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Financial Instability and Income Inequality: why the connection Minsky-Piketty matters for Macroeconomics

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Abstract

In recent years the names of Minsky and Piketty gained increasing notoriety to researchers because the two authors investigated issues of financial instability and income inequality, which represent both two unsolved macroeconomic problems of the new millennium, and evidence contradicting the long-run implications of mainstream macroeconomics.

By combining these two names we set ourselves an ambitious goal, going beyond the technical aspects of the model presented in the paper. Indeed, not only we want to contribute directly to the debate meant at clarifying the controversial relationship between financial instability and income inequality; we also aim at addressing a broader issue which is the explanation of the reasons why a theoretical revolution in macroeconomics has not yet occurred, and why financial aspects still play a subordinate role to real factors in the explanation of growth and cycles. In this broader perspective Minsky and Piketty are assumed as extreme examples of the opposite poles of heterodoxy and orthodoxy.

Both target and argumentative line of the contribution are quite unconventional, as usually financial instability and income inequality, are treated as separate if not independent issues of inquiry; and methodological reflection is no longer a customary explicit part of technical papers. We discuss possible reasons why these two circumstances happen.

The theoretical framework proposed in this paper builds on Ferri (2016), who presents a class of demandled models in a medium-run time horizon. This class of models is not conventional too, though it belongs to "pedagogical models", we consider especially relevant tool for macroeconomics. Among the different specifications investigated by the author, we select the nearest to possible comparison with Piketty (2014) and then we introduce corporate debt into the financial account of firms. Because of the non-linearity of the model, we explore its dynamic properties with numerical simulations. Such simulations are also performed to assess the parameters enabling to support the Financial Instability Hypothesis. Aiming at deepening the comprehension of robustness properties, we also consider analytic results from a linearized version of the model.

Obviously, the criticism addressed to Piketty with respect to the definition and measurement of inequality can be extended to our model too, as we use the same expedient to check the evolution of inequality. This leads to emphasize the relevance of the issue of measurement as a critical one for future developments. Nevertheless, this does not impinge on the achievement of our purpose. Indeed, our analysis confirms the utility of pedagogical models. Furthermore, it underlines the need of a change of economic vision such that complexity comes as a substantial part of representation. In terms of future perspectives these considerations point out the need for macroeconomic epistemology to resume constructive dialectics: a mixture of plural narratives and foundations for new visions of economic policy. Those just proposed at the end of the paper differ from orthodox ones as they call for financial regulation, they underline qualitative aspects and heterogeneity; but such embryonal policy suggestions stem from the overall perspective described in the paper, a perspective rooted into Ferri's notion of medium-run, and qualified by Minsky through an eclectic approach leading to networks of balance-sheets: two ways highly overlapping though not totally equivalent to represent the reality of and endogenously unstable capitalism lying at the edge of chaos.

Keywords: Economic Inequality, Financial Instability Hypothesis, Endogenous Cycles

JEL codes: B41, D31, E32

1 Introduction

Since the beginning of the New Millennium macroeconomic dynamics showed the consolidation of two phenomena that are both in contrast with mainstream predictions and are usually treated as separate pieces of economic theorizing. We refer to the increase of economic inequality (Piketty 2014a; Stiglitz 2015a) and to the rise of financial instability episodes (higher recurrence, persistence and diffusion of financial crises) (Galbraith 2012; Ferri 2016).

Indeed, mainstream framework conceives globalization as a welfare enhancing process: on the one hand it should trigger convergence processes and therefore reduce distributive inequality or at least not worsen it (Aghion and Williamson 1999, Sala-i-Martin 2000, Quah 1996a, 1996b); while on the other hand, financial markets integration should lead, at least, not to contradict the idea of long run financial neutrality, which goes hand in hand with monetary neutrality (Causevic 2017, Kandil et al. 2015, Seven and Coskun 2016). Though the possible link between finance and growth had been matter of inquiry since the end of nineteenth century, both nature and strength of such relationship still remain controversial (Levine 2004); more than that, contentious is the link between growth and distribution (Bertola 2000) or inequality (Demirguc-Kunt and Levine 2009, Rochon and Monvoisin 2019).

The fronts of literature having a critical attitude towards the stabilizing/converging properties of increasingly integrated free markets share the idea that growing inequality and instability are not accidental events being in contrast the effect of endogenous changes and adjustments; nevertheless, such endogeneity again is not typically explained treating the two issues together.

The literature focusing on growth and inequality, taking its cue from Piketty's (2014a) recent contribution, looks at the accumulation of capital at the aggregate level and keeps its attention on the real dimension of the economy; it is a research whose principal aim is the explanation of a new stylized fact of more recent years: the decline in growth accompanied by the growth of the share of capital in aggregate wealth. It usually comes combined with the adoption of a standard aggregate production function à la Solow. Thus, it cannot be considered a research project meant to address any radical or paradigmatic change in macroeconomics.

Conversely the literature centering on financial instability recognizes the fundamental role of financial assets and more in general of finance was at the core of Minsky's theory who elaborated the so-called Financial Instability Hypothesis (FIH) (Minsky 1985; Minsky 1986). After the financial crisis of 2007-2008, the importance of Minsky's theory has been rediscovered in academia; the endogenous nature of this process is explained connecting to the evolution of the complex network of debt positions of economic agents whose financial leverage is doomed to become inconsistent with the possibility to service outstanding debt. In this case, the endogeneity of instability is not simply a matter of process representation, it is rather the instrument making evident the nature of monetary economies of production (which are incompatible with money neutrality). Financial instability is therefore the channel through which the need is justified to change the reference paradigm, at least implicitly (Galbraith 2012; Fazzari et al. 2008; Skott 2013).

Then, the two strands of literature are separate because: a) they refer to questions focusing on different objects; b) they tackle different levels of economic theory: the first epistemological, the second ontological; whereas the growth-inequality literature usually embeds just a theoretical conflict of representation, the finance-instability literature involves a conflict of economic visions too.

But are these two streams really independent? Some authors argue not and in order to highlight the point they either refer to a particular class of growth models (i.e. aggregate demand led), or they refer to a particular time horizon (i.e. medium run) (Ferri 2011; Ferri et al. 2015). Doing so they question the

theoretical independence of growth and cycles due to independence of time spans; in other words, they emphasize that conventional macrodynamic representation, treating growth as separable from cycles, may lead to oversee their interaction actually evident in a time horizon whose frequency span is neither short, nor long run.

This paper takes exactly this peculiar, though unconventional, perspective. Starting from the above considerations and in line with the idea that economic inequality is sensitive to the presence of financial instability processes, this essay aims to reconsider the economic inequality problem dealing not only with the real component, as in Piketty's model, but also with the financial one. This study is motivated by the need to increase our knowledge about the relationship between wealth inequality and financial instability processes and offers a contribution to the understanding of the interactions between them. We believe that this is particularly important given the changes in our economy over recent decades, especially in the face of transformations that have been determined not by the autonomous changes of the markets, but by specific changes of policy and institutional set-ups (which in turns are sensitive to the theoretical mainstream in economics).

Though the final purpose of the paper is meant at contributing to paradigmatic discussion, the analytical structure is kept quite simple. This seeming contradiction is justified by a threefold motivation. First, the idea to build a structure as close as possible to the one proposed by Piketty (2014a). Second, the need to have a model where, at least as a starting point, the issue of inequality measurement (or definition) was not the main focus, but still a crucial element of inquiry: in this respect the use of increasing capital share on income as an aggregate sign of increasing inequality is not a satisfactory measure of inequality, but it serves the scope to capture the evolution of inequality (which is our concern). Third, the idea to build a model which could be easily connected to Minsky's financial instability hypothesis. And this track goes through the explicit consideration of the role debt.

The first motivation derives from the consideration that Piketty's model not only represents a "momentum" emblematic piece of work, but it also belongs to a class of models which constitute a tradition in macroeconomics, namely "pedagogical" models (like Solow for growth, or AD-AS or IS-LM). These models can be either used to build/compare macroeconomic narratives or to evaluate/estimate empirical parameters, hence becoming the essential starting point in the process of validation of economic theories. Thus, this class of models is not relevant because of its intrinsic realism, but as they are among the best shortcuts to connect the highest level of economic abstraction (the realm of economic visions) to the lowest level of scientific inquiry (the observation of facts). The other two motivations stem from the attempt to underline the relevance of minskian perspective, emphasizing aspects which are less customary to scholarly attention towards Minsky's contribution. We refer to the relevance of the qualitative nature of macro-dynamics which address either to growth and cycles interactions and to reflection on inequality (which can be seen as a dynamic phenomenon implying qualitative change in the distribution of income).

Specifically, through our pedagogical model, using the orthodox language, we want to highlight that some of the contradictions of nowadays macroeconomics do not lie in the lack of complexity of representation, but in the lack of consideration of the interaction among very basic forces of macroeconomics. We highlight that the relevant omission is not only the lack of consideration of the dynamic integration among financial instability and growth, but also the lack of consideration of the integration between financial instability and inequality (which is a less known piece of Minsky's research).

The most appropriate analytical framework for the implementation of the minskian view would require the use of complexity (circular causation), and instead we are going to use an orthodox framework

(linear causation), then we expect to find only indirect the evidence of the correctness of the minskian theses. Specifically, the model should exhibit integration between cycles (short-run) and growth (long-run) through the evidence of cycles persistence and procyclical inequality due to procyclical financial instability. Furthermore, procyclical financial instability should go together with procyclical aggregate indebtedness.

The theoretical framework proposed in this paper builds on that developed by Ferri (2016), who presents a class of demand-led models analyzing various aspects of the link between instability and inequality. Using investment as a key-variable connecting these two fundamental aspects of macroeconomic dynamics, our model introduces corporate debt into the financial account of firms.

Because of the non-linearity of the model, we explore its dynamic properties with numerical simulations. Such simulations are also performed to assess the parameters enabling to support the Financial Instability Hypothesis. Aiming at deepening the comprehension of robustness properties, we also explore analytic results from a linearized version of the model.

The structure of the paper is the following. Section 2 focuses on the literature and methodological aspects supporting the observations just made. Section 3 illustrates the model. Section 4 identifies the steady state conditions. Section 5 shows and discusses the results obtained by means of numerical simulations. Section 6 derives the linearized version of the model and examines the robustness of the model. Summary and perspective considerations close as customary the paper.

2 Financial Instability vs. Income Inequality: recent literature and methodological issues

This section is going to circumstantiate the introductory reflections through a short review of the literature and some methodological observations functional to justify the theoretical model we will formalize in the next section.

The part is articulated in three steps. Firstly, we address the literature considering the frequency of research focus selection in the light of the possible contrast of underlying paradigmatic views. Second, we comment the literature drawing considerations supporting the choice to focus on a theoretical model which can be directly connected to both Piketty (2014a) and Minsky's ideas, emphasizing the methodological reasons for this unusual pairing. Third we face some specific issues of this subset of economic inquiry which either constitute a puzzle to be explained, or already suggest evidence not yet embedded into standard theoretical models; such issues are the explanatory background of our model.

