Inequality and Finance in a Rent Economy

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Abstract

The present paper aims at offering a contribution to the understanding of the interactions between finance and inequality. We investigate the ways through which income and wealth inequality may have influenced the development of modern financial systems in advanced economies, the US economy first and foremost, and how modern financial systems have then fed back on income and wealth distribution. We focus in particular on securitization and on the production of complex structured financial products. We analyse this topic by elaborating a hybrid Agent-Based Stock-Flow-Consistent (AB-SFC) macroeconomic model, encompassing heterogenous (i.e. households) and aggregate sectors. Our findings suggest that the increase in economic growth, favoured by the higher levels of credit supply coming with securitization, may determine a more unequal and financially unstable economic system. We also find that a lower degree of tax progressiveness and wider wage inequality further polarize income and wage distribution, and reduce economic growth.

1 Introduction

There are two well-known stylised facts as to the evolution of most developed economies since the 1970s on. First, most developed economies, in particular Anglo-Saxon economies such as the USA and the UK, have experienced a significant increase in income and wealth inequality (Stiglitz, 2016*a*). Second, the financial sector expanded considerably, both in absolute and relative terms - with respect to the economy as a whole (Kumhof et al., 2015). Is there any causal link between these two facts? Does (expanding) finance carry out any effect on income and wealth distribution and vice versa?

Albeit being rather overlooked until recently, the possible relationship between finance and inequality is not a new topic in economics. It was first addressed by economists interested in understanding whether financial liberalization and financial development could reduce income inequality (Levine, 2005; Clarke et al., 2006; Beck et al., 2007). More recently, the outbreak of the financial crisis was interpreted as a hint that a reverse causality may also hold true. Indeed, several authors see in the above-mentioned increase in income and wealth inequality, and in its effects on households' debt, the real roots of the 2007-2008 financial shock (Fitoussi and Stiglitz, 2009; Stockhammer, 2015; Kumhof et al., 2015).

Both strands of analyses did not reach a clear-cut finding, either at theoretical or empirical level (see Bordo and Meissner, 2012, for a rejection of the 'inequality-leads-to-crisis' hypothesis). But regardless from the achievement of any consensus, what is missing in the above-mentioned theoretical or empirical analyses is a comprehensive overview of the likely endogenous and bidirectional relationship between finance and inequality. More specifically, we think that a relevant shortcoming of the existing contributions is the lack of a general portray of the ways through which income and wealth inequality may have influenced the development of modern financial systems in advanced economies, the US economy first and foremost, and how modern financial systems have then fed back on income and wealth distribution.

The present paper aims at offering a contribution in filling this gap. We do so by presenting a simple theoretical model about the reciprocal interaction between income and wealth distribution on the one hand, and the development of modern financial systems on the other hand. Financial systems have indeed changed dramatically in the last three decades. New financial institutions, new financial products and practices have emerged changing balance of power and relevance between traditional and new financial actors. Among these aspects of novelty, generally labelled under the name of shadow banking, we focus on securitization practices and on the production of complex structured financial products, trying to assess how they have interacted with income and wealth inequality. We analyse this topic by elaborating a hybrid Agent-Based Stock-Flow-Consistent (AB-SFC) macroeconomic model, encompassing heterogenous (*i.e. households*) and aggregate sectors. Into this framework, we allow households to get access to bank lending in order to achieve their consumption goals as well as to accumulate financial assets in the form of shares of Investment Funds. Investment Funds, in turn, remunerate households' financial investments by allocating recollected funds on different financial assets, namely risk-free low-remunerative government bonds and (relatively) riskier more-remunerative structured financial products such as Collateralised Debt Obligations (CDOs). The production of CDOs as carried out by investment banks is ultimately meant to satisfy the demand of remunerative assets by (wealthy) households and is permitted by the *endogenous* securitization of (a part of) commercial banks' original loans to households and non-financial firms. Through the mechanisms of our model, we provide a formal description of the functioning of what Stiglitz (2015*b*) previously labelled as a *rent-seeking* or *exploitation rent* economy, i.e. an economic system in which the ultimate goal of credit creation is not the financing of productive activities whereas the remuneration of rent positions via the production of complex structured financial products, the securitization of existing loans, and, eventually, the over-indebtedness of middle and lower-class households.

Our analysis of the relationship between inequality and securitization leads to three major outcomes. First, this paper provides a formal description of a perverse (and likely unsustainable) spiral between increasing income and wealth inequality, the spread of securitization practices, and the production of structured financial products. On the one hand, securitization and CDOs spread in order to satisfy the appetite for high returns from (rentier) wealthy households, which command a sizeable and increasing part of national income and wealth. On the other hand, financial systems accommodate such a demand for remunerative assets by allowing commercial banks to extend more loans to increasingly indebted households, and then by introducing newly created loans in the securitization process in order to produce

CDOs. The ensuing stream of interest payments from middle and low-class households and financial rents to top-income households exacerbates income and wealth inequality, and makes the conditions for the development of these new financial practices even stronger.

Second, we show how the credit boom and the economic growth that increasing inequality and new financial practices gave rise to are two intertwined aspects of a likely unsustainable process, which eventually ends up in an endogenously generated financial crisis. Indeed, over-indebted middle and low class households may ultimately default on their payments commitments. This event first causes the reduction of the remunerativeness of CDOs and of Investment Funds' shares. Secondly, it induces the dry-up of the demand for structured financial products, hence the break-down of the securitizing system (Gorton and Metrick, 2012) and the end of the credit boom that securitization itself previously allowed for. Empirical evidence from the last financial crisis tells us that restrictions to the provision of credit (if not a credit crunch) and the freezing of financial markets are distinguishing features of a financial crisis and, very likely, causes of an economic downturn.[1]

Third, in the last two years, and in particular after Donald Trump's presidential election in the USA, new emphasis has been put on the so-called 'trickle-down effect'. This is the conviction that a reduction of the tax rate for the rich, and the reduction of the degree of progressiveness in the taxation system, will also benefit the poor by stimulating more savings, investment and growth. We test the 'trickle-down' hypothesis by running an experiment in which we introduce in our economic system what is commonly labelled as the 'flat-tax' rate, i.e. a unique and proportional tax rate for everybody. The results of our experiment goes in the opposite direction with respect to what put forward by the supporters of such a reform in the taxation system. Whilst income and wealth inequality increase, investment and average economic growth slow down. We get precisely the same results, with even higher financial fragility, when we alternatively assume a one-shot increase in income inequality.

In the end, we believe that the self-reinforcing although destabilising (in a Minskyan sense) process we describe in this paper lies at the basis of the structural evolution of most developed economies since the 1970s on. By describing this process, our work offers an innovative contribution to the recent body of literature on the causes and consequences of the increasing levels of income and wealth inequality in advanced financialised economies over the last three decades (e.g. Atkinson et al., 2011; Piketty, 2014; Stiglitz, 2012, 2015*a*, 2016*a*).

2 Literature review

There is an open debate in the economic literature about the relationship between inequality and finance. A first bunch of contributions on this topic takes somehow inspiration from the literature about financial repression. The focus here is on whether financial deregulation (i.e. the removal of controls and restrictions to the operativeness of financial operators) and/or financial development (i.e. the quantity of resources provided by the banking system to economic actors) may contribute to reduce income inequality. Some initial responses to this research question are on the positive (see, for instance Clarke et al., 2006; Beck et al., 2007; Abiad et al., 2008), as Levine (2005) himself stresses by stating that 'the results indicate that finance exerts a disproportionately large, positive impact on the poor and hence reduces income inequality' (Levine, 2005, p.920). The logic behind this perspective is quite simple. Financial liberalization, and the ensuing financial development, will allow financial operators to extent credit to those economic agents, usually the poor, which were previously cut off from external finance due to lack of acceptable collaterals and/or the imposition of a too restrictive (perhaps prudential) regulation of financial activity. A wider access to external finance will in turn allow more people to accumulate human and/or physical capital, with obvious positive consequences as to income generation and the creation of a more equitable economic environment.

The above virtuous causality nexus running from (more) finance to (less) income inequality is not

[1] The fragility and weak sustainability of such a self-feeding development process is also due to the fact that the risk associated to 'financial primary commodities', read subprime mortgages, may have been diluted into apparently safer structured financial products, but an increasing body of over-indebted households is still there, so that systemic financial risk may have even increased. Interestingly, Wojnilower (1980) defines as *'paradox of risk'* (from Keynes' paradox of thrift) the dynamics for which the availability of individual risk cover leads to higher systemic risk.

undisputed however. On the one hand, some authors have made the positive effect of financial liberalization and financial development on income inequality conditional to the presence of good economic and political institutions (Rajan and Zingales, 2003; Claessens and Perotti, 2007). Indeed, good institutions, which ensure sound economic competition, transparency and accountability are fundamental to ensure that financial development does not boil down to the mere concentration and capture of increasing financial resources by a restricted elite of well-connected actors. On the other hand, some recent empirical contributions find a negative effect of finance on income inequality (Denk and Cournede, 2015; de Haan and Sturm, 2017). And indeed these last findings seem consistent with the broad long-run analysis of income distribution provided by Piketty (2014). The fact that income distribution worsened the most in those English-speaking countries, namely the USA and the UK, which experienced a significant expansion of the financial sectors since the 1970s, that an increasing part of the income of top earners is made up by capital income, and, finally, that access to financial markets as intermediated by professional financial investors (read Investment Funds) allow wealthy households to get higher-than-average returns on capital are clear symptoms if not proofs that finance can actually play a negative effect on income inequality.

Besides the effects that financial liberalization and financial development can bring about on inequality, there is a growing interest in investigating the inverse causality link running from inequality to finance. The outbreak of the last worldwide financial crisis significantly stimulated the emerge of such a new strand of literature, which actually aims at explaining the occurrence of the 2007-2008 financial shock itself as the long-term outcome of mounting inequality. There are several different interpretations of the most proximate causes of the 2007-2008 financial shock. Blanchard (2009) and Brunnermeir (2009) focus on some characteristic aspects of modern financial systems (however *without* connection with real-economy dynamics). They basically blame the spread of securitization, the production of opaque structured financial products, and the intricate network these practices gave rise as the most relevant factors, which contributed to transform financial distress in a relatively tiny segment of financial markets (the market for subprime mortgages) in a full-blown systemic financial crisis (i.e. to transform old-fashioned runs on bank deposits into modern runs on short-term external financial on wholesale monetary markets). Taylor (2009), on the contrary, thinks that policy mistakes, in particular a too lax monetary policy and excessive governmental support to mortgage lending, ignited and fed the development of a boom in the housing market that eventually went bust. Despite these analyses capture some of the factors that contributed to feed unsustainable macro dynamics in the run-up to the crisis, they neglect to frame them in a broader picture that connects those factors with the recent structural evolution of advanced economies, rising inequality first and foremost. Fitoussi and Stiglitz (2009) stress this point very clearly when they state that 'the crisis has structural roots' and that these roots consist in 'the structural changes in income distribution'. Indeed, 'since 1980, in most advanced countries the median wage has stagnated and inequalities have surged in favour of higher incomes [...]. In the US the compression of low incomes was compensated by the reduction of household savings and by mounting indebtedness that allowed spending patterns to kept virtually unchanged [so that] growth was maintained at the price of increasing public and private indebtedness' (Fitoussi and Stiglitz, 2009, pp.3-4).

Rajan (2010), Lysandrou (2011), Goda and Lysandrou (2014), van Treeck (2014), Stockhammer (2015), Kumhof et al. (2015), and Russo et al. (2016) share the same perspective. Rising inequality is to be considered the real cause of the crisis since that it generated, directly or indirectly, the quest for a credit-led (consumption and asset price) boom and the conditions for mounting households' indebtedness. Rajan (2010) stresses that such a perverse causality link from inequality to finance has been vitally intermediated by politics and political decisions. As Rajan (2010) bluntly puts it: 'The political response to rising inequality [...] was to expand lending to households, especially low-income ones. The benefits - growing consumption and more jobs - were immediate, whereas paying the inevitable bill could be postponed into the future' (Rajan, 2010, p. 9). Fitoussi and Saraceno (2010) propose a similar point of view, in the sense that they bring the level of the analysis to monetary policy. In their view, monetary authorities *endogenously* took an accommodating stance in order to avoid a permanent (inequality-led) deficiency of aggregate demand, but excessive expansionary monetary policy ultimately corroborated an unsustainable credit boom and housing bubble. The starting point of Rajan's and Fitoussi and Saraceno's analyses is the increasing *demand for loans* coming from impoverished middle and low-class households in order to compensate for stagnant wages and maintained high consumption levels. Lysandrou (2011), and

Goda and Lysandrou (2014) see this story from the opposite angle. It was the concentration of wealth in the hands of a few super rich, and the ensuing rise in the *demand of remunerative financial assets*, that induced the hypertrophic expansion of the financial sector and the production of structured financial products, of which banks' loans given to middle and low-class households constituted the primary inputs.[2]

It is worth noting that Kumhof et al. (2015) integrate the above two aspects in a formal DSGE model. In their model, households at the bottom part of the income distribution increase their demand for external finance in order to 'keep up with the Joneses'. At the same time, wealthy households at the top of the distribution respond to such a demand by increasing the supply of loanable funds given the inclusion of wealth among their preferences and into their utility function. This appreciable aspect notwithstanding, Kumhof's model misses to provide even a rough description of the financial mechanisms, better to say financial developments, that allowed the matching between the increasing demand for financial assets (supply of funds) from the better off and the higher demand for loans (demand of funds) from the worse off. This shortcoming is not trivial. On the one hand, the proliferation of remunerative, although allegedly safe, structured financial products (CDOs) meant to satisfy the 'appetite for rents' from wealthy households could only take place with the securitization of part of the stock of loans traditionally generated by commercial banks. On the other hand, commercial banks could easily satisfy the application for loans from indebted households and firms, and expand the stock of primary commodities for the production of new CDOs, only by unburdening their asset position and offloading part of the existing assets out of their balance sheets and into the whirling securitization process. On top of this, it is also through this complex network of financial mechanisms that income and wealth have been regressively redistributed away from middle- and low-class to rich households, and inequality worsened even further. The development of securitization and structured financial products stands out as the response to the structural changes emerging in advanced economies as due to rising inequality, and worked to make such trends even more acute. Rising inequality and securitization jointly contributed to the run-up towards the 2007-2008 financial crisis. This is why a deep understanding of the complex relationship between inequality and finance cannot depart from taking these two aspect together. We try to elaborate such a comprehensive overview of the endogenous dynamics of inequality and financial development through the heterogenous-household SFC model presented in the next section.

