grow.

The effect of debt can be understood by looking at its double face. It increases the spending of borrowers at the beginning, by increasing their purchasing power, but it decreases their ability to spend in the pay-back phase and their ability to borrow more because of its burden in the balance sheets.

We have developed three different models which consider three different scenarios in which debt can generate fluctuations.

In the first chapter, the model shows how the interaction between lenders and borrowers can generate what has been called a “predator-prey” or “stock-flow” dynamics of the household debt. The interaction between the demand for credit by borrowers and the leverage ceiling imposed by the banking sector can create an endogenous business cycle where debt shows its double effects.

In the second chapter, by essentially referring to the U.S. case, we address the important role of the housing market and of housing demand by the households sector to explain the dynamics of the economy preceding the recession and the subsequent demand stagnation.

In the model the interaction between the banking sector, the households sector, and the housing market generates a boom-bust dynamics when banks decide to increase their lending. When the possibility of credit access is connected to the price of the houses we are able to replicate a financial accelerator dynamic where households borrow to consume more and the banking sector accepts the value of the houses as collateral. The dynamics of the experiment is completely driven by the lending behavior of the banking sector.

The results of this second model show how aggregate demand generation can be temporarily driven by households’ debt build-ups and how the behavior of the banking sector relatively to the housing market can generate large fluctuations.

In the third chapter, we studied the impact of the household debt in an international context. Household debt expansions in an open economy environment have a permanent effect because of their impact on the distribution of income, and because of the international dimension of credit expansion.

The results of our work suggest that the management of private debt and its dynamics must be a concern of the public authority, to ensure that the growth process relies on a sustainable generation of demand and indebtedness.