Literature review has been organized selecting eight keywords, four main (inequality, financial instability, growth and instability in general) and four secondary (income distribution, finance, money, credit), from the EconLit database. Then the absolute count was done for single keyword entry as opposed to count for couples. It was also accomplished initially without any time restriction, and then splitting the time interval with respect to years 2007 and 2014. Though the first year of the sample is 1891, it turns out that more than 90% of publications is concentrated after 1988, which is the year where all the possible couples of our search become simultaneously present.[1]

[1]The numbers are the result of a search just on EconLit database, and do not restrict on the type of publication, nor it comes after a check of double entries. The last count was made on June 20th, 2021. So, any evidence is to be considered as gross qualitative measure of the observed "popularity" of each issue among Economists. Furthermore, we are aware of the likely incompleteness of the database, especially for oldest publications (ante 1980) which may not yet be indexed. We think this limit does not invalidate our considerations, as our theoretical concerns matter especially for the last forty years, where most of the counted literature is concentrated.

Considering the four main keywords lying behind our paper (inequality, financial instability, growth and instability in general) one can easily verify that the most frequent issue in Economics is growth, followed by inequality, and then instability; by far, financial instability is the less recurrent entry. There is a striking difference in the absolute number of items: whereas growth alone reaches more than 210.000 matches, financial instability barely ranges around 3.700; in between inequality with almost 50.000 and instability in general with almost 9.500. It is also interesting to notice the historical path followed by the appearance of attention to each of the specific issues. Not surprisingly in 1891 we register the first entry on growth, in 1902 comes instability, in 1920 inequality and finally in 1973 financial instability. The keywords considered jointly, not only are much fewer, but confirm the same kind of historical path. Indeed, growth-instability is the first couple (around 2.300 matches starting from 1936); growth-inequality is the second (almost 9.900 entries starting from 1955); growth-financial instability is the third (less than 900 starting from 1985) and finally inequality-financial instability (less than 130 pieces since 1988).

Thus, the absolute frequencies of entries reveal that some issues are more usual than others. Moving from the independence of keywords (where one would not expect ex-ante such a skewed distribution, due to the relevance of each of the selected issue at macroeconomic level) towards the joint consideration of topics, it becomes evident that it is quite customary to connect growth to income distribution (and hence inequality), but not to consider macroeconomic dynamics as an unstable phenomenon and even less a financially driven one.

In the introduction we depicted years 2007 and 2014 as likely critical passages, in the evolution of economic literature. Indeed, the general consideration is that the rate of publications per year surged after 2007: each topic more than doubled considering the overall production split in two subperiods ranging respectively from 1988-2007 and 2008-2021, symptom of a possible change in research/editorial strategies. While growth is a sort of evergreen research theme, both financial instability and inequality seem to be affected by moment. Growth of publications focusing on financial instability peaked in the period 2007-2014 (354% increase); but this increase is overcome by inequality (396%) which represents the absolute primacy and happened in the period 2015-2021. In this respect saying that Piketty's (2014a) Capital in the Twenty First Century put the question of economic inequality back in the center of economic studies does not seem an overstatement. To the very least Piketty choose the perfect timing to focus on inequality.

This exercise of frequency count, though in many respects simplistic, draws the attention towards the evidence of the transversality of implicit conventions in Economics (made apparent exactly because the enumeration does not put any filter with respect to concepts which may belong to one school of thought or another). We are suggesting that precisely these conventions acting as backbones of economic method ultimately determine the choice of keywords, the way they are related, and eventually the success of paradigms in the history of economic thought. The full justification of the statement is beyond the scope of this paper. Nevertheless, it explains why in our view the attempt to bring together Piketty and Minsky is in some sense more relevant with respect to methodological considerations, than with respect to any analytical exercise we may present later.

Let's briefly mention the plausible methodological conventions hiding behind the numbers we just presented. The first one is the assumption of linear causation. Indeed, cause-and-effect mechanisms presupposing independence of cause from effect are the standard for representation (Hicks 1980, Hoover 2001).[2] Noticeably the independence between real and financial sides of the economy is the pervasive

[2]For a broader perspective, intersecting disciplines other than Economics, one may also see Bunge (1980) and Wallace (1974).

implicit convention behind our count (the secondary keyword finance is as important as growth: more than 250.000 entries since 1888). Together with the observation that the secondary keywords money and credit respectively collect more than 61.000 and 55.000 entries, one may have the apparent symptom of this theoretical assumption: the two sides are fundamental but dichotomized.

In contrast, circular causation, feed-back mechanisms, integration among forces though recognized as parts of reality do not sit comfortably in the literature, especially the one dealing with modeling as they imply the representation of processes, that is they require dynamic set-ups.

If one takes as a starting point the assumption of complexity of reality (ontology) which is incompatible with linear causation, then he is to face the representation constraint (epistemology) given by the choice of the degree of simplification. Considering for convenience just the two extreme options, the complex nature (intrinsically dynamic) of reality may be either faced taking into explicit account this aspect or finding a trick allowing to dismiss dynamics (indirectly reducing complexity) making it unnecessary (Vercelli and Dimitri, 1992). Historically, due to analytical/computational difficulties, but also due to cultural frameworks, the second strategy exceeded the first, giving rise to a couple of consequences relevant to our essay.

On one side it contributed to the establishment of another cross-cutting convention for schools of thought: the search for stable components (leading to the prevailing equilibrium perspective; see Lawson 2005, Samuels 1997, Setterfield 1997). Thus, instability is typically conceived as bad and as such it must be either temporary or localized (which means both self-contained, no run-away, and not spatially widespread, no pandemic, in other words limited in a time-based or space-based dimension; see Vercelli 1982). Furthermore, it is to be an external feature (exogenous shock). In the face of the diffusion of stochastic approaches, stability has been converted into ergodicity (then invertibility) which has a corollary relevant to the paper, namely, the implicit assumption of homogeneity. The latter means that heterogeneity is not a relevant element of representation, though being a feature of real world.

This brings us to the further consequence just mentioned. It has empirical content. Providing a good deal of recent literature involves empirical exercises, linear causation method gives rise to the evidence of inconclusive exercises, with respect to the target of identification of causes (practically rendered impossible due to the conventional, hence non-objective nature of the moment selected to start the representation of the process, as in the case of the egg-chicken cycle).

Furthermore, it determines that the recognition of the qualitative nature of phenomena, which is a trait of heterogeneity, is not a standard feature of investigation. Quality obviously poses serious problems of measurability, and then conflicts with standard quantitative methods of inquiry; but as just emphasized, it is not so appealing as it is almost universally considered "unconventional". Among the keywords we selected we have inequality, money and credit. The numbers of each entry are in absolute quite similar (they range from the maximum of 61.000 of money and the minimum of 50.000 of inequality) and the proximity becomes even more evident in relative terms, where they represent almost $\frac{1}{4}$ of the occurrences of the main reference keyword (respectively growth and finance). We are suggesting that inequality, money and credit are less frequent themes of research because they cannot be studied without facing the inescapable qualitative nature of the three issues.

Though the attempts to overcome the limits due to linearity and homogeneity conventions are significantly represented by the use of Agent Based Modeling (ABM) and Stock and Flows Consistent (SFC) analysis, the methodological issues involved behind such use are still in need to be faced; as a result,

complexity in Economics is far from being the conventional assumption.[3] Furthermore, with respect to the purpose of our paper, it is quite difficult to qualify these class of models as "pedagogical" ones. As a matter of fact, nowadays orthodoxy builds on stability-equilibrium assumptions (Maki 2001, 2002). Then no surprise that the main empirical contributions by Piketty showing an increasing inequality in developed countries from the 1980s (see also Piketty 2015; Piketty and Saez 2014), come together with a theoretical model meant to explain the rising share and concentration of capital, which is a supply-side macroeconomic model of real capital accumulation in a steady state equilibrium à la Solow (Piketty 2014b).[4] So, Piketty's work represents a novelty, but not a radical innovation in the panorama of economic literature: it is the emblematic expression of the strongest conventions transversal to different schools of thought, and of the yet equally transversally and unsolved contradictions.

In contrast, from the methodological point of view, the Minskian approach is heterodox on each and all the conventions we cited. It involves circular causation, endogenous instability, and significant (still identifiable) heterogeneity (Vercelli 2010, 2011, Variato 2015). This approach addresses the foundations of economic practice shifting the debate from the epistemological level of representation to the ontological one of reality notion (vision). Then, again no surprise to find that this line of research is the one which collects the absolute minimum of counts.

Having explored on the methodological reasons dividing the strands of literature on growth/inequality as opposed to the literature on financial instability/inequality, the last part of this sections briefly recalls some examples drawn from the literature showing where inconclusiveness of linear causation, critical finance, and the integration of short-long run through the evolution of income distribution structures and financial structures become evident.

We start mentioning the contributions that represent reviews of literature or studies with a historical perspective. They are more easily classified as heterodox. A specific survey on growth theory and distribution making a broad review of models that belong to different traditions of thought can be found in Blecker and Setterfiled (2019). Then we underline Skidelsky (2018) who addresses issues referring to method of Economics, as well as papers like Jackson (2019), Saith (2011) and Tiberi (2007) who deal on long-term empirical evidence. Skidelsky (2018) connects the collapse of 2008-09, to the development of macroeconomic doctrines proven deficient by the crisis and its aftermath. He gives the rationale for the emergence of what he calls "New Consensus" (a mixture of "new" classical and "new" Keynesian economics). This New Consensus belongs to the transversal conventions we just described. For the purpose to our paper, we point out that the author corroborates a complexity vision of macroeconomic dynamics where financial innovation and endogenous instability play a crucial role together with income inequality on the growth process. In doing so he basically expresses a critical position towards both theories and policy suggestions stemming from New Consensus.

A critical position emerges also from papers related to structuralist or institutionalist positions. Here the main motivation of analysis is the attempt to show that both inequality and financial instability negatively affected growth as secondary cause of a more radical (primary) reason which lies in political and economic policy choices that directly or indirectly eventually transform the economic context (Aglietta 2017, Akyuz 2018 and Petit 2010).

A milder methodological position, which does not differ with respect to policy implications can be found in Galbraith (2012) and further empirical evidence is produced, among others, in the contributions

[3] See for example Delli Gatti et all. (2018) for ABM and Carnevali et al. (2019) for SFC analysis.

[4] For reviews of the book see for example Krugman (2014), Milanovic (2013), Solow (2014) and Summers (2014) among others.

of Berglof and Bolton (2003), Lim (2008), Morck et al. (2011). Aspects of constructive criticism are nicely emphasized in Skott (2011) and Solimano (2017).

We go on observing that, not surprisingly, the existing literature while simultaneously taking into account financial instability and inequality, does not do so with equal proportions in the choice of their causal link. In fact, consistently with the previous considerations, the examples where inequality is considered to be the cause of financial instability far outweigh those in which the opposite causal link is investigated. We mention a few. Amountzias (2019) and Hauner (2020) are recent empirical exercises which, while seeking the causal link, admit difficulties of unambiguous identification. In contrast, Choi (2018) emphasizes that financial crises are caused by inequality, therefore he does not recognize circularity. Then, we have other studies that while taking Minsky as a reference point, directly (Fernandez 2008 and Kaboub et al. 2010) or indirectly (Dragoe 2016) paradoxically affirm that income inequality leads financial instability.