3 A formal model of an exploitation rent economy

The increase in the wealth-income ratio is a well-known stylised fact characterising advanced economies in the last three decades. Stiglitz (2016*a*) clearly explains how it is possible that a relevant increase in the wealth-income might take place alongside a constant or even decreasing capital-income ratio. This is due to the fact that a sizeable part of wealth is not represented by 'produced machines', but rather by land or 'other ownership claims giving rise to rents' (Stiglitz, 2016*a*, p.3) . Given this fact, Stiglitz (2016*a*) also shows that much of the recent growth in wealth has been detached from the dynamics of economic output and productive capital as a result of the increase in different form of rents eventually reflected in the value of wealth itself.

A great deal of the activities giving rise to rents take place in the financial system (Stiglitz, 2012). There are several forms of rents. One of them is the 'exploitation' rent, i.e. rents accruing to economic agents as a consequence of monopoly power and of the departure from the standard assumptions of a perfectly competitive world. The financial sector is the paradigmatic industry that can benefit of exploitation rents given the specific role it plays in the wider economic system. Financial operators, for instance, generate and manage a huge amount of asymmetric information. They are at the centre of complex and often opaque network relationships, which certainly give rise to economic dynamics inconsistent with perfect competition.[3]

[2]Stockhammer (2015) makes a similar point when he stresses that "increasing inequality has increased the propensity to speculate, that is, it has led to a shift to more risky financial assets. One particular aspect of these developments is that subprime derivatives, the segment where the financial crisis broke out in 2008, were developed to cater to the demands of hedge funds that manage the assets of the super-rich. Increasing inequality has thus played a role in the origin of the imbalances that erupted in the crisis as well as in the demand for the very assets in which the crisis broke out." (Stockhammer, 2015, pp.950-651).

[3]It is precisely due to the complex tangle of relationships finance naturally gives rise, and of the harsh economy-wide

More in general, financial institutions are recognised the privileged position of creating (or intermediating) financial resources allowing economic actors to take economic decisions. Through this activity, financial institutions simultaneously originate others' liabilities and their own assets. In the traditional 'originate-and-hold' financial system, banks themselves kept the originated assets on their own balance sheets. In the more recent 'originate-and-distribute' system that emerged alongside with the development of securitization, originated assets are eventually moved (perhaps figuratively in the form of asset-backed securities and collateralised debt obligation) onto the balance sheet of wealthy households. It is precisely the diffusion of this practice that allowed finance to considerably increase the total amount of liabilities and assets characterising the economy.[4] Accordingly, the development of securitization appear as functional to the creation of a higher stock of liabilities for the poorer and, correspondingly, of wealth for the richer. While fuelled by inequality (through the demand of securitized assets from those better off and the indebtedness of those worst off), they contributed to exacerbate inequality even further by creating financial claims to be honoured by impoverished low and middle class households to the benefits of top-income households. In our view, this represent a significant contribution to the creation of new sources of exploitation rent, and to speed up the dynamics of wealth beyond capital and income.

The creation of interest-bearing securities starting from partitioned credit assets, (*i.e. securitisation*), is not a recent financial practice. It dates back to the 18th century when it appeared in the Dutch financial market (Frehen et al., 2014). However, over the last thirty years it reached unprecedent levels. Modern forms of securitization have their starting point in the 1970, when in the US, Ginnie Mae started building and selling mortgage backed securities (MBS). Ever since the market for securities rose dramatically.[5]

Securitization evolved beyond being a financial practice implemented by individual financial institutions, with the aim of removing risky assets from their balance sheets, and became a complex system involving different kinds of financial institutions (Botta et al., 2015). In a nutshell, commercial banks' credit creation is the starting point. The credit is then moved on to the balance sheet of pass-through financial entities (Special Purpose Vehicles), where different credits are pooled together according to their characteristics (e.g. level of risk). These credit pools are then partitioned into slices and sold to the financial system as interest bearing asset backed securities, which are bought by brokers and dealers, and transformed into increasingly complex financial instruments, such as collateralised Debt Obligations (CDOs). Finally, financial intermediaries - e.g. Mutual and Investment funds - purchase this complex structured financial products.

Gorton (2010) identifies four possible explanations for the dramatic growth of securitiazion. On the one hand, the production of structured financial products satisfied the increasing demand for (allegedly) safe collaterals arising from the growing repo market. On the other hand, the securitization of financial assets allowed financial institutions to circumvent regulation on capital requirements, to minimize bankruptcy costs, and to feed financial innovation such as the creation of Special Purpose Vehicles (SPV). While we largely agree with Gorton (2010), we believe that other (more) systemic elements concurred to the development of these financial innovations. On the supply side of the story, financial deregulation, in particular the progressive dismantling of the Glass Steagall Act, allowed financial conglomerates to implement autonomously all the steps of the securitization process. On the demand side of the story, the aforementioned trends in wealth inequality may have contributed to considerably increase the demand for remunerative but relative safe financial assets. Indeed, the concentration of wealth and the consequent proliferation of cash rich investors stimulated the rise of non-bank financial institutions investing collected funds from wealthy households in the market for securities. Money Market Mutual Funds (MMMF), for instance, emerged in the 70s, and became a highly popular alternative to commercial banks by offering more remunerative and (apparently) equally safe investment opportunities than banks' deposits to rentiers. In turn, new (or expanding) financial actors increasingly diverted their activities towards the engineering and production of new financial products in order to keep up with the voracious appetite for

consequences that might emerge from the break-down of these connections, that a 'unique' rent position characterises financial systems in the form of the implicit public guarantee acknowledged to 'too-big-to-fail' banks (see Stiglitz (2016*a*)).

[4] According to the IMF (2009), an additional recent stylised fact of advanced countries is the spectacular increase in the outstanding amount of securities, which has been taking place since the 1980s

[5] Several studies suggest that this rise contributed to leading the U.S. credit market towards an unstustainable path and might therefore be considered as one the causes of the *sub-prime* mortgage crisis (e.g. Segoviano et al., 2013; Purnanandam, 2011; Peicuti, 2013).

remunerative financial investments from wealthy households.

Into this framework, credit provision by the banking system has been increasingly motivated by the need to create 'primary' financial assets, i.e. mortgages and consumption loans, to be used as intermediate inputs for the production of complex structured finance securities (e.g. MBS, ABS, CDO). The mortgage sector represented the ideal field for the rise of these financial products. Mortgages are indeed a large, highly demanded, and relative safe - being backed by the value of the real estate - type of loan. In practice a perfect and abundant input in the production of securities (Caverzasi et al., 2018). The deregulation of financial markets, coupled with the endogenous credit creation by the banking system (Stiglitz and Greenwald, 1992, 2003; Stiglitz, 2016*b*; McLeay et al., 2014; Kaldor, 1970) eventually made such dynamics disruptive.

At the best of our knowledge, only a restricted bunch of papers describe the impact of securitization on the behaviour of the financial system as a whole, none of them connecting the development of the securitizing system to rising inequality. Mazzocchetti et al. (2017) and Lauretta (2018) propose two agent-based models, in which the authors try to describe the effects of securitization and the ensuing expansion in the provision of loans to the economy on growth and the business cycle. In their model, however, securitization is a *supply-driven* phenomenon (Mazzocchetti et al., 2017),[6] or it amounts to a pure parametrical exercise (Lauretta, 2018), which does not show any form of endogeneity and co-evolution with the distribution of income and wealth.[7] By doing so, these models do not capture a fundamental reason for the development of securitization, i.e. the attempt to satisfy the demand for remunerative assets by top-income households[8]. Nikolaidi (2015) elaborates a SFC model in which securitization allows commercial banks to enlarge credit provision to workers' households, which in turns rely upon incresing indebtedness in order to alleviate the effects of stagnating wages. In this sense, Nikolaidi (2015) successfully captures one aspect of well-know distributive dynamics in advanced economies, i.e. wage stagnation. Nevertheless, the lack of heterogenous households does not allow Nikolaidi (2015) to properly measure how *personal* income and wealth inequality coevolved with the financialization of the economy.[9]

Differently from the contributions just mentioned, this paper puts the joint dynamics of inequality and finance at the centre of its analysis. In order to accomplish with our purpose, we elaborate a hybrid Agent Based Stock Flow Consistent (AB-SFC) macroeconomic model, with all sectors at macro-aggregated level but the households sector. Indeed, we assume the households sector to be populated by multitude of heterogeneous agents. On the one hand, this parsimonious use of agent-based modelling allows us to avoid considerable problems in the interpretation of simulation results that usually arise in fully-fledged agent-based macro models. On the other hand, it allows us to formally enquire, through the assumption of multiple heterogeneous households, how increasing income and wealth inequality and the development of securitizing financial systems relate each other. In this respect, the assumption of heterogeneous households is fundamental for two reasons. First, it allows us to effectively track changes in income and wealth inequality between increasingly poorer (at least in relative terms) low and middle class households, and increasingly richer top percentile households. Secondly, it is essential to formally analyse the rationale of the securitizing banking systems, and the tendency to generate financial contagion and high systemic risks that the development of securitization inevitably brings with it. The in-depth understanding of the systemic risk-prone nature of such a 'macroeconomic regime' (rising inequality matched with the

[6] Mazzocchetti et al. (2017) assume commercial banks to securitize the amount of existing loans that will allow them to downsize their balance sheet and accomplish with capital requirements according to an exogenously set 'securitization propensity parameter' μ. In their model, the supply of securitized assets may nevertheless respond endogenously to changes in the riskiness of loans given to firms, which is in turn affected by the business cycle

[7] Lauretta (2018) describes three different dynamics of the securitization process according to three different values of the 'financial innovation' parameter governing the securitization process itself.

[8] Goda and Lysandrou (2014) provide anecdotal evidence of the relevance of this aspect by quoting Charles Prince's (ex Citigroup CEO) testimony to the Financial Crisis Inquiry Commission. Prince said: "Securitization could be seen as a factory line. As more and more and more of these subprime mortgages were created as raw material for the securitization process" (Goda and Lysandrou, 2014, p. 102). In connection with Price's statement, Goda and Lysandrou (2014) also quote Mike Francis, executive director at Morgan Stanley saying: "We almost couldn't produce enough to keep the appetite of our investors happy. More people wanted bonds than we could actually produce. That was our difficult task, was trying to produce enough" (Goda and Lysandrou, 2014, p. 314).

[9] In her model, Nikolaidi (2015) assumes the existence of three different categories of households: worker households-type I, worker households-type II, and rentier households.

development of securitizing banking) cannot be reached within a macro-aggregated analytical model, or even within a model with two classes of households. On the contrary, agent-based models can effectively shed light on the above-mentioned economic mechanisms. Indeed, one of the major successes of agent-based models is the ability to detect contagion dynamics in financial networks. We precisely want to exploit such a potential of agent-based models.

As portrayed by Tables 4 and 5, we assume a simple closed simulated economy. It consists of six sectors: households, non-financial productive firms (NFF), the government, commercial banks (CB), Special Purpose Vehicles (SPVs) and, ultimately, investment funds (IF). Our work aims at enquiring a possible bi-directional and endogenous relationship between (income and wealth) inequality and financialization. For this reason, the core of our model lies in the interaction between the households sector and the overall financial system, commercial banks, special purpose vehicles, and investment funds alike. Consistently with our goals, we assume the households sector to be made up of N heterogenous family units, which differ among one another for their wealth (both their initial endowment and wealth accumulated through time) and disposable income. More in detail, each individual household has a specific disposable income. This firstly depends on the net wage (out of taxes) from NFFs. Secondly, it also relies upon net payments from the financial sector. Indeed, in each period of the model, those households holding IFs' shares will receive financial rents. At the same time, if indebted, they will have to make interest payments to CBs (and indirectly to SPVs and IFs via the securitization chain) on their own outstanding debt stock. The ensuing positive or negative net financial payments will contribute to increase or, alternatively, squeeze each single household's disposable income.

In each period, households define the desired consumption level according to their disposable income and a 'socially determined' term. On top of this, households can keep their savings either in the form of deposits, which pay no interests and are held for precautionary purposes only (e.g. to finance future consumption expenditures), or as IFs' shares. In the attempt of meeting their desired levels of consumption and portfolio choices, households can ask for a loan to commercial banks. Considerations on borrower's creditworthiness guide both the banking sector's decision on wether to grant the required loans to the household, and the determination of the household specific interest rate.

Commercial Banks (CB) endogenously create money by extending loans to households and non-financial firms. The degree by which CBs create new loans depends on the assessment of borrowers' creditworthiness, as well as on prudential evaluations about their leverage (or capital requirements). In order to circumvent possible regulatory-imposed restrictions to further expansion of their business, CBs rely on securitization. In each period of our model, an endogenous share 'z' of the total loan stock is securitized and moved onto SPVs' balance sheet. We represent also SPVs as a macro-aggregated sector, which performs the transformation of loans into securities. Such complex financial practice consists in collecting a share 'z' of CBs-created loans to be used as 'primary commodities' for the production of collateralised debt obligations (CDOs), which are ultimately sold to IFs. IFs are financial intermediaries that collect funds by issuing shares sold to households. Collected funds are invested in financial markets by purchasing public bonds and CDOs. Whilst IFs buy government bonds as risk-free assets, CDOs produced by SPVs are meant to satisfy (rentier) households' appetite for higher but still relatively safe returns. On top of heterogenous households, the real side of the economy is completed by a macro-aggregated non-financial productive sector and by the government. Non-financial firms (NFFs) produce a homogeneous good, sold to households for consumption, to the government for public purchases, or to the firm sector itself for investment purposes. NFFs implement invest projects according to the degree of capacity utilization (i.e. the intensity with which they utilize the available capital stock), as well as their profitability. The implementation of investment projects is financed by NFFs' net profits and loans from CBs. Being an aggregated sector credit rationing for NFFs can only be partial. Also NFFs hold deposits as a precautionary stance against unforeseen events (i.e. unexpected increases in the wage bill). Finally, in a very simple way, the government collects taxes from households and firms, and makes public expenditures. Any difference between public expenditures and tax revenues is covered by issuing bonds, which are bought either by CBs or by IFs. The determination of bonds rate depend on the market interaction between the supply of bonds and the corresponding demand from Ifs and CBs.