Even on the strand of literature where the causation link goes from financial instability to income inequality, we may find those who take a strong position (Balder 2018) and other contributions whose focus is more related to address specific peculiarities (or heterogeneities) of geographical/territorial nature (Arestis and Phelps 2019, Inekwe et. al. 2020) or institutional (Tridico 2012).

Evidence of explicit or implicit circularity in the relationship inequality/instability, arises among others in the articles of Botta et. al (2021), D'Orazio (2019), Garcia and Perez (2017) and Thioune (2017) which are mentioned for the fact that they differ in the empirical verification methodologies adopted (namely ABM and SFC, event studies and PVar), all of which however lead back to heterogeneity and qualitative aspects.

Moving from general considerations towards specific remarks connected to the choices leading to the model presented into this paper, we point out the crucial explanatory role of capital gains. This variable is indeed one of the keys connecting both growth to finance and financial instability to inequality. Rowthorn (2014) is emblematic in this respect, as exactly he comes to the opposite implication with respect to the one reached by Piketty (2014a), that the primary problem is not over-accumulation of real stock of capital, but exactly the opposite: there has been too little real investment. In the same vein, Weil (2015) shows that if not for capital gains, the increase in the wealth/income ratio over the period 1989-2009 would have been 30%, rather than the 78% observed in the data. This implies that the observed rise in wealth/income ratio is not the result of an over-accumulation of physical capital as suggested by the theoretical model advanced by Piketty, but is primarily a valuation effect of assets, driven by financialization hence amplified by bubbles (Stirati, 2016). These capital gains may arise from different channels on the asset side: through the capitalized value of rents (Stiglitz 2015a; Stiglitz 2015b), from the housing sector (Bonnet et al. 2014), or from stock market (Galbraith 2014).

Given the purpose of the present paper, it is important to stress that in this strand of literature, the increase of the value of financial assets and the presence of capital gains can undoubtedly favor a process of inequality. One could look for a theoretical explanation starting from empirical evidence. As observed by Taylor (2016), the share owned by the top decile of the distribution of wealth is an increasing function in term of equity asset. Portfolio choices by "poor" are qualitatively different from "rich" ones. Whereas "poor" hold a small proportion of their wealth as financial assets, "rich" hold a relatively larger proportion of their wealth in stocks (Skott 2013). Since fewer people own a higher share of these assets, the increase in value implies a worsening in the economic inequality process. In other words, inequality goes up mainly because of the raise of stock prices (or capital gains). Along the same line, Madsen (2019) and Galbraith (2014) produce specific empirical evidence on the dynamics of the relationship between capital gain and

inequality of wealth distribution for the UK and the US respectively.

Connecting to Minsky and to the Financial Instability Hypothesis, as known, this theory explains how, during expansionary phases, the interaction between finance and investment eventually leads to more fragile financial structures (with speculative booms and euphoria as limit possibilities). During the process, asset prices evaluations affect investment and debt relationships resulting in economic fluctuations and instability. One can refer to the survey made by Nikolaidi and Stockhammer (2017) to have a quite comprehensive explanation of the possible alternative theoretical set-ups and narratives supporting this specific dynamic process.[5]

As a result, referring to the literature on Piketty (King 2016), we stress a precise weakness of his model represented by the inconsistency between the definition of capital, the explanatory variable, and how it is used in the model.

Capital is defined by means of its two main components, real and financial, which in turn become a single variable used as a synonym of wealth (Piketty 2014a, p. 46). Simultaneously, a neo-classical theoretical model is considered with only the real component of capital; this leads to a gap between the definition and the model proposed (which becomes a special case of the more general condition implied by the definition). Indeed, in the aggregate, only real capital appears, whereas capital gains are assumed to be unrealized (Piketty 2014b). As a result, the dynamics of capital share (depending only upon physical productive capital) and the related rising income share of wealth-owners is seen just as an over-accumulation of capital through saving (Piketty and Zucman 2014; Piketty and Zucman 2015).

Though the simplifying assumption may not be problematic in the long run, abandoning the long run stable paradigm, it is important to consider the different forms of capital and the effect of capital gains, especially in a context of a financial economy (Solow 2014). As we will see later, such a misleading usage of the term capital can lead to serious consequences as to the knowledge of the process lying behind increasing economic inequality .

3 The model

In this section we present the macrodynamic model proposed by Ferri (2016, chapter 10). The aim of Ferri's work is to build a model where real aspects interact with financial ones in a medium-run dynamic monetary economy of production in line with the Keynesian tradition (Keynes 1933 [1963]). He presents a recursive demand-led growth model where the dynamics is driven by endogenous forces outside steady states equilibrium conditions. We then go a step further by introducing private debt in the model. In this context, we can study the relationships between income share and growth with the presence of capital gains and private debt.

The nonlinear nature of the model, which does not yield closed-form solutions, will be solved with numerical simulations. Firstly, we find the steady state conditions from the nonlinear model. Once we obtain the steady states values, the model will be simulated with the parameters that have been chosen in accordance to existing literature.[6] Second, to obtain information on the dynamics of the nonlinear system, the model will be linearised around the steady state. On the one hand, the local analysis from the linearised model allows us to test the robustness of the model, that is whether changes in the values

[5] A growing body of literature has examined on a theoretical level the FIH. For a summary of these formalizations see also Nikolaidi (2017).

[6] The parameters chosen are within the range established by previous research according to the results of econometric studies. They reflect values estimated in the relevant literature.

of the parameters maintain the main structural properties of the system. On the other, it identifies the role of the parameters.[7]

3.1 *Wealth/income ratio*

Let us start by examining the model. The dynamics equations of capital stock K_t and output Y_t, are respectively[8]

$$K_t = K_{t-1} + I_{t-1} \tag{1}$$

$$Y_t = (1 + g_t)\, Y_{t-1} \tag{2}$$

where g is the rate of growth of output and I is the investment in absence of depreciation. Indicating with v_t the capital/income ratio and with $i_{t-1} = I_{t-1}/Y_{t-1}$ the investment ratio, Eq. (1) is divided by Eq. (2) so as to obtain the intensive form of capital/income ratio

$$v_t = \frac{v_{t-1} + i_{t-1}}{(1 + g_t)}$$

Wealth (W_t) is divided into its real and financial component, which in turn is reflected by the value of financial equity assets. The wealth/income ratio $\beta_t = W_t/Y_t$ does not increase in the real component, which is assumed to be fixed. Imposing the condition $v_t = v_{t-1} = v^*$, from the previous equation the output growth becomes

$$g_t = \frac{i_{t-1}}{v^*} \tag{3}$$

Vice versa, the wealth/income ratio is assumed to increase only through an evaluation effect of equity assets reflected by an increase in capital gains $(Q_t - Q_{t-1})$, where Q_t is the relative price of equity asset defined with the following equation

$$Q_t = Q_{t-1} + \xi \left(\frac{Er_t - r_0}{R_0 - \pi_0} \right) \qquad \xi > 0 \tag{4}$$

where Er_t is the expected rate of profit while $(R_0 - \pi_0)$ represents the real rate of interest in steady state, given by the differences between nominal rate of interest R and inflation rate π.[9] With $\xi > 0$ and when $Er_t > r_0$, the price at time t increases generating capital gains $(Q_t - Q_{t-1}) > 0$. When $Er_t < r_0$ the price at time t decreases generating capital losses $(Q_t - Q_{t-1}) < 0$. In other words, capital gains are realised when expected profit is higher with respect to the steady state value r_0, capitalized by the long-term real rate of interest.

With this specification, the increase in the value of wealth/income ratio can be generated by a rise in the expected rate of profit in a situation of low interest rate set by monetary policy

[7] See also Fazzari et al. (2008; 2010), Ferri (2012), Ferri and Variato (2010) and Ferri et al. (2011; 2015; 2016; 2019) for a similar exercise.

[8] Depreciation is neglected in the traditional capital accumulation equation for simplicity reason.

[9] Hereafter the subscript 0 will refer to the steady state value of variables.

$$\beta_t = v^* \left(1 + (Q_t - Q_{t-1})\right) \tag{5}$$

3.2 *Investment equation*

Investment is the main behavioural element in the model and plays a dual role. Firstly, it is the main component of aggregate demand. Secondly, it is a source of economic growth: given v^*, the rate of growth is determined by Eq. (3). In a monetary economy of production, the investment is assumed to be driven by the difference between the expected rate of profit and the real rate of interest

$$i_t = i_a + \gamma \left\{ Er_t - [(R_t - \pi_t)] \right\} \qquad \gamma > 0 \tag{6}$$

where i_a represents the autonomous component and γ is the responsiveness of firms investment to the difference between the expected rate of profit and real interest rate.

From Eq. (6), the expected rate of profit is formulated in the following adaptive way

$$Er_t = (1 - \rho)\, r_{t-1} + \rho r_0 \qquad \rho > 0 \tag{7}$$

where rate of profit is obtained from the accounting equation of capital share $\alpha_t = r_t v^*$

$$r_t = \frac{\alpha_t}{v^*} \tag{8}$$

The inflation rate π_t is expressed à la Phillips where the rate of unemployment is replaced by the rate of growth of output using Okun's law plus a third term highlighting the effect of an increase in debt on the level of inflation[10]

$$\pi_t = \pi^* + \varphi_1 \left(\pi_{t-1} - \pi_0\right) + \varphi_2 \left(g_t - g_0\right) + \varphi_3 (d_t - d_0) \qquad \varphi_1, \varphi_2, \varphi_3 > 0 \tag{9}$$

where π^* is the target rate of inflation.

The nominal rate of interest R_t is defined in Taylor's form with parameter $\psi > 1$

$$R_t = R^* + \psi \left(\pi_t - \pi_0\right) \tag{10}$$

where R^* refers to the exogenous target value of the nominal rate of interest. With this specification, the Central Bank reacts to the divergence of inflation from its target value.

Finally, saving follows the Kaldor hypothesis (Kaldor 1956)[11]

$$s_t = (s_\pi - s_w)\, \alpha_t - c_\beta \beta_t + s_w \qquad c_\beta > 0, \quad 0 \leqslant s_w < s_\pi \leqslant 1 \tag{11}$$

where c_β is the propensity to consume out of wealth and s_w with s_π are the propensity to save out of

[10] The formula is constructed considering both the negative relationship between output and unemployment and the positive relationship between a higher credit growth with higher GDP growth.

[11] In the tradition of Kaldor's theory of growth and income distribution, savings are divided between savings that come from wages and from profits. The formula takes into account the assumption that the proportion of saving out of profits is larger than the proportion of saving out of wages, $s_w < s_\pi$.

wages and profits respectively. Finally, taking into account of the macro equilibrium between investment and savings ($s_t = i_t$), from Eq. (11), the capital share can be defined in the following way

$$\alpha_t = \frac{i_t + c_\beta \beta_t - s_w}{s_\pi - s_w} \tag{12}$$

From Eq. (12), it is possible to notice the positive influence of wealth/income ratio on the capital share.

3.3 *Debt dynamics*

To cover Minsky's Financial Instability Hypothesis, we extend the model introduced in the previous subsections. There is no agreement upon the formal presentation of Minsky's idea, with the result that FIH has been formalised in different ways. We will refer to models where the dynamics of asset prices and corporate debt is considered together in the analysis, and the cyclical dynamics is the consequence of the interaction between the real and financial aspects of the economy.[12]

In our model, debt D_t finances the difference between the sum of investment and consumption out of wealth ($c_\beta W$) minus retained profits ($\lambda \Pi$), where $0 \leqslant \lambda \leqslant 1$ is the retention rate

$$D_t = I_{t-1} + c_\beta W_{t-1} - \lambda \Pi_{t-1}$$

The higher is retention rate, the lower will be the issue of new debt for firms. Conversely, with low retention rate, investment and consumption out wealth must be financed by issuing debt loans.

Knowing that $\Pi_{t-1} = r_{t-1} K_{t-1}$, we obtain

$$D_t = I_{t-1} + c_\beta W_{t-1} - \lambda \left(r_{t-1} K_{t-1} \right)$$

In intensive form, with $\beta_{t-1} = W_{t-1}/Y_{t-1}$ and $v^* = K_{t-1}/Y_{t-1}$ we obtain

$$d_t = \frac{i_{t-1}}{(1+g_t)} + c_\beta \beta_{t-1} - \lambda \left(r_{t-1} v^* \right)$$

Finally, using Eq. (8), we substitute $r_{t-1} v^*$ with capital share a time $t-1$

$$d_t = \frac{i_{t-1}}{(1+g_t)} + c_\beta \beta_{t-1} - \lambda \left(\alpha_{t-1} \right) \tag{13}$$

The nonlinear deterministic system of eleven equations (Eq. 3 - 13) in eleven unknowns (g_t, r_t, β_t, Q_t, i_t, Er_t, π_t, R_t, d_t, s_t and α_t) does not allow closed-form solutions to be obtained. As a consequence, the main results will be obtained by means of simulations. Moreover, a linearisation around the steady state makes it straightforward to understand the role of economic forces at the root of the behavioural movement of the system.

[12] Minsky's original thesis on private indebtedness's destabilising impact is focused on corporate debt.

4 Steady state analysis

Taking as given the autonomous investment (i_a), the fixed capital/income ratio (v^*) and the nominal interest rate (R_0), we obtain the steady states of the other variables with the following recursive procedure. In steady state, the rate of profit is equal to the real rate of interest if the risk premium is zero and no-arbitrage condition holds. Then we obtain the steady state level of investment i_0 from Eq. (6)

$$i_0 = i_a$$

Using i_0, from Eq. (3) we obtain the steady state level of growth rate of output g_0

$$g_0 = i_0/v^*$$

In equilibrium the expected rate of profit is equal to the actual rate of profit and from Eq. (4) it then follows that $Q_t = Q_{t-1}$. Substituting this condition in Eq. (5), it turns out that the steady state value of wealth/income ratio is equal to the real capital/income ratio v^*

$$\beta_0 = v^*$$

This result is in line with Piketty's analysis where capital gains are zero in steady state. However, differently from Piketty, we will concentrate our analysis in a disequilibrium process. With β_0 and i_0, the steady state value of the capital share is obtained solving Eq. (12)

$$\alpha_0 = \frac{i_0 + c_\beta v^* - s_w}{s_\pi - s_w}$$

Using α_0, from Eq. (8) we solve for steady-state rate of profit

$$r_0 = \frac{\alpha_0}{v^*}$$

Given the nominal rate of interest R^* and the equality of the rate of profit with the real rate of interest in steady state, we obtain the steady state value of inflation π_0

$$\pi_0 = R^* - r_0$$

Considering the values of g_0, i_0, β_0 and α_0, from Eq. (13), we solve for steady state debt d_0

$$d_0 = \frac{i_0}{(1+g_0)} + c_\beta \beta_0 - \lambda(\alpha_0)$$

The positive value of d_0 assures the existence of steady-state debt in this framework, which is coherent with the idea of a financialized economy.

Finally, from Eq. (11), we obtain the steady state level of saving, not surprisingly finding the same value of the investment in equilibrium, $s_0 = i_0$.

The parameters and steady state values are reported in Table 1. The baseline parametrization in our model has been assigned in accordance with existing literature (See for example, Ferri 2016 and Ferri

et. al., 2016) and with some minor adjustments from our side for parameters γ and ξ. These parameter values were chosen to provide results economically meaningful, although we do not pretend that we are calibrating a real economy. The baseline value for v^* is 3 in accordance with the value of capital/income ratio in absence of capital gains. The value of the coefficient of inflation target in Taylor equation is higher than the one assumed in the literature (see Woodford 2003 and Galí 2008). Along the lines of Kaldor tradition $s_\pi > s_w$. Moreover, we examine the effect of changing the retention rate over the range from near 0 to near 1.

Parameters			Steady states values		
$v* = 3$	$\xi = 0.5310$		$\beta_0 = 3$	$i_0 = 0.07$	
$\gamma = 1.8$	$\rho = 0.2$		$g_0 = 0.023$	$\alpha_0 = 0.1714$	
$\psi = 1.8$	$c_\beta = 0.05$		$Q_0 = 1$	$s_0 = 0.07$	
$s_\pi = 0.80$	$s_w = 0.1$	$\lambda = 0.4$	$R_0 = 0.055$	$r_0 = 0.05$	
$\varphi_1 = 0.90$	$\varphi_2 = 0.40$	$\varphi_3 = 0.20$	$Er_0 = 0.05$	$\pi_0 = 0.02$	$d_0 = 0.0813$

Table 1: Parameters and steady state values.

5 A disequilibrium analysis: simulation results and comparative study

In the model, variables are determined sequentially in a recursive way as the simulation solves for period t values based on period $t-1$ information. We shock the investment equation for one period to move the system recursively from the steady state condition. The positive shock can be interpreted as an increase in the expected rate of profit on equity assets in a situation of financial deregulation and low interest rate set by monetary policy. Simulations run for 1000 periods and the non linearity of the system with the choice of parameters generate endogenous cyclical fluctuations, not allowing for explosive or implosive paths. In Figures 1, 2 and 3 we can observe the last 50 runs of simulation of 1000 periods for our variables of interest.

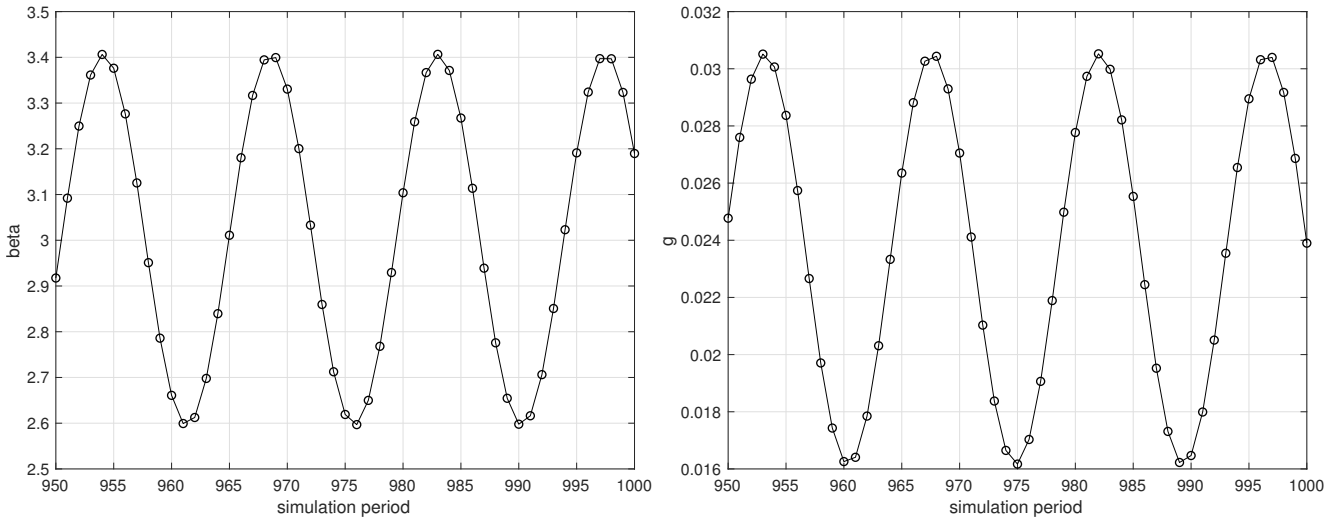

Figure 1: Dynamic behaviour of wealth/income ratio and growth.

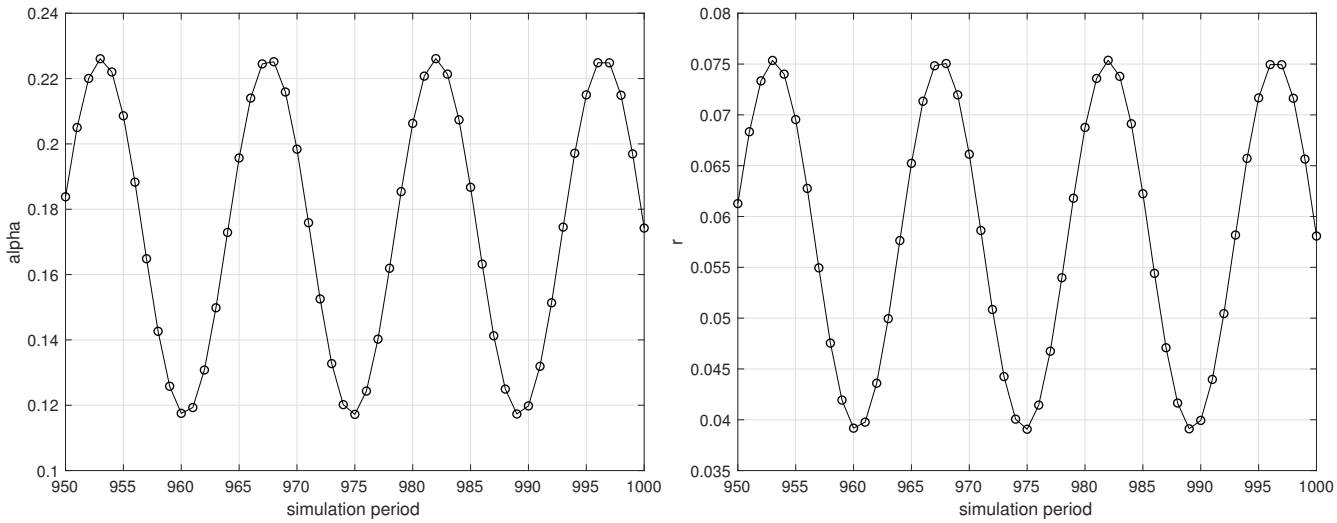

Figure 2: Dynamic behaviour of capital share and rate of profit.