In order to capture the importance of conglomerated financial holdings in the US financial market, we assume that IFs - which can be thought as representing non-bank financial institutions and different

kinds of mutual funds - own the banking sector. Accordingly, CBs' profits are entirely passed, in the form of dividends, to IFs. Dividends from CBs, interests on CDOs and interests on government bonds constitute IFs' revenues. As it is standard in AB-SFC literature, our model is dynamic. Simulations last for T periods. The sequence of events in each period is as follows:

1. *Households receive their wages from NFFs and pay their wage tax.*
2. *Financial flows take place. Interests on public bonds are paid by the government. At the same time, commercial banks collect interests on issued loans and keep the portion coming form non securitized loans. CBs finally transfer their profits to the IF sector in the form of dividends.*
3. *The part of financial proceeds deriving from securitized loans is passed to IFs via SPVs.*
4. *IFs compute their revenues given by the interests paid on securitized loans (as 'packed' into CDOs), dividends from commercial banks, as well as interests on pubic bonds holding. Revenues from invested funds are then subdivided among share holders in the form of remuneration of IFs' shares.*
5. *Households compute their disposable income out of wages, tax payments and net financial payments and define their desired levels of consumption, deposits and stock of shares. Households go to commercial banks and ask for loans in order to cover any possible gap between their portfolio and consumption decisions and own available liquid resources, i.e. disposable income and stock of deposits.*
6. *Commercial banks decide whether to grant loans or not to households.*
7. *Households adjust consumptions and portfolio decisions according to credit availability. When loans are granted households meet their desired levels of consumptions and financial investments.*
8. *The government makes public expenditures. NFFs decide investments according to previous period capacity utilization and profitability.*
9. *Firms produce and sell goods in order to satisfy aggregate demand. Whenever net profits* - i.e. *without taxes and interests on outstanding debt - do not cover the cost of investment, firms borrow money form the banking sector. If, on the contrary, net profits exceed the cost of investments, the remaining is stored in the form of extra deposits.*
10. *The government issues public bonds in order to cover any public deficit. This safe assets are sold on financial markets and bought by IFs and CBs.*
11. *Financial transactions are completed with the purchases of CDOs by IFs. IFs decide the amount of funds collected from (rentier) households to allocate on CDO according to the spread between interest rates on public bonds and effective returns on CDOs.*

4 Behavioral equations

4.1 Households

We start the description of the equations composing our model from the households sector. In particular, let's see how the disposable income of each individual household's is determined. This is formally stated in Equations (1)-(2) below:

$$yd_{i,t} = w_{i,t} - tax^{w}_{i,t} + rsh_{i,t} - r^{h}_{i,t-1}\widetilde{Lh_{i,t-1}} \tag{1}$$

$$tax^{w}_{i,t} = \tau^{w}_{j} w_{i,t} \begin{cases} \text{if } w_{i,t} < \hat{w}_t & \Longrightarrow tax^{w} = \tau^{w}_{1} * w_{i,t} \\ \text{if } w_{i,t} \geq \hat{w}_t & \Longrightarrow tax^{w} = \tau^{w}_{1} * \hat{w} + \tau^{w}_{2} * (w_{i,t} - \hat{w}_t) \end{cases} \tag{2}$$

The individual family unit and the time of the simulation are identified respectively by the subscript i and t. In Equation (1), $yd_{i,t}$ stands for disposable income. The first component we take into account

in Equation (1) is the gross wage $w_{i,t}$ each individual household receives from NFFs at the beginning of each period. We first assume that the total wage bill W_t is set exogenously as a given proportion λ of the capital stock.[10] The household-specific gross wage $w_{i,t}$ is then determined through a stochastic process that distributes the total wage bill over heterogeneous households according to a log-normal distribution. With log-mean equal to 1 and log-standard deviation equal to θ. More in details, at the beginning of each period, households' wages are ranked in a descending order so as to maintain a certain stability in the distribution of gross wages. This said, stochastic shocks can, to some extent, modify such a distribution or the magnitude of the difference between wages among households. The inclusion of stochastic shocks in the process of wage generation is meant to capture unforeseen events, like unemployment, that may hit some households and influence their disposable income.

Taxes tax^w levied on wages are modelled in a progressive fashion, as reported in Equation (2). In particular, we assume that the government charges two different tax rates, τ_1^w and τ_2^w, with $\tau_1^w < \tau_2^w$. The former is charged on wages lower than the median wage rate $\hat{w}_t$. Should households' wages be higher than threshold, τ_2^w applies to the part exceeding $\hat{w}_{i,t}$.

Disposable income $yd_{i,t}$ is then influenced by net financial payments. In Equation (1), $\widetilde{rsh_{i,t}}$ stands for the rent that each household may receive on its eventual holding of IFs' shares. Similarly, $\widetilde{r^h_{i,t-1}Lh_{i,t-1}}$ represents 'effective' interest payments done by household i to the banking system according to its own specific interest rate $r^h_{i,t-1}$ and its outstanding debt stock $Lh_{i,t-1}$.

In an economic system in which households' debt represents not only a liability for the indebted units but also a source of income for the family units holding IFs' shares, households' financial outlays and entries are tightly connected and feed one another in a circular process. On the one hand, the remuneration of IFs' shares comes in part from returns on CDOs. These are affected by the capacity of households to meet their financial commitments, which are then channeled to the bearers of the securities. On the other hand, households capability to meet debt obligations may partially be influenced by the financial income they receive from the IFs' shares they hold. Indeed, this is the essence of the redistribution process from debtors to rentiers, and the source of the ensuing rising inequality, that may take place in modern financialized economies through the mechanisms of securitization.

In our model, we solve the simultaneous determination of households' financial commitments and financial rents through a recursive process. We first assume that, at the beginning of each period, each individual household starts to set its own financial commitments out of its gross wage, once paid taxes to the government and once a minimum amount of resources ($\tilde{c}_t$) has been put aside for subsistence consumption. Together with payments from households, CBs and IFs collect payments from other debtors - i.e. NFFs and the government - and distribute them to (rentier) households in proportion to their share holding. Remuneration of shares will be taken as a 'pure' addition to disposable income available for consumption purposes and wealth accumulation by those household units which entirely set their pending financial payments in the first round of the 'payment process'. On the contrary, those households that may still have some arrears will use the above financial income in order to pay, at least in part, what is overdue. This triggers off a new round of redistribution of financial rents among share holders. We assume such recursive process to come to an end when new financial income available to an individual household represents less than 10 percent of its remaining interest commitments. In our model, at a micro level, this last event stands for a sort of partial individual household's default on its own interest payments.

Once disposable income is defined, households decide their desired levels of consumption and assets accumulation. As far as consumption is concerned (see Equation 3), each individual household sets its desired level $c^*_{i,t}$ on the basis of the propensity to consume out of disposable income c_y, and a 'socially determined' consumption norm captured by the average consumption observed in the previous period $\bar{c}_{t-1}$, multiplied by the parameter c_n, which may be conceived as the strength of the social norm. The social norm components serves the double scope of capturing the influence of the prevailing consumption standard and the well known stylized fact that the propensity to consume decreases with income. In line

[10] From a theoretical point of view, this assumption is consistent with a Leontief production function characterising the production process in the non-financial sector of the economy. For the sake of simplicity, in this model we do not consider technological changes or innovation processes that modify the fixed combination of labour and capital in a Leontief-type production process.

with the recursive process described above, each individual household holds a sufficient amount of liquid resources to achieve subsistence consumption $\tilde{c}_t$, which is a share c_{sub} of last period median consumption.

Once established desired consumption, desired savings s^* follows straightforwardly as the difference between disposable income and desired consumption (see Equation (4)).

$$c^*_{i,t} = c_y yd_{i,t} + c_n \bar{c}_{t-1} \tag{3}$$
$$s^*_{i,t} = yd_{i,t} - c^*_{i,t} \tag{4}$$

Equations (5) and (7) represent households' desired portfolio choice. Equation (5) defines the desired stock of deposits $D^*_{i,t}$ that each household wants to hold as a precautionary stance against unexpected changes in disposable income and in order to maintain living standard rather stable. This is a given share η of previous-year stock of wealth $WH_{i,t-1}$. The ensuing desired variation in deposits is reported in Equation (6). Equation (7) formalises households' desired level of IFs' shares. Each family unit wants to increase or decrease its holding of IFs shares according to the difference between the observed return on shares $(rsh_{i,t-1})/(Sh_{i,t-1})$ and the interest rate on bond, which represents also the base rate of our economy. In other words Equation (7) simply stresses that for each households the return on shares needs to justify an eventual recourse to external financing. Should $(rsh_{i,t-1})/(Sh_{i,t-1})$ be lower than $i^B_{i,t-1}$,[11] it would indeed make sense to decumulate shares and repay back outstanding debts. In Equation (7), parameter σ stands for households' sensitiveness to the spread between the return on shares and the base rate. Consistently with Equation (7), Equation (8) computes the desired variation in households' share stock. Equation (9), in turn, is the implicit desired budget constraint of each household. Indeed, it defines the desired amount of new loans $\Delta Lh^*_{i,t}$ that - given its desired consumption (savings) - household i asks to CBs in order to implement the desired increase (decrease) in the stock of deposits and IFs shares.

$$Dh^*_{i,t} = \eta WH_{i,t-1} \tag{5}$$
$$\Delta Dh^*_{i,t} = Dh^* - Dh_{i,t-1} \tag{6}$$
$$Sh^*_{i,t} = Sh_{i,t-1}[1 + \sigma(\frac{rsh_{i,t-1}}{Sh_{i,t-1}} - i^B_{i,t-1})] \tag{7}$$
$$\Delta Sh^*_{i,t} = Sh^*_{i,t} - Sh_{i,t-1} \tag{8}$$
$$\Delta Lh^*_{i,t} = \Delta Dh^*_{i,t} + \Delta Sh^*_{i,t} - s^*_{i,t} \tag{9}$$

The capability of households' to realize their plans depends on CBs' willigness to accept their loan requests. In our model, we assume CBs to perform an assessment of the creditworthiness of each single household applying for a loan. In particular, CBs compare the household's *'desired'* debt service ratio $m^*_{i,t}$ (see more about this below in the 'banks behaviour' block) to CBs' risk aversion and propensity to expand their business further. In our model, we capture this last point through ψ_t which depends negatively on CBs' current leverage with respect to the threshold leverage ratio $\bar{k}$ (see more on this below). In the event that $m^*_{i,t} < \psi_t$, CBs will accept the loan application from household i, who will be allowed to carry out its desired consumption and accumulation decisions. This is formally stated in Equation (10) below:

$$\text{if } m^*_{i,t} < \psi_t \Longrightarrow \begin{cases} \Delta Lh_{i,t} = & \Delta Lh^*_{i,t} \\ \Delta Sh_{i,t} = & \Delta Sh^*_{i,t} \\ \Delta Dh_{i,t} = & \Delta Dh^*_{i,t} \\ c_{i,t} = & c^*_{i,t} \end{cases} \tag{10}$$

In the event that $m^*_{i,t} > \psi_t$, CBs will reject household's application for bank's credit. For the sake of simplicity, we exclude the possibility for partial rationing at micro level (i.e. CBs will concede to each household the requested loan or nothing). Nonetheless, partial rationing can still emerge at macro level, when households sector is considered as a whole. Households getting their loan denied, adjust

[11] The interest rate on bond, $i^B_{i,t-1}$, plays the role of the base rate and proxies the potential cost of indebtedness.

their original plans. When a household is exposed to this event, we assume it to follow a 'pecking-order' revision strategy. It will first scale down the accumulation of IFs shares, and perhaps even liquidate part or all of them, in order to keep up with desired deposits and consumption levels. Revision of desired deposits and, if necessary, reduction of the existing deposit stock will come next in order to meet the desired consumption level. In the extreme case that disposable income and the existing deposit stock could not provide enough resources to cover for desired consumptions, the household's consumption will reduce to the subsistence level $\tilde{c}$. The sequence of revisions in households' choices is formally described in the system of options (Equation 11):

$$
\text{if } m^*_{i,t} > \psi_t \Rightarrow Lh_{i,t} = 0 \Rightarrow \begin{cases}
\text{if } s^*_{i,t} > \Delta Dh^*_{i,t} \Rightarrow \begin{cases} \Delta Sh_{i,t} > 0 \\ \Delta Sh_{i,t} = s^*_{i,t} - \Delta Dh^*_{i,t} \\ \Delta Dh_{i,t} = \Delta Dh^*_{i,t} \\ c_{i,t} = c^*_{i,t} \end{cases} \\
\text{if } s^*_{i,t} < \Delta Dh^*_{i,t} \text{ and } s^*_{i,t} + Sh_{i,t-1} > \Delta Dh^*_{i,t} \Rightarrow \begin{cases} \Delta Sh_{i,t} < 0 \\ \Delta Sh_{i,t} = s^*_{i,t} - \Delta Dh^*_{i,t} \\ \Delta Dh_{i,t} = \Delta Dh^*_{i,t} \\ c_{i,t} = c^*_{i,t} \end{cases} \\
\text{if } s^*_{i,t} + Sh_{i,t-1} < \Delta Dh^*_{i,t} \text{ and } s^*_{i,t} + Sh_{i,t-1} > 0 \Rightarrow \begin{cases} Sh_{i,t} = 0 \\ \Delta Sh_{i,t} = -Sh_{i,t-1} \\ \Delta Dh_{i,t} > 0 \\ \Delta Dh_{i,t} = s^*_{i,t} + Sh_{i,t-1} \\ c_{i,t} = c^*_{i,t} \end{cases} \\
\text{if } s^*_{i,t} + Sh_{i,t-1} < 0 \text{ and } s^*_{i,t} + Sh_{i,t-1} + Dh_{i,t-1} > 0 \Rightarrow \begin{cases} Sh_{i,t} = 0 \\ \Delta Sh_{i,t} = -Sh_{i,t-1} \\ \Delta Dh_{i,t} < 0 \\ \Delta Dh_{i,t} = s^*_{i,t} + Sh_{i,t-1} \\ c_{i,t} = c^*_{i,t} \end{cases} \\
\text{if } s^*_{i,t} + Sh_{i,t-1} + Dh_{i,t-1} < 0 \Rightarrow \begin{cases} Sh_{i,t} = 0 \\ \Delta Sh_{i,t} = -Sh_{i,t-1} \\ Dh_{i,t} = 0 \\ \Delta Dh_{i,t} = -Dh_{i,t-1} \\ c_{i,t} \geq \tilde{c} \\ c_{i,t} = yd_{i,t} + Sh_{i,t-1} + Dh_{i,t-1} \end{cases}
\end{cases}
\tag{11}
$$

Wealthiest households may end up in an antithetical situation and generate a flow of savings that outstrips the resources needed to accumulate the desired level of deposits and shares. In this scenario, we assume that households will deleverage and pay back their loans. If the entire individual debt is repaid, the household will keep any extra saving in the form of extra shares. From a formal point of view, this final set of 'allocation decisions' kicks in when the left-hand-side of Equation (9), i.e. the desired amount of new loans from commercial banks $\Delta Lh^*_{i,t}$ gets negative. This last set of each individual household's

allocation decision is modelled by Equation (12):

$$\text{if } \Delta Lh^*_{i,t} < 0 \Rightarrow \begin{cases} \text{if } Lh_{i,t-1} > \Delta Lh^*_{i,t} \Rightarrow \begin{cases} Lh_{i,t} = Lh_{i,t-1} - \Delta Lh^*_{i,t} \\ \Delta Sh_{i,t} = \Delta Sh^*_{i,t} \\ \Delta Dh_{i,t} = \Delta Dh^*_{i,t} \\ c_{i,t} = c^*_{i,t} \end{cases} \\ \text{if } Lh_{i,t-1} \leq \Delta Lh^*_{i,t} \Rightarrow \begin{cases} Lh_{i,t} = 0 \\ \Delta Sh_{i,t} = \Delta Sh^*_{i,t} + [Lh_{i,t-1} - \Delta Lh^*_{i,t}] \\ \Delta Dh_{i,t} = \Delta Dh^*_{i,t} \\ c_{i,t} = c^*_{i,t} \end{cases} \end{cases} \tag{12}$$

4.2 Commercial Banks

As described in section 1, CBs and SPVs are at the core of the securitzing system. Accordingly, in our model the overall banking sector - commercial banks and special purpose vehicles together - plays a major role in shaping the behaviour of the economy through their decisions about *credit rationing* as well as the amount of loans to securitize.