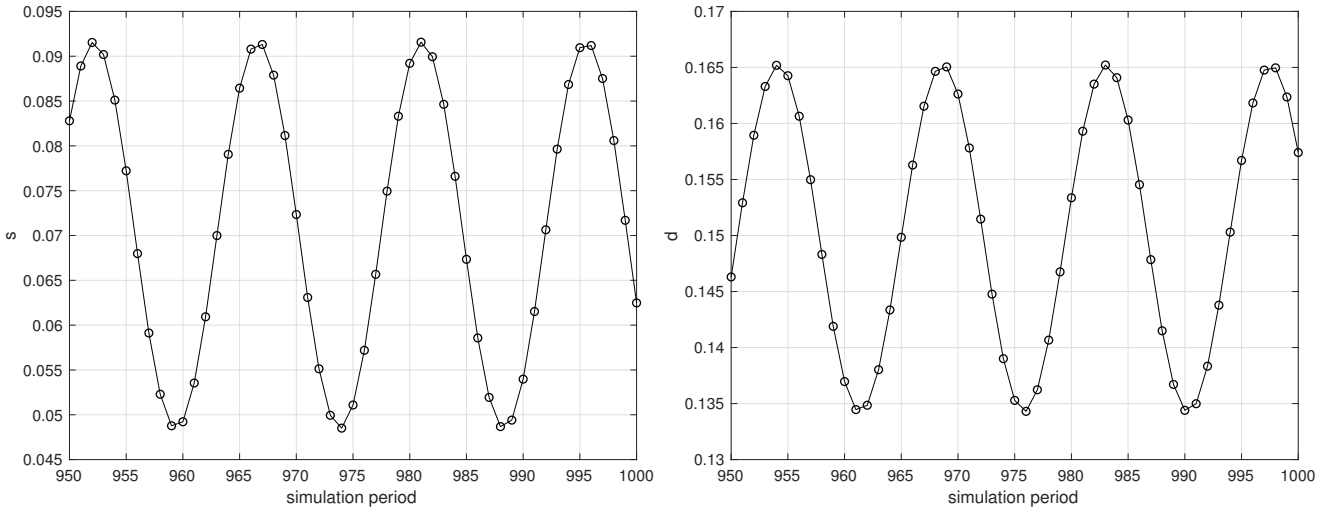

Figure 3: Dynamic behaviour of saving rate and debt loan.

In the model the persistence of fluctuations comes as the combined effect of two feedback loops: the positive one related to investment and the negative one due to monetary decisions in a context of increasing inflation.[13] The conflict between these two forces is in line with the characteristics described in Hyman Minsky's research.

In our model the process goes on as follows. Let us start with an increase in the expected rate of return on equity. It produces a threefold effect: primarily, it induces firms to invest more in equity, while increasing equity prices (hence increasing capital gains). The increase in capital gains pushes up the wealth/income ratio in the financial component and not in the real component, which remains fixed in the model. Second, the rise in equity prices increases investment, enabling higher profitability and further growth. Third, given a low growth of retention rate and in a framework of increasing credit expansion the increase in profitability allows a rise in the debt ratio.

This process cannot continue indefinitely because economic expansion also stimulates the inflation process. As a result, the Central Bank during the boom phase increases the nominal interest rate via the Taylor rule, generating a negative chain reaction. A higher nominal interest rate reduces investment and sets the stage for the bust phase of the cycle, characterized by the decline of growth along with the wealth/income ratio and debt. The decline in economic activity ultimately leads to a reduction in the interest rate, allowing the economy to recover and to restart the process. In other words, when the expected rate of profit becomes sufficiently high with respect to the interest rate, a new upward movement of the system is induced.

We now compare the results of the proposed model with those of Piketty. To study the strength and the direction of the relationship between variables we use the Pearson product-moment correlation coefficient, commonly called simply the correlation coefficient.

With respect to the original model, where the rate of saving and profit are exogenous and not influenced by the change of growth, now they are both positively correlated with growth. The positive correlation between saving and growth is in contrast with the "second fundamental law of capitalism".[14] The positive correlation between profit and growth is in contrast with "the great contradiction of capitalism". With

[13] These forces act as thwarting forces to runaway situations (see for example Ferri and Minsky 1992). See also Section 5.

[14] Theoretical support for the results obtained can be found in Homburg (2015) and Krusell and Smith Jr. (2015).

these results, the decreasing rate of growth assumed by Piketty would be accompanied by a contemporaneous decrease in the rate of profit, breaking the link between the difference $r - g > 0$ and the increasing concentration of capital. Besides, we find not only a positive correlation between wealth/income ratio and capital share but also, differently from Piketty, for capital share and growth. Results are summarised in Table 2.

Variables	Piketty's model correlations	Our model correlations
$\beta \leftrightarrow g$	$r_{\beta,g} < 0$	$r_{\beta,g} = 0.91 > 0$
$\beta \leftrightarrow \alpha$	$r_{\beta,\alpha} > 0$	$r_{\beta,\alpha} = 0.90 > 0$
$s \leftrightarrow g$	$r_{sg} = 0$	$r_{sg} = 0.90 > 0$
$r \leftrightarrow g$	$r_{rg} = 0$	$r_{rg} = 0.99 > 0$

Table 2: Main results

As we can observe in Figure 4, the positive correlation between wealth/income ratio and growth is in contrast with Piketty's model, but at the same time, with the pro-cyclicality of the debt ratio, it is in line with the Minskian Financial Instability Hypothesis. Moreover, in Figure 5 we observe the same co-movement of variables with that of capital share during the oscillatory process. This highlights the fact that during the expansion phase of the growth process, there is an influence on the functional distribution of income in favour of capital, emphasising a fundamental non-neutrality of finance on the level of inequality. In other words, the boom phases are characterised not only by an increase in instability à la Minsky with the pro-cyclicality of the debt ratio but also by an increase in the degree of inequality reflected in an increase in capital share. The results obtained provide clear support for the Stiglitz's argument (2015a; 2015b). In recent years, through financial deregulation and low interest rates, we have observed an increase in the value of land and other financial assets, such as the equity assets that can be used for collateral during the lending process. As stressed in introduction, these financial instruments are available to those who belong to the wealthiest classes (Taylor 2016); those who hold financial assets become wealthier compared with those who do not have this financial wealth, a situation which generates increasing inequality. In this case, economic growth is stimulated by policies accompanied by lower interest rates, but at the same time, this process is a source of financial instability and economic inequality.

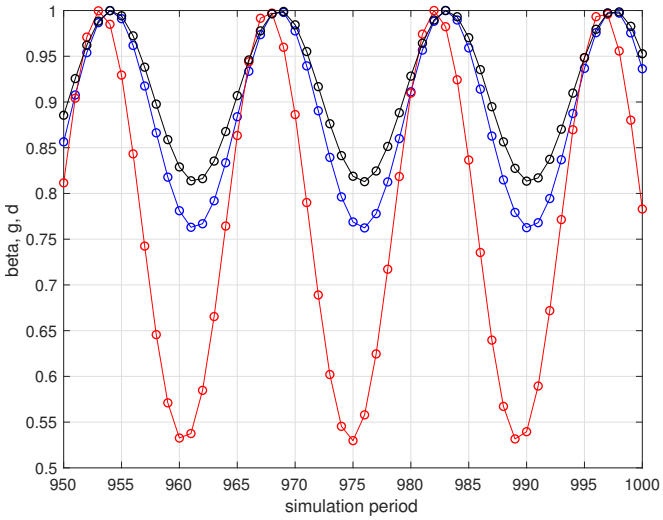

Figure 4: Normalised dynamic behaviour of debt (black) - wealth ratio (blue) - growth (red).

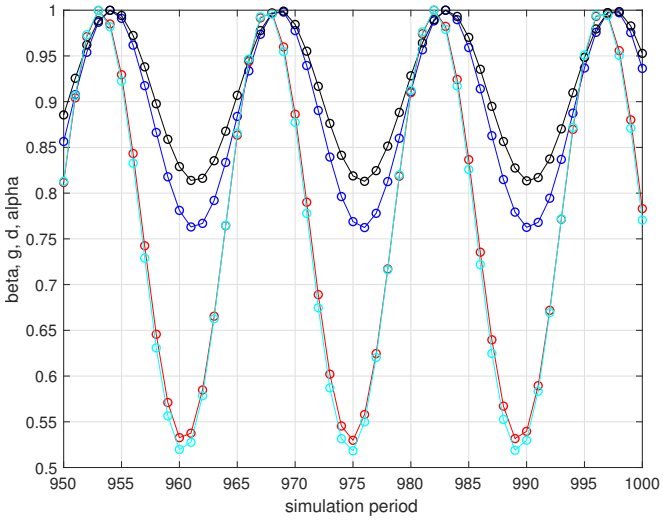

Figure 5: Normalised dynamic behaviour of debt (black) - wealth ratio (blue) - growth (red) - capital share (cyan).

It is important to stress that the pro-cyclicality of debt ratio depends exclusively on the fact that retained profits have to grow more slowly than the sum of investment and consumption out of wealth.[15] In this sense, the retention rate plays the same role in the cyclical process of debt as discussed by Lavoie and Seccareccia (2001). The authors underline the need of assuming that retained profits grow more slowly than investment; in our model the condition is more articulated, but equal in nature. Pointing out this similarity of implications, we are not subscribing the generality of the authors' critique to the drivers of FIH dynamic process: indeed, the cyclical behavior of aggregate leverage cannot be fully ascertained if different types of borrowers are assumed to be independent at aggregate level; but this is a limit that we cannot overcome either with the present contribution (given the fact we have just indebted firms and we do not dig into the different types of firms, as in contrast Minsky's FIH does).

As shown in Figure 6, when the retention rate diminishes to a threshold value of $\lambda = 0.6$, the debt increases in the boom phase, validating Minsky's descriptive analysis of macro-cycles. With a retention rate higher than 0.6, the debt dynamics tend to have counter-cyclical paths with respect to the other variables, validating the Steindl regime.[16]

[15] In the model the condition leading to leverage increase is: retention rate growth lower than investment growth rate plus consumption out of wealth growth rate. See equation 13.

[16] These results are in line with the work of Charles (2015): the counter-cyclicality of the debt ratio is less likely when the retention rate of firms is low.