In our model, CBs create money by conceding loans to households and NFFs. As far as households' loans are concerned, CBs decide whether to provide each single household with the demanded amount of credit (i.e. ΔLh^*) on the basis of two considerations. On the one hand, CBs will assess the creditworthiness of each single potential borrower measured by the household-specific *desired* debt-service ratio. This is formally represented in Equation (13) below, where $E[r^h_{i,t}]$ is the *expected* interest rate that commercial banks would apply to the *updated* household's debt burden in the event of its application being accepted. The *expected* interest rate that CBs will charge on new loans is defined by Equation (14). Given the higher degree of risk of loans with respect to public bonds, CBs set household-specific interest rates through a mark-up on returns on bonds. In Equation (14), CBs take the previous-period interest rate on public bonds i^B_{t-1} as starting point for interest rate determination. The positive spread between $E[r^h_{i,t}]$ and i^B_{t-1} is then established as a function of a household-specific *reference debt-service ratio*, which is computed by applying the previous-period interest rate on bonds to the *updated* household's debt stock over its own disposable income. In Equation (14), ι stands for a positive parameter revealing CBs' sensitiveness to households' *reference debt-service ratio* in the process of interest rate setting. It goes without saying that the expected interest rate will become effective in the event that CBs will eventually concede the new loans (see Equation (15)).

$$m^*_{i,t} = E[r^h_{i,t}] \frac{Lh_{i,t-1} + \Delta Lh^*_{i,t}}{yd_{i,t}} \tag{13}$$

$$E[r^h_{i,t}] = i^B_{t-1} + \iota i^B_{t-1} \frac{Lh_{i,t-1} + \Delta Lh^*_{i,t}}{yd_{i,t}} \tag{14}$$

$$\text{if } m^*_{i,t} < \psi_t \text{ and } \Delta Lh_{i,t} = \Delta Lh^*_{i,t} \text{ then } r^h_{i,t} = E[r^h_{i,t}] \tag{15}$$

As already described in section 4.1, CBs will grant new loans depending on each household specific desired debt service ratio being lower than CBs' aversion to risk. We assume CBs' risk aversion to be represented by the time-varying parameter ψ_t, as formally described by Equation (16):

$$\psi_t = max\left(\bar{\psi}, \quad \bar{\psi} + \omega(k_{t-1} - \overline{k})\right) \tag{16}$$

$$k_{B,t} = \frac{B_{B,t}}{[(1 - z_t)L_t + B_{B,t}]} \tag{17}$$

The value of ψ_t is negatively influenced by CBs' levarage ($1/k_B$) - see Equation (17). In our model, CBs hold two different types of assets: risk-free public bonds B_B and riskier loans conceded to both households and NFFs, i.e. $L = (L_h + L_f)$. Consistently with standard banks regulation as internationally enshrined in the Basel accords, public bonds holding is ranked at the status of own capital. Accordingly, we take the ratio of CBs' government bonds over total CBs' assets, i.e. k_B, as an *inverse* measure of CBs' leverage. This is compared with a threshold leverage ratio $\overline{k}$ as given by standard CBs' regulatory capital requirements. The higher k_B the lower CBs' leverage, and the more likely the concession of the loans. On the contrary, in the event that CBs' portfolio composition would be relatively skewed towards riskier loans, CBs will be more reluctant to grant the loan. In Equation (16), we weight the importance of portfolio composition and leverage over CBs' loan policy through parameter ω_2, with $\omega_2 > 0$. The impacts of different value of the parameters will be tested in the simulation presented in the following section.

There is one more point, which is worth stressing, about loans and capital requirements. In the age of securitization and shadow banking, CBs can actively manage both the liability and asset side of their balance sheets. Active asset management takes place through the securitization of a share z of existing CBs-created loans. Botta et al. (2018) show that the traditional banking sector can reduce its leverage by offloading part of their loans onto the balance sheet of SPV. And this will in turn create the possibility for CBs to give rise to a new round of loans creation. In this paper, we capture this fact by reporting the *endogenous* securitization share z at the demonimator of Equation (15). The higher the demand for CDOs, the higher the demand for securitized loans, and the more easily CBs will raise z, reduce their leverage (i.e. increase k_B) and ultimately 'create new space' for the generation of new assets. Indeed, the process of financialization can be interpreted as the growth of a hypertrophic financial sector creating an enormous amount of financial assets and, correspondingly, financial liabilities. What allows this dynamics to develop is the distribution of mounting (and eventually unsustainable) financial liabilities across the whole economic system, hence the externalization of creditors' risks, thanks to the selling, pooling, and trancing of credits, which is at the heart of the securitizing system. The attempt of understanding the development of a modern rentier-friendly economy cannot depart from the analysis of the way securities are created.

Loans to the non-financial productive sector are relatively simpler. The determination of the interest rate to be applied on the loan NFFs (r_t^f) is very similar to what shown in Equation (14) for expected interest rate on households' loans. Also in this case, CBs will take the previous-period interest rate on public bonds i_{t-1}^B as 'starting point', i.e. as minimum interest rate to apply on any conceded loan. The banking sector will then determine the positive spread between r_t^f and i_{t-1}^B as a function of NFFs' debt service ratio. This is the ratio between the *updated 'reference'* cost of external financing, measured applying the previous-period interest rate on bond to the *revised* NFFs' debt stock over their net profits Pf_t - see Equation (18). As before, ι is a positive parameter capturing CBs' sensitiveness to the debt service ratio of the overall non-financial productive sector.

$$r_t^f = i_{t-1}^B + \iota i_{t-1}^B \frac{Lf_{t-1} + \Delta Lf_t^*}{Pf_t} \tag{18}$$

As in the case of loans to households, CBs can ration credit given to the macro-aggregated non-financial productive sector. Once again, CBs' decisions will hinge upon the comparison between NFFs' debt-service ratio (as measured by NFFs' *desired* interest payments over NFFs' profits) and CBs' adversion to risk as captured by parameter ψ_t (see more details on credit rationing to NFFs in the NFF section).

The last point to consider for this sector is commercial banks' decisions about the purchase of government bonds. For sake of simplicity, in this paper we integrate primary and secondary markets for public bonds, which are bought by CBs and IFs. IFs will demand public bonds according to the optimal allocation of collected funds among available assets, i.e. public bonds and CDOs (see more on this below in the investment funds block). CBs, in turn, will buy the residual amount of available public bonds unsold on the market. In this regard, the behaviour of CBs is consistent with how the allocation of public bonds among financial operators effectively works in the US economy, where a certain amount of public bonds is allocated, by default, to *non-competitive bidders* regardless of the interest rate bid they make in public bonds' auctions. Moreover, primary dealers are the main players in this market, as they are explicitly

required to take part to every auction and to make reasonable market for government securities. In our model, the *buffer* and market-maker functions that primary dealers perform in the US financial system is formalised by CBs filling any possible gap between the supply of public bonds and IFs' demand. This said, the interest rate on bonds will be determined by market forces and will depend on whether CBs will have to increase their relative share of public bonds holding (with respect to the previous period) in order to clear the market (see more on this below). More in details, a relatively low demand for bonds (at least with respect to the supply) from IFs would imply first that CBs increase their contribution to the market for public securities, second that the returns on public bonds will raise. On the contrary, a considerable demand for public bonds from IFs would cause a squeeze in the buffer role of CBs and would imply a reduction in the interest rate on public bond. This mimics the distinction between competitive and non competitive bidders, where the former, whose demand set the price, are here represented by the IFs. Equation (19) formally expresses the *buffer* action carried out by CBs on the market for public bonds and shows that, given the total supply of public bonds on financial markets GD_t and the quantity of bonds IFs want to hold on their balance sheets, i.e. $B_{IF,t}$ (see more on this later), the remaining will be allocated to CBs.

$$B_{B,t} = GD_t - B_{IF,t} \tag{19}$$

The flow of revenues that CBs receive from their activity of providing loans to households and non-financial firms as well as holding bonds (and consistently with the securitization of part of the created loans) are reported in the series of Equations (20), (21), and (22) below. Equation (23) finally gives CBs total profits, which, as explained in section 3, are transferred to the IFs sector.

$$RL^h_{B,t}t = \sum_{i=1}^{N}(1 - z_{t-1})[r^h_{i,t-1}\widetilde{Lh_{i,t-1}}] \tag{20}$$

$$RL^f_{B,t} = (1 - z_{t-1})[r^f_{t-1}Lf_{t-1}] \tag{21}$$

$$RB_{B,t} = r^b_{t-1}B_{B,t-1} \tag{22}$$

$$\Pi_{B,t} = RL^h_{B,t} + RL^f_{B,t} + RB_{B,t} \tag{23}$$

4.3 Special Purpose Vehicles

Special purpose vehicles play an important role, although rather passive, in the process of securitization and creation of structured financial products (CDOs). Indeed, thier balance sheets is where securitised loans are stored in order to enable CBs to further expand credit. Special purpose vehicles package securitised loans together in order to create an apparently safer asset (i.e. CDOs), to the benefit of rentiers. Other way around, SPVs are the institutions allowing the financial system as a whole to give rise to the so-called 'originate-and-distribute' practice replacing the 'originate-and-hold' practice that traditionally characterised the process of bank loans creation. The relevant function SPVs perform in our model is formalised by Equations (24), (25), and (26) below:

$$z_t \sum_{i=1}^{N} Lh_{i,t} + z_t Lf_t = CDO_{if,t} \tag{24}$$

$$z_t = min(1, \frac{CDO_{IF}}{L_t}) \tag{25}$$

$$r^{cdo}_t = \frac{z_t[(\sum_{i=1}^{N} r^h_{i,t-1}\widetilde{Lh_{i,t-1}}) + r^f_{t-1}Lf_{t-1}]}{CDO_{if,t-1}} \tag{26}$$

Equation (24) simply says that, in each period, the asset side of SPVs' balance sheets is made up of a portion z_t of all the loans originally created by CBs. For the sake of simplicity, we assume that z_t is homogeneous across loan categories, i.e. CBs securitise *on demand* an equal portion of all the

loans created so far through their lending activity, regardless of the (household-) specific level of risk characterising any single loan. The liability side of SPVs is in turn represented by CDO created by SPVs themselves, and purchased on financial markets by IFs. Equation (25) defines the extent of the securitization process with respect to the original lending activity performed by CBs. Given the natural supply constraint as determined by the total amount of loans generated through time by the banking system, we assume z_t to be demand-driven and endogenously determined in each period by the demand for CDOs from IFs. In our economy, CDOs stand for the complex structured financial products so widely demanded by IFs and so aggressively produced by investment banks (SPVs in our model) before the outbreak of the last financial crisis. Securitised loans are the *raw material* provided by CBs and used as intermediate inputs by SPVs for the production of CDOs. Accordingly, the higher the demand for CDOs, the higher the demand for loans to securitize from SPVs, and the higher the proportion of existing loans entering the securitization process. In this sense, it is worth noting that a downsizing of special purpose vehicles, due to the break down of investors confidence in the degree of safety of CDOs, would imply a drop in the demand for CDOs and the dry-up of the securitization chain. CBs would not only be forced to reduce the extent by which they can securitize, but they will have to reload on their balance sheet some of the loans previously offloaded and reduce the activism and benevolent approach in the concession of new loans.

Equation (26) finally shows how financial revenues are distributed throughout the whole economic system through the securitization process and the production of CDOs. Indeed, SPVs and IFs form a arm-length chain through which interests, originally paid by indebted households and NFFs, eventually accrue to (rentier) households as financial income on their (indirect) holding, mediated by IFs, of CDOs. In this sense, Equation (26) also says that the remunerativeness and appealing (as investment opportunities) of CDOs is closely related to (indebted) households' capability to meet their interest payments on outstanding debt. Indeed, the lower the *effective* interest payments $r^h_{i,t-1}\widetilde{Lh_{i,t-1}}$ made by households on their own debt, as due to the unsustainability of their financial position, the lower the remunerativeness of each issued CDO with respect to its 'face value'. Accordingly, IFs will likely re-orient their portfolio towards less remunerative but safer (in particular during times of financial turmoil) assets, namely public bonds. Other way around, we could say that the viability of the SB system - and of the assets it produces - relies on an unstable equilibrium between the creation of an increasing amount of financial liabilities/assets and the preservation of good households' financial 'solvency' The over-indebtedness of US households and the inclusion of sub-prime mortgages in the production of CDOs ultimately caused the disruption of the financial system at the base of which they lay.

4.4 Investment Funds

The last component of the financial system of our model are Investment Funds (IFs). As already stressed in section 3, IFs act as financial intermediaries collecting funds from households and deploying them to purchase financial assets. The financial revenues of IFs' investment - i.e. interests on public bonds and remuneration of CDOs - are ultimately distributed to (rentier) households as remuneration of their shares holding. Equations describe how IFs allocate collected funds among the different possible deployments, and the ensuing streams of IFs' revenues and payments (to rentiers).

$$D_{IF,t} = \eta SH_t \tag{27}$$

$$q^b_{if,t} = q^b_{if,t-1}(1 - \beta[(r^{cdo}_t - i^B_t) - (r^{cdo}_{t-1} - i^B_{t-1})] \tag{28}$$

$$B^D_{IF,t} = q^b_{if,t} SH_t(1 - \sigma) \tag{29}$$

$$CDO^D_{IF,t} = SH_t(1 - \sigma) - B_{IF,t} \tag{30}$$

$$CDO_{IF,t} = min(z_t L_t, CDO^D_{IF,t}) \tag{31}$$

Equation (27) firstly says that IFs always want to keep a relatively small share σ of collected funds SH_t in the form of banks' deposit. This decision is linked to a precautionary stance meant to provide IFs with the required liquidity in the event that rentiers would like to redeem some shares. Total IFs' resources available for financial investments on interest-bearing assets therefore amount to (1 −

$\sigma)SH_t$. Equation (28) establishes the share of deployable resources $q^b_{if,t}$ IFs would like to allocate to the purchase of government bonds. We model such portfolio allocation decision by looking at the relative remunerativeness of government bonds with respect to CDOs. In particular, IFs increase the share of available funds devoted to the purchase of public bonds when the spread between CDOs and government bonds, i.e. $(r^{cdo}_t - i^B_t)$ is lower than the spread registered in the previous period i.e. $(r^{cdo}_{t-1} - i^B_{t-1})$. Other way around, given the higher degree of risk associated to CDOs with respect to public bonds, a reduction of the spread between the former and the latter will induce IFs to allocate an increasing share of available funds to bonds holding. In Equation (28), β reveals the sensitiveness of IFs portfolio decisions to changes in the spread between available assets.

Consistently with Equations (27) and (28), Equation (29) defines the demand for public bonds from IFs, whilst Equation (30) gives the ensuing demand for CDOs. Equation (31) finally shows that IFs' demand for CDO ($CDO^D_{IF,t}$) cannot exceed the maximum amount of CDOs potentially producible by the securitizing system (given by the total amount of existing loans that could potentially be securitised). Both the CDO and Bonds' market may occasionally be supply-constrained. May this occur, the excess demand will take the form of liquidity hence increasing the stock of IFs' deposits.

Financial investments by IFs obviously give rise to a stream of financial revenues which constitute the total amount of resources that IFs will divert to rentier households as remuneration of their shares. On top of this, IFs also receive profits from CBs since, as we said, we assumed that the former owns the latter. We assume banks dividends to be held in the form of deposits by the IFs sector. This may be conceived as the cumulation of wealth by the financial sector. More specifically, Equations (32) and (33) define the revenues IFs will get on CDOs and bonds holding, respectively. Equation (34) determines the total set of payables to rentiers. The remuneration (rentier) households will eventually get from IF shares is expressed by Equation (35), and it is proportional to the amount of shares each individual household 'i' holds (i.e. $sh_{i,t-1}$) with respect to the total amount of shares issued so far by IFs, i.e. SH_{t-1}.

$$RCDO_{IF,t} = r^{cdo}_{t-1} CDO \tag{32}$$

$$RB_{IF,t} = r^b_{t-1} B_{IF,t-1} \tag{33}$$

$$RSH_t = RCDO_{IF,t} + RB_{IF,t} \tag{34}$$

$$rsh_{i,t} = RSH \frac{sh_{i,t-1}}{SH_{t-1}} \tag{35}$$

4.5 Non-financial Firms

In this paper, we assume the NFFs to be a simple macro-aggregated sector producing a homogenous good used both for consumption and investment purposes. Production decisions by NFFs are demand-driven and satisfy the demand for consumption, investment, and public purchases emerging in the economy. Equation (36) defines consumption expenditures as the sum of each individual household *realised* consumption. Equation (37), in turn, defines the demand for new capital goods. First of all, we assume that the demand for capital goods depends positively on previous-period firms' profitability. Following Badhuri and Marglin (1992), the profitability of the macro-aggregated non-financial productive sector is captured by the profit share $\pi_{t-1} = (\Pi_{F,t-1}/Y_{t-1})$, with $\Pi_{F,t-1}$ as previous-period NFFs gross profits, and Y_{t-1} as previous period Gross Domestic Product (GDP). On top of this, NFFs' investment demand also responds positively to the observed (previous-period) rate of capacity utilization, i.e. $u_{t-1} = (Y_{t-1}/K_{t-1})$. In Equation (37), γ_1 and γ_2 are positive parameters, γ_2 being the well-known Harrod-type accelerator. Finally, there is an 'animal spirits' component, that is the stochastic process described in Equation (38), weighted by γ_3. The ensuing process of capital accumulation is reported in Equation (39), with parameter δ as the depreciation rate of the existing capital stock. Given public purchases (to be explained in the government box), Equation (40) eventually defines GDP Y_t, whilst Equation (41) identifies non-financial firms' gross profits as the difference between revenues from production and selling activity and the wage bill paid to workers.

$$C_t = \sum_{i=1}^{N} c_{i,t} \tag{36}$$

$$I_t = \gamma_1 \frac{\Pi_{t-1}}{Y_{t-1}} + \gamma_2 u_{t-1} + \gamma_3 Zt \tag{37}$$

$$Z_t = \gamma_4 Z_{t-1} + U(0, 0.1) \tag{38}$$

$$K_t = (1 - \delta) K_{t-1} + I \tag{39}$$

$$Y_t = C_t + I_t + G_t \tag{40}$$

$$\Pi_{F,t} = C_t + I_t + G_t - W_t \tag{41}$$

$$\pi_t = \frac{\Pi_{F,t}}{Y_t} \tag{42}$$

We assume that NFFs do not distribute dividends, hence they retain all their *net* operative profits $P_{F,t}$ once payed corporate taxes to the government and interest rates on outstanding loans to the banking system. This is formalised by Equation (43). In Equation (43), τ_3 is the governmental tax rate levied on NFFs' gross profits (see Equation (44) for the total amount of taxes payed by NFFs), whilst RL^f stands for interest payments from NFFs towards the financial system. Equation (45) straightforwardly defines NFFs' financial payment commitments as given by the ruling interest rate on loans to NFFs $r^l_{f,t-1}$ and the outstanding NFFs' debt stock Lf_{t-1}.

At any period, NFFs wants to hold a certain amount of liquid assets, i.e. CBs' deposits, in order to cover for unexpected events, say increases in the wage bill or maintenance costs of installed capital goods. NFFs set the desired amount of liquid assets as a positive proportion μ of the capital stock (see Equation (46). The ensuing change in NFFs' stock of deposits follows immediately as reported in Equation (47).

$$Pf_t = (1 - \tau_3)\Pi_{F,t} - RL_{f,t} \tag{43}$$

$$T_{f,t} = \tau_3 \Pi_{F,t} \tag{44}$$

$$RL^f_t = r^l_{f,t-1} L^f_{t-1} \tag{45}$$

$$D_{f,t} = \eta K_t \tag{46}$$

$$\Delta D_{f,t} = Df_{f,t} - D_{f,t-1} \tag{47}$$

$$\Delta Lf_t = I - Pf_t + \Delta D_{f,t} \tag{48}$$

$$Lf_t = Lf_{t-1} + \Delta Lf_t \tag{49}$$

Equation (48) defines the budget constraint of the whole non-financial productive sector, once its demand for new capital goods, net operative profits, and desired change in liquid asset holdings have been identified.

Equation (48) simply says that NFFs will fully retain their net operative profits in order to finance the purchases of new capital goods as well as to increase their liquid assets. In the event available profits not being enough, NFFs will resort to credit from CBs. Also in this case credit rationing may occur. However this time, also in consideration of NFFs being an aggregate sector, the rationing is partial. The banking sector will grant credit to NFFs as long as the ratio between NFFs' net profits and financial commitments does not exceed ψ_t. Whenever this occurs loan is extended up to the threshold and NFFs need to diminish their deposits in order to finance their investment decisions.

4.6 Government

The last sector to describe is the government. In this regards, the first set of equations below define government's revenues (see Equation (50)) - given by taxes on households' wages and profits of NFFs - and government outlays. We decided to maintain the behaviour of the public sector as simple as possible, hence we assume that public purchases are set as a share ξ of previous-period aggregate consumption C_{t-1}.

The government also performs a sort of counter-cyclical role by expanding or cutting public purchases according to the dynamics of economic activity with respect to target level of capacity utilization. In Equation (51), the government increases public purchases with respect to the benchmark level in the event that previous-period capacity utilization u_{t-1} would have fallen shorter than the corresponding target level.The target level is set following Skott (2012) who estimates full-employment long-run capacity utilization to be around 0.8 in the case of the US economy. In the alternative scenario in which a buoyant economy would have led GDP to rise above the target level (i.e. $u_{t-1} > 0.8$), the government will cut current public purchases in the attempt to slowdown the economic dynamics. On top of public purchases, the government has to meet interest payments on the outstanding amount of public debt. The costs of servicing public debt are reported in Equation (52).

$$T_t = \tau_3 \Pi_{F,t} + \sum_{i=1}^{N} \tau_j^w w_{i,t} \tag{50}$$

$$G_t = \xi C_{t-1} \tag{51}$$

$$GDS_t = r_{t-1}^b GD_{t-1} \tag{52}$$

The difference between government outlays and tax revenues determines the public deficit in each period of our model. This is formally stated in Equation (53) below. Public deficit is in turn financed by issuing new government bonds, which will raise the stock of public debt (see Equation (54)).

$$\Delta GD_t = G_t - T_t - GDS_t \tag{53}$$

$$GD_t = GD_{t-1} + \Delta GD_t \tag{54}$$

Public bonds issued on financial markets in previous periods (and constituting the existing stock of public debt) plus the issuance of new government bonds aimed at financing current public deficit, determine the total supply of public securities. As already described in the previous sections of this paper, CBs and IFs are the purchasers of government bonds according to the different roles they perform in financial markets. In our model, we assume that yields on public bonds are determined by market mechanisms through the interaction between supply and demand. More in details, consistently with the behaviour of IFs and CBs, we assume a recursive mechanism to take place. First, the total supply of public bonds is defined (Equation (54)). Given the *realised* return on CDOs, as well as previous-period interest rate on public bonds, which constitutes the starting bid for the new round of government bonds' auctions, IFs declare which amount of public bonds, at the prevailing interest rate, they would like to hold in their portfolio. CBs come next. They make their bid for the remaining part of public bonds in excess with respect to the demand from IFs. In the event that CBs would have to increase their share of public bonds (over total supply) with respect to the previous period in order to clear the market, CBs will ask for higher yields. Alternatively, should their *buffer* and *market-maker* role go downsized given buoyant demand for bonds from IFs, CBs' bids on public bonds' yields will show a downward orientation. A second round of bids now starts, with IFs revising and updating their own demand for bonds on the basis of what emerged in the last round and consistently with the *observed* behaviour of CBs. In each round the interest rate adjusts depending on the parameter ϕ which governs the speed of adjustment of the process. Such a sequence of bids eventually comes to an end when further increases or reductions in yields on public bonds do not induce any further adjustment – namely the process hits the stopping condition related to the parameter $\bar{\epsilon}$ – in the demand from IFs and, as a consequence, in the buffer purchase from CBs. The complex mechanism we assume behind the determination of yields on government bonds is formalised by Equation (55) below, where we assume r_t^b to be a positive function of the share of public bonds (over total supply) CBs will eventually hold on their balance sheet at the end of bid rounds just described.

$$r_t^b = r_{t-1}^b [1 + \alpha(\frac{B_{B,t}}{GD_t} - \frac{B_{B,t-1}}{GD_{t-1}})] \tag{55}$$

5 Simulations

Our hybrid AB-SFC model does not aim at reproducing the historical time series characterising a specific economy, or at accurately forecasting the future evolution of the variables at stake in a particular country. Our analysis is qualitative in its essence: we aim at analysing the co-evolution of finance and inequality in a stylised financialised economy from a theoretical point of view. For this reason, the initialisation of our simulations does not resemble the current state of any specific economy. It rather starts from a sort of 'virtual' economy with only an initial capital stock equal to 1. Accordingly, all other stocks are set to zero. Given this initial setting, we run simulations over one thousand periods in order to let the 'structural properties' (i.e. the relationship between inequality and finance, as well as between finance and the real economy) of the economy develop and assume meaningful values. The list of parameters is reported in Table 1. In what follows, both statistics and plots are referred to the period 501-1000, so to get rid of transient dynamics. All simulations are checked for accounting consistency, in line with SFC literature (Godley and Lavoie, 2007; Caverzasi and Godin, 2014), both at individual and sectoral level.

Symbol	*Description*	*Baseline*
T	Number of periods	1000
N	Number of households	1000
τ_1	Lower tax rate on income	0.2
τ_2	Higher tax rate on income	0.4
τ_3	Tax rate on profit	0.5
γ_1	Profit share weight (investment function)	0.2
γ_2	Capacity utilization weight (investment function)	0.01
γ_3	Animal spirit weight (investment function)	0.1
γ_4	Weight of the autoregressive component (investment function)	0.9
η	Precautionary deposits	0.2
β	Weight of CDO/Bond spread in IF portfolio allocation	10
σ	Sensitivity to return on share/base rate spread (household portfolio choice)	1
ϕ	Speed of adjustment in public bonds' bids	0.01
ω	Sensitivity to distance from desired share of bonds (banks credit rationing)	0.3
ι	Sensitiveness to the debt service ratio (interest rate setting)	1
ϵ	Tolerance in recursive processes (bonds and return on share determination)	0.1
$\bar{k}$	Desired share of bonds in banks' portfolio	0.4
c_y	Propensity to consume out of income	0.8
δ	Capital depreciation rate	0.03
λ_1	Wage bill's determination out of capital	0.15
ξ	Public purchases' determination out of capital	0.6
θ	Log-standard deviation (wage distribution)	0.5
c_{sub}	Subsistence consumption	0.25
c_n	'Socially determined' consumption	0.2

Table 1: Parameters

The first computational experiment we perform includes two sets of multiple (Monte Carlo) simulations: (i) 100 simulations of the model without securitization (*No Securitization*), namely a scenario in which securitization does not take place (*i.e.* $z = 0$) and the portfolio choice of IFs is therefore limited to either deposits or public bonds, and (ii) 100 simulations of the model with securitization (*Securitization*), where banks securitize a portion z of their loans, varying with households' demand for financial assets, as described in Section 3. Results are reported in Table 2.

The comparison between these two scenarios suggests that GDP growth appears to benefit from securitization. While the shares of the different components of GDP are very similar, public debt is considerably higher without securitization. Conversely private debt, both as a stock over GDP and

with respect to total net income (*i.e.* net wage plus the rents from IFs shares) is higher in the case of securitization. The *Securitization* scenario is also characterized by higher levels of both income and wealth inequality, and this seems to confirm the role played by securitization in favouring the *rent-seeking* activity of richer households, as described in our analysis in Section 1. The higher inequality and private indebtedness linked with securitization lead to higher financial fragility. Indeed, the probability of a financial crisis (here arbitrary captured by a thresholds of unpaid interests on non performing loans above 5% of total interests) is more than four times higher when the financial system can rely on securitization. To sum up, while securitization appears to be beneficial for growth, as it makes easier for banks to provide loans to the private sectors, the boost in credit creation gives rise to higher inequality and more financial instability. Lower income households are indeed recurrently unable to service their debts and need to cut consumption below their desired level. A word of caution is in order. The absence of an asset which may loose value, as in a Fisherian debt-deflation crisis (Fisher, 1933), the aggregate CBs, SPVs, and IFs sectors, with the consequent lack of financial units defaulting, make the model resilient to crisis.

	No Securitization	**Securitization**
GDP growth		
- mean	0.0243	0.0249
- Standard Deviation	0.0161	0.0155
- Skewness	-0.0675	-0.0594
- Kurtosis	2.0489	2.0470
GDP level*	0.5761	1
GDP shares		
- Consumption	0.5457	0.5464
- Investment	0.1269	0.1257
- Public Purchases	0.3274	0.3278
Public Debt	2.5884	1.8076
Gini Indexes		
- Income	0.2789	0.2912
- Wealth	0.7188	0.7373
Loan Stock over GDP	1.6343	1.7565
Debt to income ratio	0.9519	0.9950
Non-Performing Loans**		
- Mean	0.0120	0.0112
- Standard Deviation	0.0017	0.0020
- Skewness	0.3534	0.6090
- Kurtosis	2.6159	2.8785
- Crisis Probability***	0.0120	0.0530
Share of securitized loans	0	0.2855

* GDP last period baseline = 1

** Unpaid over due interests on loans

*** NPI above 5% of all interests

Table 2: Descriptive statistics comparing the baseline scenario (*'No Securitization'*) with the *'Securitization'* scenario.