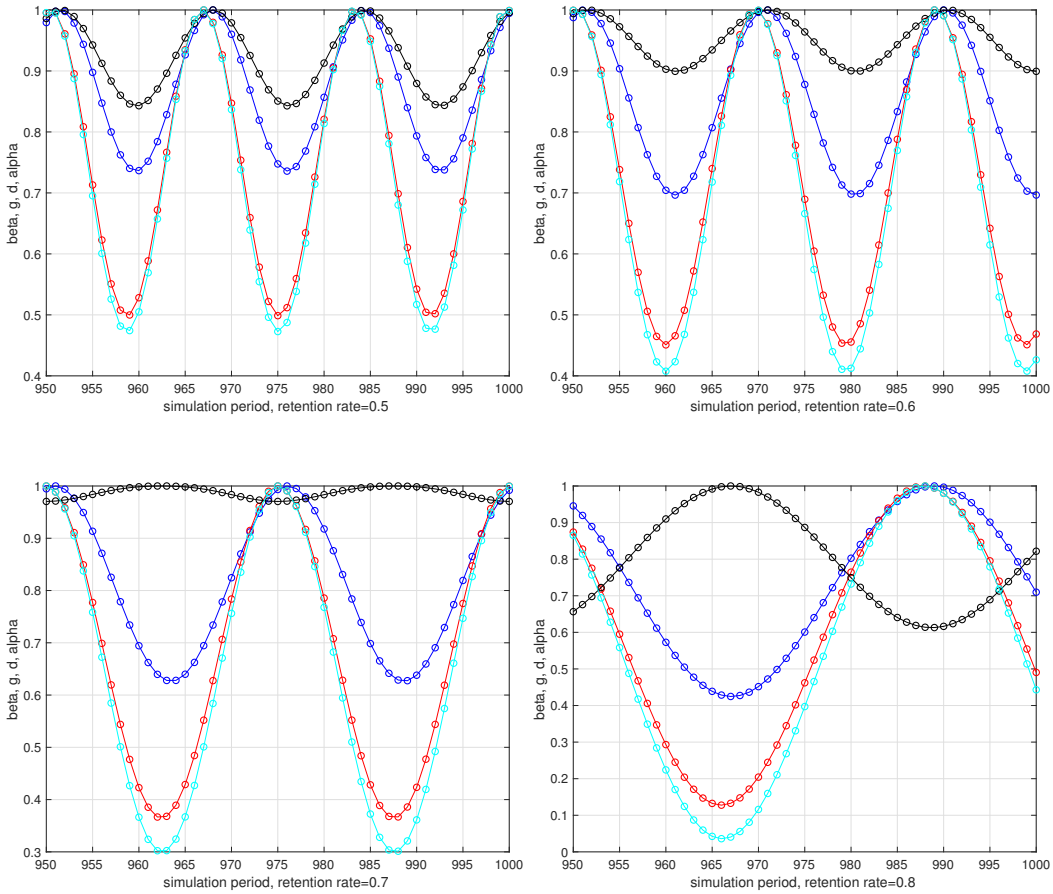

Figure 6: Normalised dynamic behaviour of debt (black) - wealth ratio (blue) - growth (red) - capital share (cyan) for different values of λ.

Finally, as emerges from the analysis, when we change the value of the retention rate, the model is robust because changes in the values of the parameters maintain the main structural properties of the system. Only the amplitude and the frequency of the oscillations are affected. As can be seen in Table 3 and Figure 7, a lower λ increases the model's volatility because it accelerates the cyclical process: the initial shock causes the debt ratio to rise and decline more with shorter cyclical periods.

Stage	λ	**Debt Loan**	Δt
Trough	0.6	0.10	10
Peak	0.6	0.12	
Trough	0.4	0.13	7
Peak	0.4	0.16	
Trough	0.2	0.16	6
Peak	0.2	0.20	

Table 3: Cyclical implication of different retention rate parameters (λ).

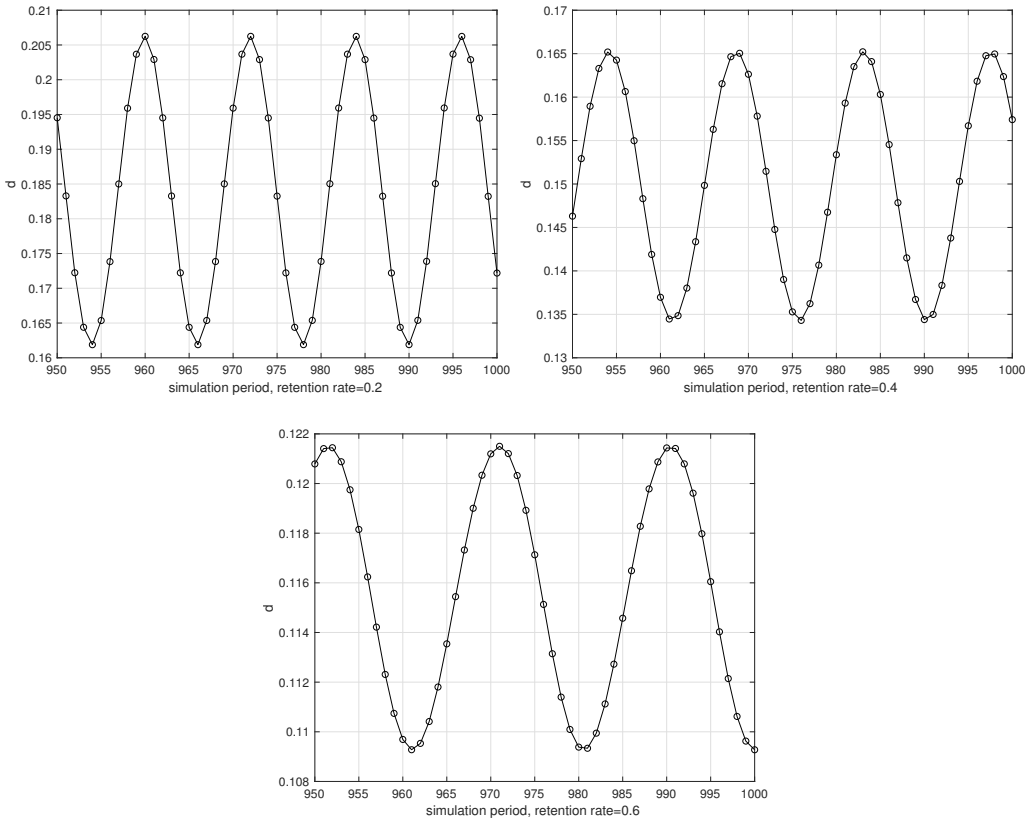

Figure 7: Dynamic behaviour of debt loan for different values of retention rate.

6 Local analysis

To better understand the economic mechanism underlying the oscillatory movement of the system, we present a linearised version of the model. Equations of the nonlinear system are linearised with Taylor expansion and variables are expressed as a variation from the steady state level. Constant terms are omitted and capital letters, K_1 with K_2, refer to the multiplier of the linearisation. With this procedure, we can analytically evaluate the stability properties of the linearised model for given parameter values. Henceforth, the variables are expressed as a variation from the steady state level.

$$\tilde{\beta}_t = \nu^* \left(\tilde{Q}_t - \tilde{Q}_{t-1} \right) \tag{14}$$

$$\tilde{Q}_t - \tilde{Q}_{t-1} = \xi \left(\frac{1}{R_0 - \pi_0} \right) \tilde{E}r_t \tag{15}$$

$$\tilde{g}_t = \frac{\tilde{i}_{t-1}}{v^*} \tag{16}$$

$$\tilde{r}_t = \frac{\tilde{\alpha}_t}{v^*} \tag{17}$$

$$\tilde{i}_t = \gamma \left\{ \tilde{E}r_t - \left[\left(\tilde{R}_t - \tilde{\pi}_t \right) \right] \right\} \tag{18}$$

$$\tilde{\pi}_t = \varphi_1 \left(\tilde{\pi}_{t-1} \right) + \varphi_2 \left(\tilde{g}_t \right) + \varphi_3 (\tilde{d}_t) \tag{19}$$

$$\tilde{R}_t = \psi \left(\tilde{\pi}_t \right) \tag{20}$$

$$\tilde{E}r_t = (1 - \rho)\, \tilde{r}_{t-1} \tag{21}$$

$$\tilde{\alpha}_t = \frac{\tilde{i}_t + c_\beta \tilde{\beta}_t}{s_\pi - s_w} \tag{22}$$

$$\tilde{s}_t = (s_\pi - s_w)\, \tilde{\alpha}_t - c_\beta \tilde{\beta}_t \tag{23}$$

$$\tilde{d}_t = (K_1)\, \tilde{i}_{t-1} + (K_2)\, \tilde{g}_t + c_\beta \tilde{\beta}_{t-1} - \lambda \tilde{\alpha}_{t-1} \tag{24}$$

where

$$K_1 = \frac{\partial d_t}{\partial i_{t-1}} = \frac{1}{(1 + g_0)}$$

$$K_2 = \frac{\partial d_t}{\partial g_t} = -\frac{i_0}{(1 + g_0)^2}$$

Using the linearised equations, the system can be reduced of dimensionality. With Eq. (16), the dynamics of inflation becomes

$$\tilde{\pi}_t = \varphi_1 \left(\tilde{\pi}_{t-1}\right) + \varphi_2 \left(\frac{\tilde{\tilde{\imath}}_{t-1}}{v^*}\right) + \varphi_3 \left(\tilde{d}_t\right) \tag{25}$$

With Eqs. (17), (20) and (21), investment can be rewritten in the following way

$$\tilde{\tilde{\imath}}_t = \frac{\gamma\left(1-\rho\right)\tilde{\alpha}_{t-1}}{v^*} + \gamma\left(1-\psi\right)\tilde{\pi}_t \tag{26}$$

Using Eqs. (14) and (15), the capital share becomes

$$\tilde{\alpha}_t = \frac{\tilde{\tilde{\imath}}_t}{s_p - s_w} + \frac{c_\beta}{s_p - s_w}\left[v^*\xi\left(\frac{1}{R_0 - \pi_0}\right)\right]\tilde{E}r_t$$

With Eqs. (18) and (20) we rewrite the expected rate of profit in the following way

$$\tilde{E}r_t = \frac{\tilde{\tilde{\imath}}_t}{\gamma} + \left(\psi - 1\right)\tilde{\pi}_t$$

which then is substituted in the equation of capital share

$$\tilde{\alpha}_t = \frac{\tilde{\tilde{\imath}}_t}{s_p - s_w} + \frac{c_\beta}{s_p - s_w}\left[v^*\xi\left(\frac{1}{R_0 - \pi_0}\right)\right]\left[\frac{\tilde{\tilde{\imath}}_t}{\gamma} + \left(\psi - 1\right)\tilde{\pi}_t\right]$$

from which

$$\tilde{\alpha}_t = \frac{\tilde{\tilde{\imath}}_t}{s_p - s_w} + \frac{c_\beta}{s_p - s_w}v^*\xi\left(\frac{1}{R_0 - \pi_0}\right)\frac{\tilde{\tilde{\imath}}_t}{\gamma} + \frac{c_\beta}{s_p - s_w}v^*\xi\left(\frac{1}{R_0 - \pi_0}\right)\left(\psi - 1\right)\tilde{\pi}_t$$

i.e.

$$\tilde{\alpha}_t = \left[\frac{1}{s_p - s_w} + \frac{c_\beta}{s_p - s_w}v^*\xi\left(\frac{1}{R_0 - \pi_0}\right)\frac{1}{\gamma}\right]\tilde{\tilde{\imath}}_t + \left[\frac{c_\beta}{s_p - s_w}v^*\xi\left(\frac{1}{R_0 - \pi_0}\right)\left(\psi - 1\right)\right]\tilde{\pi}_t \tag{27}$$

Using Eq. (16) and Eq. (22), the dynamics of debt becomes

$$\tilde{d}_t = \left[\frac{1}{\left(1 + g_0\right)} - \frac{i_0}{\nu^*\left(1 + g_0\right)^2} - 1\right]\tilde{\tilde{\imath}}_{t-1} + \left[\left(s_\pi - s_w\right) - \lambda\right]\tilde{\alpha}_{t-1} \tag{28}$$

We obtain Eqs. (25), (26), (27) and (28) which represent the following four-dimensional system in four equations.

$$\begin{cases} \tilde{\pi}_t = \varphi_1\left(\tilde{\pi}_{t-1}\right) + \varphi_2\left(\frac{\tilde{i}_{t-1}}{v^*}\right) + \varphi_3\left(\tilde{d}_t\right) \\ \\ \tilde{i}_t = \frac{\gamma(1-\rho)\tilde{\alpha}_{t-1}}{v^*} + \gamma\left(1-\psi\right)\tilde{\pi}_t \\ \\ \tilde{\alpha}_t = \left[\frac{1}{s_p - s_w} + \frac{c_\beta}{s_p - s_w} v^* \xi\left(\frac{1}{R_0 - \pi_0}\right)\frac{1}{\gamma}\right]\tilde{i}_t + \frac{c_\beta}{s_p - s_w} v^* \xi\left(\frac{1}{R_0 - \pi_0}\right)\left(\psi - 1\right)\tilde{\pi}_t \\ \\ \tilde{d}_t = \left[\frac{1}{(1+g_0)} - \frac{i_0}{\nu^*(1+g_0)^2} - 1\right]\tilde{i}_{t-1} + \left[\left(s_\pi - s_w\right) - \lambda\right]\tilde{\alpha}_{t-1} \end{cases}$$

This four-dimensional system can be further reduced to a two-dimensional system.