Given these general features of our simulated economy, let's have a deeper look at the results of our simulations as to the joint evolution of the domestic financial sector and of inequality standards. We first look at the developments of the financial system with and without securitisation by analysing the the plots of a single simulation (which represents the typical dynamics already summarized above). Among other things, we will pay particular attention to the capability of the financial sector to generate an increasing amount of loans thanks to the possibility to subsequently securitise part of them. We

will then check for the effect of securitisation and the diffusion of structured financial products on the evolution of both income and wealth inequality. We capture the evolution of inequality standards through the computation of the Gini index over gross income and gross wealth for the whole set of one thousand households composing our economy. We will finally describe the main qualitative properties characterising the occurrence of endogenous crises as linked to unfolding dynamics in the financial sphere of the economy.

5.1 Financial dynamics with and without securitization

The four panels included in Figure 1 describe some relevant features of our simulated financial system. We particularly pay attention to how financial dynamics change according to the existence (or not) of securitisation. The functioning of the financial system without securitisation is represented by the blue dashed line. Financial dynamics associated to securitisation are represented by the orange solid line.

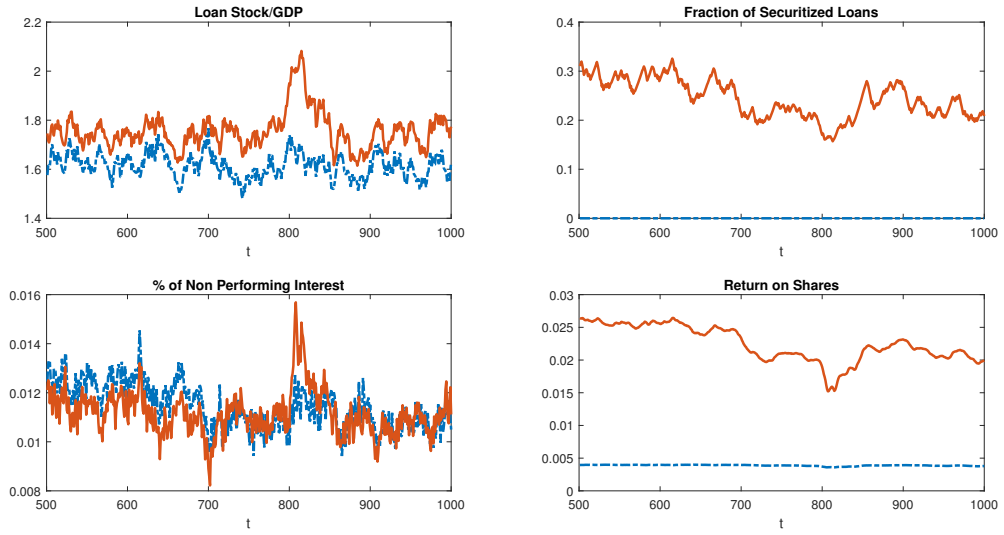

Figure 1: *Descriptive Plots 1.* The orange solid line is the scenario with securitization, the blue dashed line is without securitization (baseline scenario).

The upper-left panel in Figure 1 shows the total stock of loans (as a share of GDP) extended by CBs to the economy as a whole. It clearly shows the persistently higher amount of loans CBs can provide to the economy under securitisation. This is obviously due to the possibility CBs have to create new loans and then unburden their financial positions by putting part of them off their balance sheets. According to this panel, CBs persistently create about 10 percent more loans (as a share of GDP) when securitisation and 'originate-and-distribute' practices are allowed. Results portrayed in Figure 1 also show that such an upward drift is not constant. Indeed, our simulated economy experiences a credit boom around periods 750 and 800, when the stock of loans increases up to above 200 percent of GDP. This figure is roughly 40 percentage points more than in the baseline scenario excluding securitisation. Such an astonishing increase in the total stock of loans, and the ensuing rising degree of indebtedness of the economy as a whole, is then followed by an abrupt contraction. The credit boom eventually goes wrong and a quite standard credit boom-and-bust cycle takes place (see more on this below).

The evolution of credit inside the economy is obviously connected to the dynamics of the other financial variables reported in Figure 1. In the upper-right panel of Figure 1, we show the evolution of 'z', i.e. the total amount of securitised loans. It is important to keep in mind that in our model, 'z' is an *endogenous* variable, which depends on the demand for CDOs of which securitised loans are primary inputs. In our model, the securitisation of existing loans is indeed a pre-condition for the production of CDOs. And the production of CDOs is in turn meant to satisfy the appetite for high returns by rentier

households. When securitisation is allowed, CBs generally put about 30 percent of existing loans out of their balance sheet. The bottom-right panel of Figure 1 shows how financial innovations such as the creation of structured financial products and the inclusion of CDOs in the portfolio of IFs considerably increased the remunerativeness of IFs shares with respect to the baseline scenario (in which only the interest on bonds contributes to the remuneration of shares).

The ratio of securitised loans is not constant. Interestingly, it tends to decrease during the credit bubble and in the run-up to the crisis. The reason why this happens can be fully grasped by jointly analysing the bottom-left and bottom-right panel of Figure 1. The considerable increase of loans extended to the private sector helps the economy to grow faster. At the same time, however, it makes households and non-financial firms increasingly indebted. As the bottom-left panel reveals, a rise in the rate of non-performing loans takes place, as over-indebted households do not meet their interest payments. More in details, from period 700 on, the fraction of unpaid interest over due interests related to non-performing loans turns higher in the *'Securitisation'* scenario than in the case without securitisation. It eventually skyrockets at time 800. It is by no means incidental that this trend unfolds alongside with an increasing gap between the stock of loans created under securitisation (orange solid line) with respect to the baseline scenario (blue dashed line). The increase in non-performing loans in turn bears a obvious negative impact on the effective remuneration of CDOs and, consequently, IFs' shares. In the bottom-right panel, a reduction in the remuneration of shares appears from period 700. Whilst this reduces households' demand for IFs' shares, it also causes a drop in the amount of funds IFs allocate to CDOs (see more on this below), and hence in the demand for securitised loans. In the end, the increase in the amount of loans extended to the economy and a lower demand for securitised loans jointly cause a decrease in the degree of securitisation 'z' observed in our economy between periods 700 and 800.

The ratio of securitised loans starts to increase again after the burst of the credit bubble when CBs considerably reduce the amount of loans extended to the economy. On top of this, tighter rationing ensures loans are given to a (relatively) restricted number of creditworthy counterparts. The ensuing increase in the *effective* remuneration of CDOs and IFs' shares brings back a high enough demand for CDOs and securitised loans, and contributes to rise 'z' to pre-crisis-levels.

Figure 2 provides some insights about the behaviour of the financial sector. The upper-left and the bottom-left panels in Figure 2 show the share of public bonds in IFs' portfolio and the dynamics of public bonds' yields, respectively. In particular, they show the so-called 'flight to quality' that generally takes place when first rumours and symptoms of a financial crisis spread. In the upper-left panel, when the rise in non-performing loans reduces the remunerativeness of CDOs, IFs decide to divert collected funds towards risk-free government bonds. The market for CDOs shrinks and the share of public bonds in IFs portfolio increases.[12] Such a rather dramatic (although temporary) switch in the investment decisions of IFs brings to a reduction in the yields on government bonds. The temporary reduction in government bonds' yields is considerably more pronounced in the securitisation scenario than in the baseline scenario. This might be taken as a first sign of the greater instability and propensity to give rise to episodes of 'flight to quality', which characterises modern financial systems.

The above impression that financial shocks can more easily take place in the context of a financial system with securitisation is confirmed by the upper-right and the bottom-right panels in Figure 2. The first one tells us that securitisation contributes to maintain CBs' leverage under control (and actually very close to the 'benchmark') even in presence of a considerably more active creation of loans (see upper-left panel in Figure 1). At the same time, when the credit boom unfolds (from period 700 to about 800), CBs' leverage (as captured by the inverse of the capital adequacy ratio 1/k) skyrockets. This would not happen in the baseline scenario without securitisation, since that CBs would stop much earlier the expansion of credit given to the economy. In the end, securitisation reduces the aversion to risk of CBs, and allows them to reduce rationing and extend loans even to risky counterparts. This would have not

[12]The upper-left panel in Figure 2 reports the share of funds IFs allocate to public bonds for the case with securitisation only. Indeed, in the baseline scenario without securitisation, IFs would allocate all the collected funds to public bonds given the absence of any alternative investment opportunity, namely CDOs. The share of IFs' resources allocated to bonds would then be persistently equal to 1. The graphical representation of such a baseline scenario would 'visually' blur the 'flight to quality' phenomenon, which takes place when securitisation and CDOs are allowed, and signs of financial dislocation start to emerge. Therefore, we don not display the line in the baseline scenario.

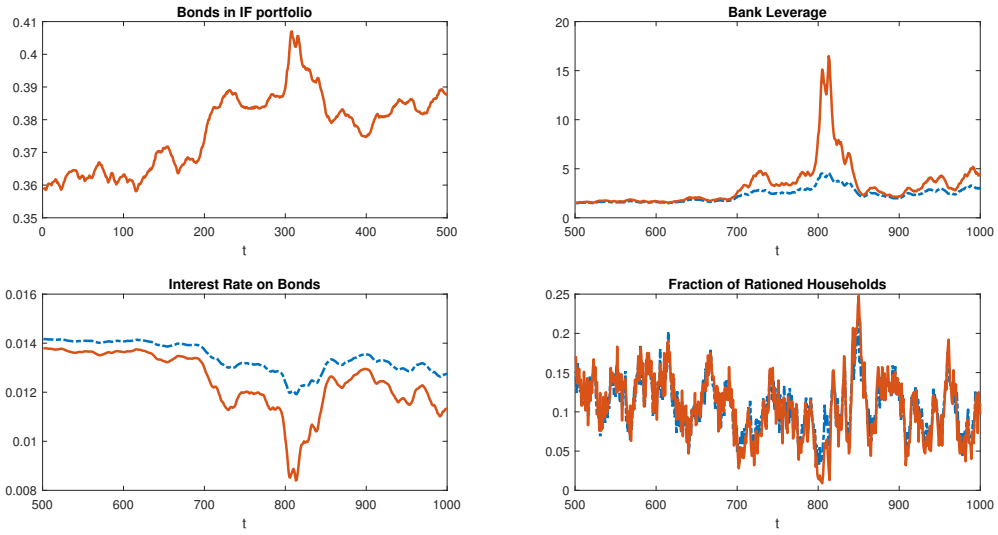

Figure 2: *Descriptive Plots 2.* The orange solid line is the scenario with securitization, the blue dashed line is without securitization (baseline scenario).

happened had CBs been forced to keep all the created loans on their own balance sheets.

Interestingly, loose borrower screening by CBs during the credit boom is replaced by much tighter rationing (in absolute terms and with respect to the baseline) when the credit boom goes burst. After period 800, 25 percent of households are rationed (see bottom-right panel), and a sort of credit crunch takes place. This fact will obviously bring the economic system towards a recession (more on this below).

5.2 Inequality

Figures 3 and 4 help us to understand how the spread of modern financial practices, namely securitisation and the production of CDOs, do affect inequality standards. The left-panel in Figure 3 shows the evolution of the Gini index as computed on the distribution of gross income over one thousand households. The right-panel in Figure 3 shows the same inequality index now related to gross wealth. What emerges clearly from both panels is that income and wealth inequality reaches higher levels when modern financial practices develop with respect to a 'traditional' financial world without securitisation and CDOs.

It is important to make some more points on the persistence of inequality. First, wealth inequality does not show any relevant sign of reduction, and it rather increases when a credit boom takes place, both with and without securitisation. This is due to the fact that whilst wealthy households increase their stock of wealth without recurring to loans (see more on this below), a larger number of middle and low-class households get indebted just to maintain consumption levels without accumulating any form of financial wealth. Income inequality shows a stable path when securitisation is out of the picture. This comes from the fact that the remuneration of financial investment from wealthy households exclusively depend on public bonds' yields rather than on more remunerative but far more volatile composite CDOs' yields. Income inequality reaches persistently higher but more unstable levels when securitisation and CDOs emerge. In particular, income inequality decreases when the symptoms of a financial crisis unfold. This is due to the fact that when credit booms develop, an increasing number of over-indebted households and firms do not set their interest payments, which in turn constitute the remuneration of rentier households' (indirect) investment in CDOs (via IFs' share).

The upper-left panel in Figure 3 shows that such a reduction in income inequality is purely transitory. Indeed, when financial markets restore their soundness after the outbreak of a full-fledge crisis, and only creditworthy borrowers are granted a loan, the distribution of 'exploitation rents' associated with the production of CDOs starts again together with a new rise in income inequality. In a way, this finding is

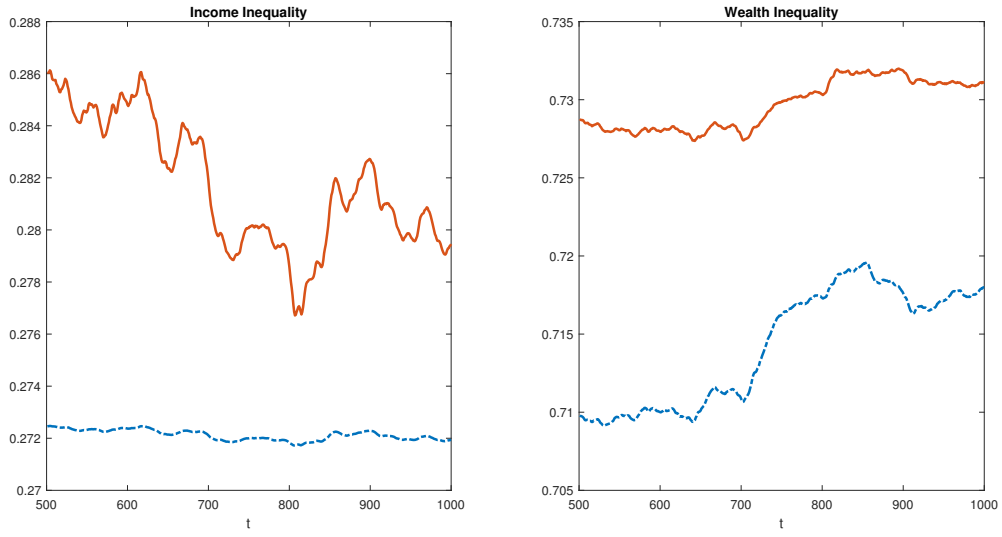

Figure 3: *Inequality.* The two graphs represent respectively the Gini index on income and wealth. The orange solid line is the scenario with securitization, the blue dashed line is without securitization (baseline scenario).

consistent with the recent empirical evidence put forward by Piketty (2014) as to inequality dynamics in the aftermath of the most recent financial crisis. According to Piketty (2014), whilst income inequality has decreased during the crisis, it has quickly returned to even higher levels soon after. In the end, the outbreak of a full-blown financial shocks seem to emerge as temporary interruptions of much deeper and structural dynamics in the joint evolution of financial systems and inequality.

Figure 4 provides some more information about wealth inequality, as emerging in the last period of simulation. Indeed, it shows the distribution of *net* wealth among all the one thousand family units composing our economy. Again, what emerges clearly is that net wealth is more polarised when we include securitisation and CDOs in our model than in the baseline scenario.

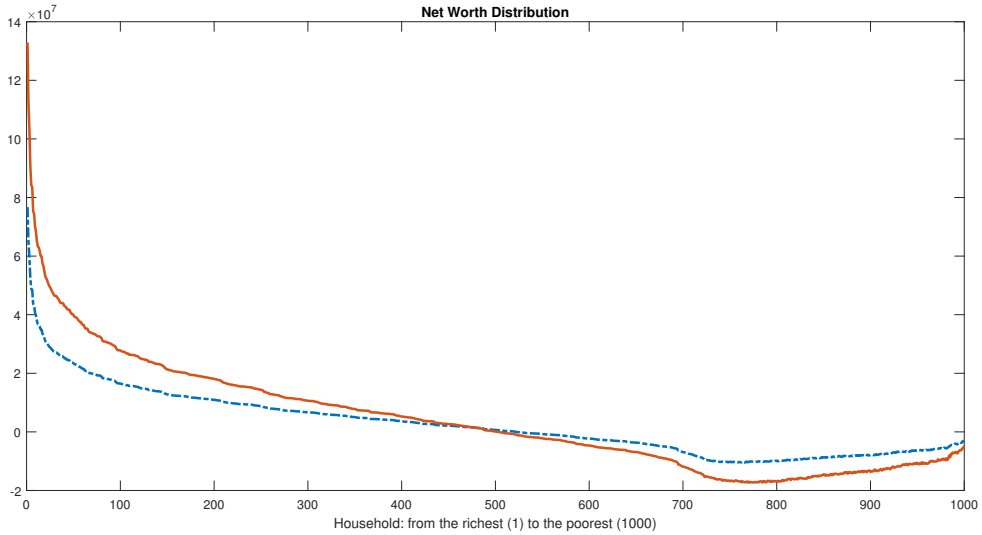

Figure 4: *Net worth distribution.* The graph represents the distribution of net wealth among households in the two main scenarios. The orange solid line is the scenario with securitisation, the blue dashed line is without securitisation (baseline scenario).

According to Figure 4, modern financial practices allow net wealth to become increasingly more concentrated in the top 10 percent households of the wealth distribution. On the contrary, the 50 percent households at the bottom of the distribution register a reduction of their net wealth. Some of them even enter in 'negative territory'. The increasing amount of loans they have to take in board just for satisfying consumption purposes and to 'keep up with the Joneses' force them to accumulate a *negative* net wealth.

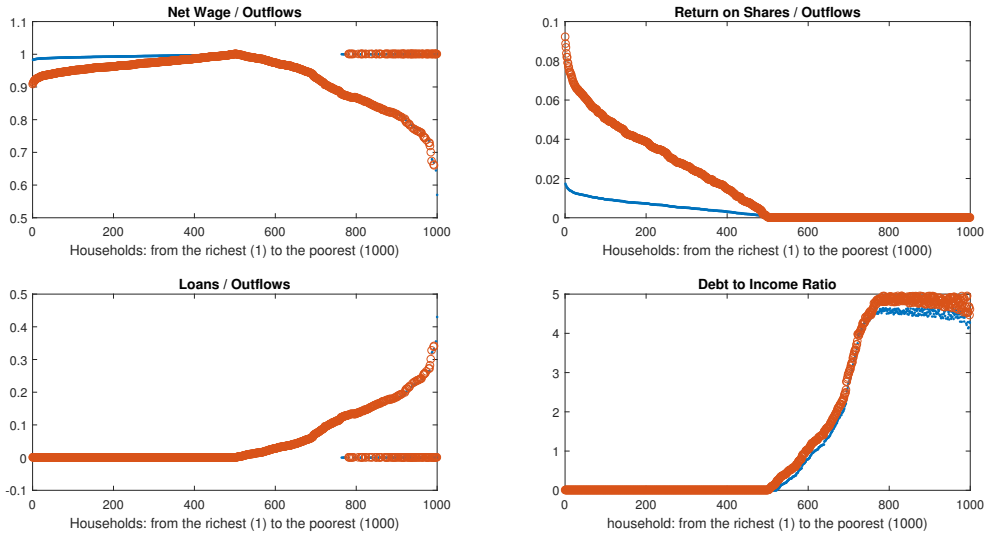

Figure 5: *Flows Ratios.* The two top graphs and the bottom-left graph show the weight of each monetary source on total outflows. The bottom-right graph represents the ratio between income and stock of debt. The blue dots represent the (baseline) scenario without securitisation and the red circles the scenario with securitisation. The four graphs show results from the last period of simulation. Households are ranked from the richest (left) to the poorest (right).

The financial flows that originate from such an increasingly unequal distribution of wealth are reported in Figure 5. The upper-left panel in Figure 5 shows that net wage covers for 90 percent of all current outlays (both for consumption or investment purposes) of top income households. The upper-right panel also shows that the production of CDOs and the higher remunerativeness of IFs' shares (with respect to the baseline scenario) allowed to increase the relevance of financial income in the budget of rentier households. Whilst financial income accounted for less than 2 percent (of households' outlays) in a world without securitisation, it has increased up to almost 10 percent after securitisation takes place and CDOs are produced. This obviously goes to the benefit of those rich households, which are wealthy enough to accumulate some interest-bearing financial asset. At least half family units are excluded from this process instead. Indeed, the bottom-right panel in Figure 5 shows that the debt-to-income ratio of the bottom 50 percent households increases when securitisation is introduced. The larger amount of financial commitments low and middle class households will have to deal with eventually constitute the source of the rise in financial income perceived by wealthy family units. Once again, we think this fact represents a clear example of new and deeper sources of 'exploitation rents' that may actually develop thanks to the pro-rich financial flows associated to securitisation and the proliferation of structured financial products.

5.3 Financial crises

In Sections 5.1, 5.2, and 5.3 we describe the structural relationship between some relevant financial variables and inequality standards that develop in our simulated economy over a long-run time horizon. In the present section we rather focus on the mechanisms behind the full-blown financial crisis that takes place around period 800 of our simulation scenario with securitsation. Indeed, some of the results of our theoretical analysis may be informative for a better understanding of the interaction between inequality and finance in the generation of financial and economic shocks.

Figure 6 first shows the co-evolution of CBs' leverage and non-performing loans. According to Figure 6, it seems that the former variable (CBs' leverage) anticipates and drives the dynamics of the latter (non performing loans). Other way around, CBs start to extend an increasing amount of credit to the economy; a credit boom originates and CBs' leverage increases, with obvious implications for the (weaker) financial solidity of CBs themselves. Non-performing loans follow with some lags. Increasingly

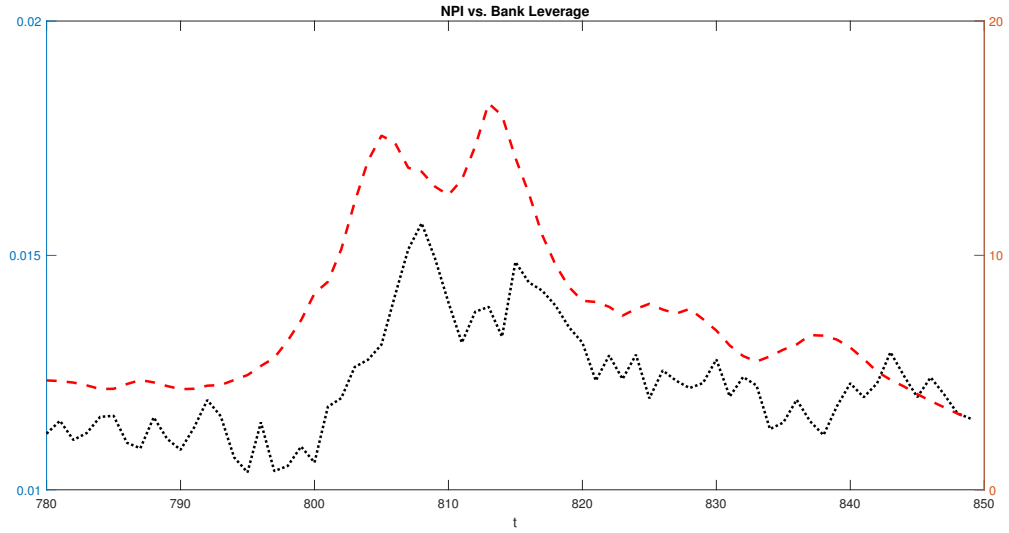

Figure 6: *NPI vs Bank Leverage.* The red dashed line represents banks leverage (right axis), the dotted black line represents the unpaid over due interests related to non-performing loans (left axis).

indebted households and firms do not set all the expected interest payments, so that CBs' revenues and financial position deteriorate. CBs react to this event by adopting a stricter stance in the provision of new loans. Actually, access to credit becomes restricted to a much smaller number of solid and creditworthy households and firms. Credit rationing and the burst of the credit boom take place, with the ensuing reduction in the amount of non-performing loans.

Whilst the end of credit euphoria and CBs' deleveraging help CBs to restore some sort of financial soundness, the consequences for the dynamics of the real economy may be harsh. This is what emerges from Figure 6, which portrays the negative correlation between non-performing loans and the GDP growth rate. Figure 6 actually shows that soaring non-performing loans, here identified as delayed consequences of credit booms, are associated with reductions in economic activity and, eventually, economic slumps.

It is worth noting that the negative correlation between non-performing loans and GDP growth (or, alternatively, the negative effect of a credit crunch over economic activity) is not a peculiar feature of the specific 'crisis event' we are currently describing. It actually emerges as a well-established statistical property of the full simulation over the entire time span we take into account. This fact is portrayed in Figure 7 below which shows that, on top of the statistically significant negative correlation between current values on non-performing loans and GDP growth, such a negative correlations gets even more negative for lagged values of non-performing loans up to 7 lags. In our model, whenever a credit boom initially gives rise to mounting financial fragility and to a rise in non-performing loans, it will soon or later trigger off a showdown in economic activity if not a full-fledged economic crisis.

The correlation between credit booms, increasing non-performing loans and, eventually, economic downturns, bring us back to the economic debate set out at the beginning of this work about to the most relevant factors behind crises. The story we describe in this last section is certainly consistent with the narrative put forward by Shularick and Taylor (2012) and Bordo and Meissner (2012), who identify credit booms as the most prominent causes and predictors of financial and economic crises. This fact notwithstanding, Shularick and Taylor (2012) and Bordo and Meissner (2012) neglect to analyse in details which are the economic and/or institutional factors, which enable financial institutions to

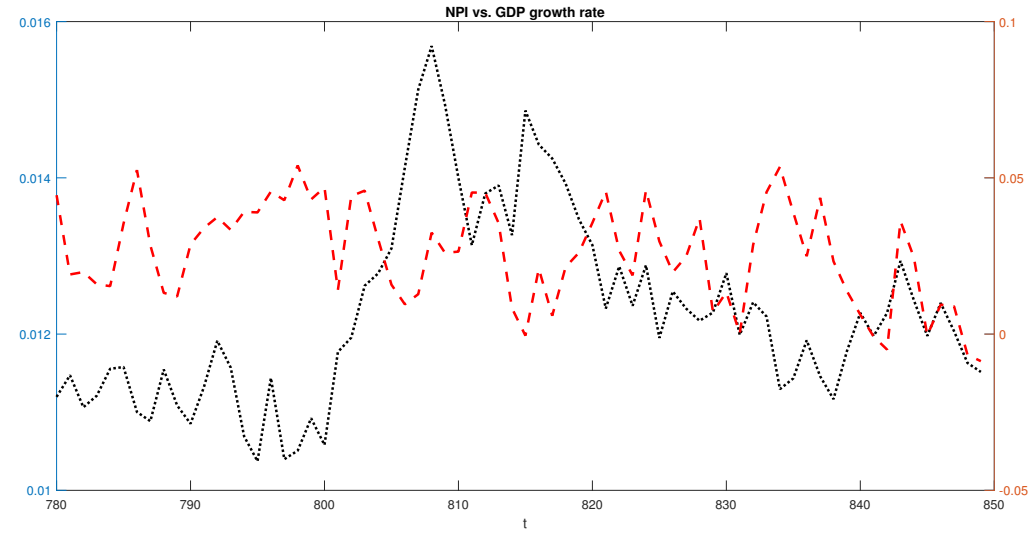

Figure 7: *NPI vs GDP growth.* The red dashed line represents the rate of growth of GDP (right axis), the dotted black line represents the unpaid over due interests related to non-performing loans (left axis).

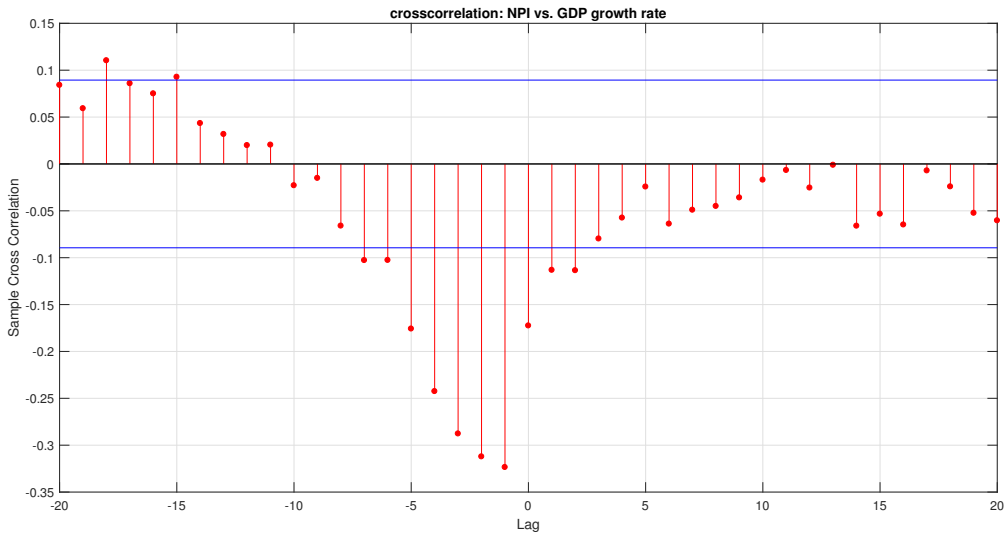

Figure 8: *NPI and GDP growth cross correlation.* Red bars represent the correlation between lagged values of non-performing loans and current GDP growth, blue horizontal lines define confidence intervals.

frequently ignite and feed a credit boom. Shularick and Taylor (2012) and Bordo and Meissner (2012) rightly mention financial liberalisation and financial innovations as potential triggers of boom-and-bust cycles. But financial innovations are presented as exogenous events. In this model, we offer an alternative and perhaps more general view, in which financial innovations that can give rise to unstable dynamics are actually *endogenous* and tightly connected with the structural long-run forces governing the evolution of the economic system.