Eq. (28) can be substituted in Eq. (25) obtaining

$$\tilde{\pi}_t = \varphi_1\tilde{\pi}_{t-1} + \varphi_2\left(\frac{\tilde{i}_{t-1}}{\nu^*}\right) + \varphi_3\left\{\left[\frac{1}{(1+g_0)} - \frac{i_0}{\nu^*(1+g_0)^2} - 1\right]\tilde{i}_{t-1} + \left[\left(s_\pi - s_w\right) - \lambda\right]\tilde{\alpha}_{t-1}\right\}$$

from which

$$\tilde{\pi}_t = \varphi_1\tilde{\pi}_{t-1} + \left(\frac{\varphi_2}{\nu^*}\right)\tilde{i}_{t-1} + \left[\frac{\varphi_3}{(1+g_0)}\right]\tilde{i}_{t-1} - \left[\frac{\varphi_3 i_0}{\nu^*(1+g_0)^2}\right]\tilde{i}_{t-1} - \varphi_3\tilde{i}_{t-1} + \varphi_3\left(s_\pi - s_w\right)\tilde{\alpha}_{t-1} - \varphi_3\left(\lambda\right)\tilde{\alpha}_{t-1}$$

i.e.

$$\tilde{\pi}_t = \varphi_1\tilde{\pi}_{t-1} + \left[\frac{\varphi_2}{\nu^*} + \frac{\varphi_3}{(1+g_0)} - \frac{\varphi_3 i_0}{\nu^*(1+g_0)^2} - \varphi_3\right]\tilde{i}_{t-1} + \left[\varphi_3\left(s_\pi - s_w\right) - \varphi_3\left(\lambda\right)\right]\tilde{\alpha}_{t-1}$$

Indicating with A and B the term inside the graph parentheses, we obtain

$$\tilde{\pi}_t = \varphi_1\tilde{\pi}_{t-1} + (A)\tilde{i}_{t-1} + (B)\tilde{\alpha}_{t-1}$$

With

$$A = \frac{\varphi_2}{\nu^*} + \frac{\varphi_3}{(1+g_0)} - \frac{\varphi_3 i_0}{\nu^*(1+g_0)^2} - \varphi_3$$

and

$$B = \varphi_3\left(s_\pi - s_w\right) - \varphi_3\left(\lambda\right)$$

In the previous equation, $\tilde{\alpha}_{t-1}$ is substituted one period lag with Eq. (27). To simplify the terminology, we call

$$X = \frac{1}{s_p - s_w} + \frac{c_\beta}{s_p - s_w} v^* \xi \left(\frac{1}{R_0 - \pi_0} \right) \frac{1}{\gamma}$$

and

$$Y = \frac{c_\beta}{s_p - s_w} v^* \xi \left(\frac{1}{R_0 - \pi_0} \right) (\psi - 1)$$

from which

$$\tilde{\alpha}_t = (X)\, \tilde{i}_t + (Y)\, \tilde{\pi}_t \tag{29}$$

so to obtain

$$\tilde{\pi}_t = \varphi_1 \tilde{\pi}_{t-1} + (A)\, \tilde{i}_{t-1} + B\,(X)\, \tilde{i}_{t-1} + B\,(Y)\, \tilde{\pi}_{t-1}$$

i.e.

$$\tilde{\pi}_t = (\varphi_1 + BY)\, \tilde{\pi}_{t-1} + (A + BX)\, \tilde{i}_{t-1}$$

Indicating with

$$Y_1 = \varphi_1 + BY$$

and with

$$X_1 = A + BX$$

we obtain

$$\tilde{\pi}_t = (Y_1)\, \tilde{\pi}_{t-1} + (X_1)\, \tilde{i}_{t-1} \tag{30}$$

Finally, with Eq. (30) and Eq. (29) one period lag, we rewrite Eq. (26) in the following way

$$\tilde{i}_t = \frac{\gamma\,(1-\rho)}{v^*}\,(X)\, \tilde{i}_{t-1} + \frac{\gamma\,(1-\rho)}{v^*}\,(Y)\, \tilde{\pi}_{t-1} + \gamma\,(1-\psi)\,(Y_1)\, \tilde{\pi}_{t-1} + \gamma\,(1-\psi)\,(X_1)\, \tilde{i}_{t-1}$$

from which

$$\tilde{i}_t = \left[\frac{\gamma\,(1-\rho)}{v^*}\,(X) + \gamma\,(1-\psi)\,(X_1) \right] \tilde{i}_{t-1} + \left[\frac{\gamma\,(1-\rho)}{v^*}\,(Y) + \gamma\,(1-\psi)\,(Y_1) \right] \tilde{\pi}_{t-1}$$

Indicating with

$$X_2 = \frac{\gamma\,(1-\rho)}{v^*}\,(X) + \gamma\,(1-\psi)\,(X_1)$$

and with

$$Y_2 = \frac{\gamma(1-\rho)}{v^*}(Y) + \gamma(1-\psi)(Y_1)$$

we obtain

$$\tilde{i}_t = (X_2)\,\tilde{i}_{t-1} + (Y_2)\,\tilde{\pi}_{t-1} \tag{31}$$

Eqs. (30) and (31) represent our two-dimensional system of difference equations

$$\tilde{\pi}_t = (Y_1)(\tilde{\pi}_{t-1}) + (X_1)\left(\tilde{i}_{t-1}\right)$$

$$\tilde{i}_t = (Y_2)(\tilde{\pi}_{t-1}) + (X_2)\left(\tilde{i}_{t-1}\right)$$

i.e.

$$\begin{pmatrix} \tilde{\pi}_t \\ \tilde{i}_t \end{pmatrix} = \begin{pmatrix} Y_1 & X_1 \\ Y_2 & X_2 \end{pmatrix} \begin{pmatrix} \tilde{\pi}_{t-1} \\ \tilde{i}_{t-1} \end{pmatrix}$$

The Jacobian matrix J is

$$J = \begin{pmatrix} Y_1 & X_1 \\ Y_2 & X_2 \end{pmatrix}$$

The characteristic roots are

$$\lambda_1, \lambda_2 = \left[(\mathrm{tr}J) \pm \sqrt{(\mathrm{trJ})^2 - 4(\det \mathrm{J})}\right]/2$$

where

$$trJ = Y_1 + X_2$$

and

$$\det J = Y_1X_2 - X_1Y_2$$

With the benchmark parameters presented in section (3) we obtain

$$\Delta = (Y_1 + X_2)^2 - 4(Y_1X_2 - Y_2X_1) < 0$$

with a pair of complex roots

$$\bar{\lambda}_{1,2} = \frac{trJ}{2} \pm i\frac{\sqrt{-(\Delta)}}{2} = a + ib$$

where i is the imaginary part and a and b are real number.

The complex number in the cartesian form $a \pm ib$ can be written in the equivalent trigonometric form $\bar{\rho}(\cos\omega \pm i \sin\omega)$. The positive number $\bar{\rho} = \left(a^2 + b^2\right)^{\frac{1}{2}}$ is called the modulus or absolute value of the complex number (Gandolfo, 2009). With the benchmark parameters presented in section (3) we obtain

$$\bar{\rho} = \sqrt{\left(\frac{Y_1 + X_2}{2}\right)^2 + \frac{-\left[(Y_1 + X_2)^2 - 4(Y_1 X_2 - Y_2 X_1)\right]}{4}} = 1$$

i.e.

$$\bar{\rho} = \sqrt{(Y_1 X_2 - Y_2 X_1)} = 1$$

For those specific parameters we provide evidence for the existence of a discrete time limit cycle. Choosing γ as a bifurcation parameter, the conditions set by the Neimark-Sacker theorem are respected, then a limit cycle is generated. In particular, the eigenvalues' modulus become unity at γ and the derivative of the roots with respect to this parameter are not null (for a similar analysis see for example Ferri et al. 2015 and Ferri et al. 2016).

These conditions give support to our thesis of cycles persistence; furthermore, they highlight the relevance of the underlying endogenous economic forces associated with each of the parameters (i.e. the value of the coefficient γ in the investment equation, and the value of ψ in the Taylor equation).

It turns out that with a higher value of γ, the amplitude of the fluctuations increases monotonically, eventually exploding in the very long-run: indeed, as the parameter increases from its benchmark value, we obtain complex eigenvalues with modulus higher than 1, resulting in a significant reduction of system stability. The opposite happens when γ is lower with respect to the benchmark value. This result again stresses the importance of the reactivity of investment to the difference between expected rate of profit and real interest rate. At the same time, an increase in ψ tends to generate complex eigenvalues with modulus lower than 1. In other words, the Central Bank could stabilize the system with a more aggressive response to inflation.

Finally, we consider a wide range of robustness tests on other parameters values. We just report that from the linearized model we observe it is robust to both increases or decreases in the retention rate (the modulus of complex eigenvalue becomes equal to 1). In contrast, an increase in ξ is destabilizing for the positive (negative) effect of capital gains (losses) on the wealth/income ratio.

7 Concluding remarks

In this paper, we have presented a macrodynamic model which, taking into account the financial components of capital, analyses the increasing wealth inequality in the context of the Financial Instability Hypothesis. When a shock disturbs the steady-state value, the simulated variables trace a cyclical pattern which remains bounded through the endogenous economic forces. It is important to stress that the results do not depend only upon the hypotheses underlying the model, but also upon the values of the parameters.

The model generates bounded endogenous dynamics of expansions and contractions, where the co-movements between main variables are different from those obtained in Piketty's model; we revisited and compared the main results. Moreover, this approach allowed us the possibility to reconsider the increasing economic inequality in the light of Minsky's FIH. We obtained two fundamental results: firstly, during the boom phase of Minsky cycles, we observe a contemporaneous increase in capital share in the functional distribution of income. This result is in line with the idea that those who hold financial assets become

wealthier during the growth process with respect to those who have no financial wealth (Stiglitz 2015a; Stiglitz 2015b; Madsen 2019). Second, and this is the second fundamental novelty of our model, it appears that a sufficient fall in the retention rate reinforces Minsky's theory, thus at the same time emphasising the destabilising role of shareholders in the functional distribution income (Charles 2015; Lavoie and Seccareccia 2001). Conversely, with an increase in the retention rate, we find a counter-cyclical debt ratio. This is the case in which we refer to the "Steindl regime" where the debt cycles move in the opposite direction of that of Minsky cycles (Lavoie 2014). In this sense, the model emphasises the non neutrality of finance on the level of economic inequality and the fundamental role of retention rate in the generation of Minsky cycles. These theoretical results remain the essential novelty of our paper and contribute to the literature by setting the conditions in which increasing economic inequality and Minsky's Financial Fragility can co-occur.