The 'credit-boom-gone bust' we describe in this section (with its connections with non-performing loans and economic growth) has been permitted by financial innovations such as the securitisation of existing loans and the production of structured financial products. At the very least, credit booms and

unstable dynamics would have been far less acute in an economic system without securitisation. These financial innovations are in turn intrinsically connected with unfolding structural trends in the economy, namely rising income and wealth inequality. On the one hand, the production of CDOs is meant to provide IFs and, indirectly, wealthy households with those remunerative assets satisfying their appetite for high returns. On the other hand, the securitisation of existing loans, with the implicit transfer of debtors' interest payments from originating banks to rentiers, guarantees the supply of primary inputs for the production of CDOs themselves. This arm-length chain from inequality to economic dynamics passing by securitization and CDOs is once again synthetically demonstrated in Figure 9 below.

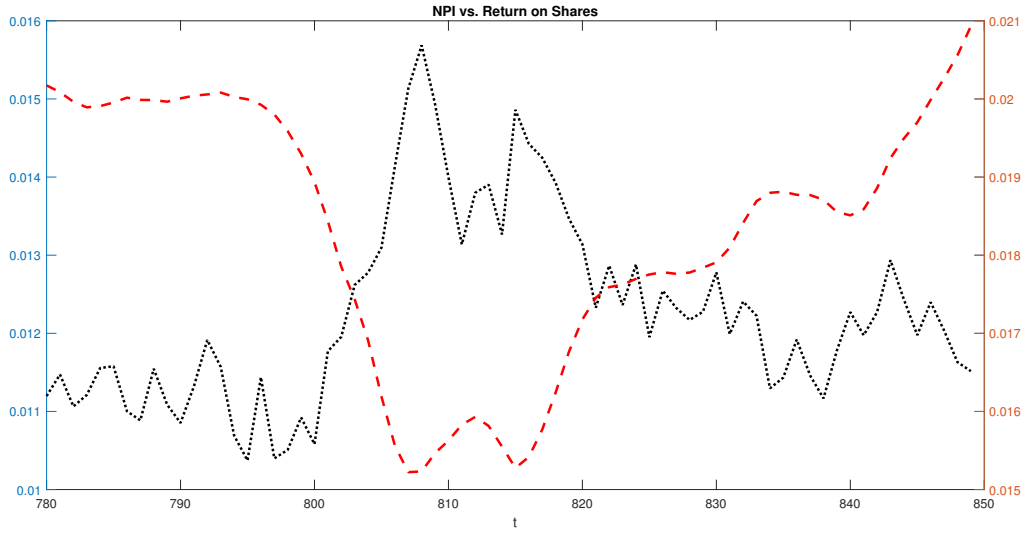

Figure 9: *NPI vs Return on share.* The red dashed line represents the return on shares (right axis), the dotted black line represents the unpaid over due interests related to non-performing loans (left axis).

Figure 9 shows the negative correlation that clearly emerges between non-performing loans and the remunerativeness of IFs' shares at the time of the financial crisis in our simulation. A low level of non-performing loans ensures that indebted households and firms generally comply with their payment obligations, yields on CDOs are high as is the remunerativeness of IFs shares. But when the start of the credit boom eventually leads to an increase in the number of non-performing loans, the remunerativeness of CDOs and IFs shares decline. When the much lower remunerativeness of CDOs leads to a dry-up in the market for CDOs (see upper-left panel in Figure 2), the securitisation process enabling the credit boom comes to an end, and the boom inevitably goes bust. We already described the negative consequences this sequence of events may produce on real-side economic dynamics. What is relevant for the purpose of our analysis is that financial and economic crises emerge as the last outcome of the endogenous interplay between between financial innovations, financial dynamics, and economic inequality. In our simulated economy, income inequality is all but neutral with respect to economic shocks.

5.4 Two experiments on taxation and wage inequality

As described in Section 1, our work focuses on a very specific and often overlooked determinant of inequality. Other economic and political aspects not portrayed in our model are equally or even more important in determining the level of inequality. In this section we describe the results of two computational experiments which involve the degree of tax progressiveness and wage inequality. In both cases, we refer to the model with securitization. In the first one we want to assess the role of taxation by comparing the baseline model, in which two different tax rates are applied, with a scenario characterized by the introduction of a single tax rate for all households (*Flat Tax*). In particular, the level of the new tax rate (0.252) is set so as to keep the fiscal balance almost unchanged, in order not to hamper the comparability

of the descriptive statistics. The second experiment (*Wage Inequality*) regards a more unequal wage distribution. In particular, the second moment of the log-normal distribution of wages passes from 0.5 to 0.55. We perform two additional batteries of Monte Carlo simulations by running 100 simulations for each new scenario. Descriptive statistics are presented in Table 3.

Let's first focus on the *Flat Tax* scenario. Table 3 shows three main results. First, the new fiscal regime has a negative impact on growth. While the level of public debt over GDP is, by construction, close to (2% lower) what obtained in the *Securitization* scenario, private indebtedness is considerably (7%) higher. Second, inequality, as measured by the two Gini indexes, increased and the rise is more acute in the case of wealth. Private debt, measured both with respect to GDP and net income, increases significantly. Other results are very much in line with previous scenario: in particular, albeit higher private indebtedness, financial fragility and the probability the probability of crisis does not increase. This results might very well be explained by credit rationing: while the median across Monte Carlo simulations is 0.1297 with progressive taxation, the same value with the flat tax increases to 0.1519. The different taxation regime impacts on disposable income, which in turn concurs in determining, via debt service ratio, the access to credit. In this case the flat tax results in a lower access to credit for the poorer households and eases access to credit for higher income households. The ease in access to credit may be particularly relevant for those households whose wage is slightly above the threshold for a higher tax rate, which can therefore purchase more shares, resulting in higher shares of securitized loans. On the contrary, lower income households, which in the previous scenario are those defaulting on their debt, having lower access to credit, are hampered in their possibility of relying on bank loans to purchase assets. This results in higher wealth inequality and less GDP growth, without increasing the probability of crises.

The second scenario, *Wage Inequality*, is aimed at portraying the outcomes of a more unequal wage distribution combined with a financial system where securitization takes place (see again Table 3). The reasons for the increased wage inequality may be various, as a weakening of trade unions or new labor laws, and are not modelled in our paper. This scenario presents a level of GDP lower than *Securitization* and comparable to the *Flat Tax*. Public debt is in this case significantly lower and this comes at the expenses of private debt, which increases. Inequality is higher, markedly on income. The main results of this scenario however pertains to financial fragility. Non performing loans are significantly higher and, more interestingly, the probability of crisis escalates to become six time greater than in the *Securitization* scenario, which means almost thirty times higher than in the baseline scenario.

The outcomes of the *Flat Tax* and *Wage Inequality* scenarios are even more interesting, if observed jointly. In the former, wealth inequality rises but, due to stricter credit rationing, financial fragility is considerably lower. This suggests that the positive nexus found by Levine (2005) (see Section 2) may indeed take place, but at the sacrifice of increased financial fragility. That is to say, once obtained credit, poor households may very well use the inflow of money to buy goods or assets. However, unless purchased assets are income-generating - hence allowing for the debt to be repaid - the benefice will only be transitionary and the positive effect on wealth inequality illusional. The debt burden will soon become unsustainable and indebted poor households will default. This situation, if generalised, is bound to determine a full-fledged financial crisis. In sum, easier access to credit, detached from a proper redistribution of income, may very well be a self-defeating and destabilizing policy.

6 Conclusions

In this paper we analyse the interaction between finance and inequality. Most of the existing literature on this topic tries to assess how the former may affect the latter or vice versa. Nevertheless, it does not offer a comprehensive overview in which inequality standards and the development of modern financial systems co-evolve, feed back one into the other, and jointly shape the short- and long-run dynamics of an economy. With this work, we aim at filling this gap. For this purpose, we present a hybrid AB-SFC model featuring an economy composed by one thousand heterogeneous household units. We run a battery of Montecarlo simulations over a time horizons of one thousand periods through which we can infer how

	Securitization	**Flat Tax**	**Wage Inequality**
GDP growth			
- mean	0.0249	0.0248	0.0248
- Standard Deviation	0.0155	0.0158	0.0157
- Skewness	-0.0594	-0.0584	-0.0576
- Kurtosis	2.0470	2.0718	2.0690
GDP level*	1	0.8766	0.8816
GDP shares			
- Consumption	0.5464	0.5463	0.5463
- Public Purchases	0.1257	0.1260	0.1260
- Investment	0.3278	0.3278	0.3278
Public Debt	1.8076	1.7804	1.4483
Gini Indexes			
- Income	0.2912	0.2937	0.3172
- Wealth	0.7373	0.7658	0.7521
Loan Stock over GDP	1.7565	1.8240	1.8061
Debt to income ratio	0.9950	1.0919	1.0212
Non performing Interests			
- Mean	0.0112	0.0096	0.0177
- Standard Deviation	0.0020	0.0017	0.0034
- Skewness	0.6090	0.6826	1.0557
- Kurtosis	2.8785	3.1018	4.4488
- Crisis Probability*	0.0530	0.0520	0.3230
Share of securitized loans	0.2855	0.3109	0.2964

* GDP last period *'Securitization'* = 1

** NPI above 5% of all interests

Table 3: Descriptive Statistics comparing the *'Securitization'* scenario with the *'Flat Tax'* scenario and the *'Wage Inequality'* scenario.

finance and inequality evolve and concur to determine the emerging structural properties of our simulated economy. Three points are worth noting as to the results of our simulations.

First, in a world allowing for the securitisation of Commercial Banks' loans, income and wealth inequality constitutes the in-depth sources for the demand of remunerative structured financial products (by wealthy households) and the ensuing securitisation of existing liabilities (of indebted middle and low class households). These modern financial practices in turn exacerbate income and wealth inequality with respect to a more traditional 'originate-and-hold' financial system without securitisation.

Second, the perverse interaction between rising inequality and and over-expanding financial system increases the probability of financial and economic crises. In our model, we verify that the concentration of wealth and income in the hands of a few rises the demand for remunerative financial assets (Investment Funds' shares and Collateralised Debt Obligations), which then spurs the securitisation of existing assets and allows CBs' to extend more loans to the economy. Whilst GDP growth may temporarily benefit from this, credit booms more likely unfold and eventually bust, giving rise to recessions. The absence of an asset which may loose value, the aggregate CBs, SPVs, and IFs sectors, with the consequent lack of financial units defaulting, make the model resilient to crisis. Feature developments of the model will relax this characteristics in order to better assess the impact of extend crisis and the role of financial speculation.

Third, we run two different computational experiments in order to see the effects of the introduction of a flat tax regime and of a more unequal distribution of wages on the performance of our simulated economy. In both cases, we find that income and wealth inequality increases. More importantly, we find that in both the experiments average GDP growth declines, its volatility increases, and the probability of crisis rises, in the second experiment (higher wage inequality) more than in the former (flat tax). Easier

access to credit, detached from a proper redistribution of income, appears to be a self-defeating and destabilizing policy.

All in all, the results of our simulations tend to reject the promises of 'trickle-down economics', which after Brexit and Trump's presidential election seems to guide the economic policy strategy of governments in several developed countries. Unregulated (modern) finance, a better taxation for the rich, and/or a more throat-cut system (read higher wage inequality) do not improve economic dynamics, make economic systems more unstable and crisis-prone, and exacerbate the unequal distribution of resources.

	Households	Banks	SPV	IF	Firms	Gov	Total
Deposits	$+D_H$	$-D$	$+D_{IF}$	$+D_{SPV}$	$+D_F$		0
Capital					$+K$		$+K$
Shares	$+Sh$			$-Sh$			0
Bonds		$+B_B$		$+B_{IF}$		$-B$	0
Loans	$-L_H$	$+(1-z)L$	$+zL$		$-L_F$		0
Derivatives			$-CDO$	$+CDO$			0

Table 4: Aggregate Balance Sheet (Initial Situation)

	Households	Banks		SPV		IF		Firms		Govt.	Σ
		CA	KA	CA	KA	CA	KA	CA	KA		
Consumption	$-C$	0	0	0	0	0	0	$+C$	0	0	0
Publ. Exp.	0	0	0	0	0	0	0	$+G$	0	$-G$	0
Investment	0	0	0	0	0	0	0	$+I$	$-I$	0	0
Wages	$+W$	0	0	0	0	0	0	$-W$	0		0
Taxes	$-T_H$	0	0	0	0	0	0	$-T_F$	0	$+T$	0
Int. on Loans	$-r_h Lht-1$	$+r(1-z)L$	0	$+rzL$	0	0	0	$-r_f Lf_{t-1}$	0	0	0
Return on Deriv.	0	0	0	$-fCDO$	0	$+fCDO$	0	0	0	0	0
Return on Shares	$+RSH$	0	0	0		$-RSH$	0	0	0	0	0
Int. on Bonds	0	$+RB_B$	0	0	0	$+RB_{IF}$	0	0	0	$-RB$	0
Dividends	0	$-Div_B$	0	0	0	$+Div_B$	0	0	0	0	0
Profits	$+\Pi_H$	0	0	0	0	$-\Pi_{IF}$	$+\Pi_{IF}$	$-\Pi_F$	$+\Pi_F$	0	0
Change in the stocks of											
Deposits	$-\Delta D_H$	0	$+\Delta D$	0	0	0	$-\Delta D_{IF}$	0	$-\Delta D_F$	0	0
Loans	$+\Delta L_H$	0	$-\Delta(1-z)L$	0	$-\Delta zL$	0	0	0	$+\Delta L_F$	0	0
Derivatives	0	0	0	0	$+\Delta CDO$	0	$-\Delta CDO$	0	0	0	0
Shares	$-\Delta Sh$	0	0	0	0	0	$+\Delta Sh$	0	0	0	0
Bonds		0	$-\Delta B_B$	0	0	0	$-\Delta B_{IF}$	0	0	$+\Delta B$	0
Δ Total	0	0	0	0	0	0	0	0	0	0	0

Table 5: Aggregate Transaction Flow Matrix (Initial Situation)

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