Overall, our results suggest that inequality can increase as growth accelerates, as has happened since the mid-1990s where there has been a strong growth accompanied by the presence of financial instability and remarkably increasing wealth inequality. In other words, the process of Minsky's instability characterises the process of growth, fuelling at the same time the process of inequality in the functional distribution of income.

In conclusion, this work suggests two final considerations. First, even if the task is beyond the scope of our paper, policy conclusions can be grasped from the model. The process described, as the source of an increase in inequality, can be controlled by the state through a process of taxation on capital gains and regulation of finance processes. It is necessary to understand how to stabilise or control financial fluctuations to avoid significant and negative repercussions on the rest of the economy. This is especially important in economies marked by large divisions, like our economies today. Second, since the global financial crisis, a wide consensus has emerged as to the importance of an integration of theory of the financial system with that of the real economy. At the same time, we believe it is time for the need to understand the increasing economic inequality in the light of an unstable financial capitalism, extending inequality studies into the sphere of the Financial Instability Hypothesis.

References

Aghion, P., and Williamson, J. G. W. 1999. *Growth, Inequality, and Globalization: Theory, History, and Policy.* Cambridge: Cambridge University Press.

Aglietta, M. 2017. 'Capitalisme et inegalites.' *Revue d'Economie Financiere* 128: 21-43.

Akyuz, Y. 2018. 'Inequality, Financialisation and Stagnation.' *Economic and Labour Relations Review* 29: 428-45.

Amountzias, C. 2019. 'An Investigation of the Effects of Income Inequality on Financial Fragility: Evidence from Organization for Economic Co-Operation and Development Countries. *International Journal of Finance and Economics* 24: 241-59.

Arestis, P., and Phelps, P. 2019. 'A Panel Analysis of Brazilian Regional Inequality.' *Environment and Planning A: Economy and Space* 51: 1558-85.

Balder, J. M. 2018. 'Financialization and Rising Income Inequality: Connecting the Dots.' *Challenge* 61: 240-54.

Berglof, E., and Bolton, P. 2002. 'The Great Divide and Beyond - Financial Architecture in Transition.' *Journal of economic perspective* 16: 77-100.

Bertola, G. 2000. 'Macroeconomics of Distribution and Growth.' In *Handbook of Income Distribution.* edited by A. B. Atkinson and F. Bourguignon. Amsterdam; New York and Oxford: Elsevier Science, North-Holland, 477-540.

Blecker, R. A., and M. Setterfield. 2019. *Heterodox Macroeconomics: Models of Demand, Distribution and Growth*, Cheltenham, UK: Elgar.

Bonnet, O., Bono, P. H., Chapelle, G., and Wasmer, E. 2014. 'Does housing capital contribute to inequality? A comment on Thomas Piketty's Capital in the 21st Century.' *Sciences Po Economics Discussion Papers* Sciences Po Departement of Economics.

Botta, A., Caverzasi, E., Russo, A., Gallegati, M., and Stiglitz, J.E. 2021. 'Inequality and Finance in a Rent Economy.' *Journal of Economic Behavior and Organization* 183: 998-1029.

Bunge, Mario A. 1980. *Causality and Modern Science.* Mineola: Dover Publications Inc.

Carnevali, .E., Deleidi, M., Pariboni, R., Passarella, M.V. 2019. 'Stock-Flow Consistent Dynamic Models: Features, Limitations and Developments.' In *Frontiers of Heterodox Macroeconomics.* Edited by P. Arestis, M. Sawyer. Palgrave Macmillan.

Causevic, F. 2017. *A Study into Financial Globalization, Economic Growth and (in)Equality.* New York: Springer Nature, Palgrave Macmillan.

Charles, S. 2015. 'Is Minsky's financial instability hypothesis valid?' *Cambridge Journal of Economics* 40: 427-436.

Choi, Y. 2018. 'Masked Instability: Within-Sector Financial Risk in the Presence of Wealth Inequality.' *Risks* 6: 1-15.

D'Orazio, P. 2019. 'Income Inequality, Consumer Debt, and Prudential Regulation: An Agent-Based Approach to Study the Emergence of Crises and Financial Instability.' *Economic Modelling* 82: 308-31.

Delli Gatti, D., Fagiolo, G., Gallegati, M., Richiardi, M., Russo, A. 2018. *Agent-based models in economics: a toolkit.* Cambridge: Cambridge University Press.

Demirguc-Kunt, A. and Levine, R. 2009. 'Finance and Inequality: Theory and Evidence.' *National Bureau of Economic Research*, Inc, NBER Working Papers: 15275.

Dragoe, S.I. 2016. 'Inequality Fragility Hypothesis.' *Expert Journal of Economics* 4: 34-52.

Fazzari, S., Ferri, P., and Greenberg, E. 2008. 'Cash flow, investment, and Keynes–Minsky cycles.' *Journal of Economic Behavior and Organization* 65: 555–572.

Fazzari, S., Ferri, P., and Greenberg, E. 2010. 'Investment and the Taylor rule in a dynamic Keynesian model.' *Journal of Economic Dynamics and Control* 34: 2010–2022.

Fernandez, L. 2008. 'Minsky and Economic Policy: A Minskyan Analysis of the Subprime Crisis.' Levy Economics Institute. The Economics Working Paper Archive No. 548.

Ferri, P. 2011. *Macroeconomics of Growth Cycles and Financial Instability.* Cheltenham, UK and Northampton, US: Edward Elgar Publishing

Ferri, P. 2012. 'Income distribution and debts in a fragile economy: market processes and macro constraints.' *Journal of Economic Dynamics and Control* 8: 219–230.

Ferri, P. 2016. *Aggregate demand, inequality and instability.* Cheltenham, UK and Northampton, US: Edward Elgar Publishing.

Ferri, P., and Minsky, H. 1992. 'Market processes and thwarting systems.' *Structural Change and Economic Dynamics* 3: 79-91.

Ferri, P., and Variato, A. M. 2010. 'Financial Fragility, the Minskian Triad, and Economic Dynamics.' *International Journal of Political Economy* 39: 70-82.

Ferri, P., Fazzari, S., Greenberg, E., and Variato, A. M. 2011. 'Aggregate Demand, Harrod's Instability and Fluctuations.' *Computational Economics*, 38: 209-220.

Ferri, P., Cristini, A., and Variato, A. M. 2015. 'Endogenous fluctuations, markups, capacity and credit constraints.' *Journal of Economic Interaction and Coordination* 11: 273-292.

Ferri, P., Cristini, A., and Variato, A. M. 2016. 'Income shares, wealth and growth.' *EconomiA* 17: 254-264.

Ferri, P., Cristini, A., and Variato, A. M. 2019. 'Growth, unemployment and heterogeneity.' *Journal of Economic Interaction and Coordination* 14: 573–593.

Galbraith, J. K. 2012. *Inequality and instability. A study of the world economy just before the great crisis.* Oxford: Oxford University Press.

Galbraith, J. K. 2014. 'Kapital for the twenty-first century?' Dissent, Spring, http://www.dissent-magazine.org/article/kapital-for-the-twenty-first-century.

Galí, J. 2008. *Monetary Policy, Inflation and the Business Cycle.* Princeton, New Jersey: Princeton University Press.

Gandolfo, G. 2009. *Economic Dynamics.* Berlin: Springer.

Garcia, S., and Perez N. 2017. 'Desigualdad, Inflacion, Ciclos Y Crisis En Chile.' (Inequality, Inflation, Cycles and Crisis in Chile. With English Summary.) *Estudios de Economia* 44: 59-95.

Hauner, T. 2020. 'Aggregate Wealth and Its Distribution as Determinants of Financial Crises.' *Journal of Economic Inequality* 18: 319-38.

Hicks, J. 1980. *Causality in Economics.* Oxford and Canberra: Basil Blackwell.

Hoover, K. D. 2001. *Causality in Macroeconomics.* Cambridge: Cambridge University Press.

Homburg, S. 2015. 'Critical remarks on Piketty's Capital in the Twenty-first Century.' *Applied Economics* 47: 1401-1406.

Inekwe, J. N., Jin, Y. and Valenzuela M. R. 2020. 'Income Inequality, Financial Flows and Political Institution: Sub-Saharan African Financial Network.' *Empirical Economics* 58: 2635-65.

Jackson, T. 2019. 'The Post-growth Challenge: Secular Stagnation, Inequality and the Limits to Growth.' *Ecological Economics* 156: 236-246.

Kaldor, N. (1956). 'Alternative theories of distribution.' *Review of Economic Studies* 23: 83-100.

Kandil, M., Shahbaz, M., and Nasreen, S. 2015. 'The Interaction between Globalization and Financial Development: New Evidence from Panel Cointegration and Causality Analysis.' *Empirical Economics* 49: 1317-39.

Kaboub, F., Todorova, Z., and Fernandez, L. 2010. 'Inequality-Led Financial Instability: A Minskian Structural Analysis of the Subprime Crisis.' *International Journal of Political Economy* 39: 3-27.

Keynes, J. M. 1963 [1933]. 'On the Theory of a Monetary Economy.' *Nebraska Journal of Economics and Business* 2: 7-9.

King, J. E. 2016. 'The literature on Piketty.' *Review of Political Economy* 29: 1-17.

Krugman, P. 2014. 'Why we're in a new gilded age.' The New York Review of Books. http://www.nybooks.com/articles/archives/2014/may/08/thomas-piketty-new-gilded-age/.

Krusell, P., and Smith Jr., A. A. 2015. 'Is Piketty's "Second Law of Capitalism" Fundamental?' *Journal of Political Economy* 123: 725–748.

Lavoie, M. 2014. *Post-Keynesian Economics: New Foundations.* Cheltenham, UK and Northampton, US: Edward Elgar.

Lavoie, M., and Seccareccia, M. 2001. 'Minsky's financial fragility hypothesis: a missing macroeconomic link?' In *Financial Fragility and Investment in the Capitalist Economy, the Economic Legacy of Hyman Minsky.* Edited by Bellofiore, R. and Ferri, P. Cheltenham, Edward Elgar.

Lawson, T. 2005. 'The (confused) state of equilibrium analysis in modern economics: an explanation.' *Journal of Post Keynesian Economics* 27: 423-44.

Levine, R. 2004. 'Finance and Growth: Theory and Evidence.' *National Bureau of Economic Researc*, Inc, NBER Working Papers: 10766.

Lim, M.M.H. 2008. 'Old Wine in a New Bottle: Subprime Mortgage Crisis-Causes and Consequences.' *Levy Economics Institute*, The Economics Working Paper Archive No. 532.

Madsen, J. B. 2019. 'Wealth and Inequality in Eight Centuries of British Capitalism.' *Journal of Development Economics*138: 246-260.

Maki, Uskali. 2001. *The Economic World View. Studies in the Ontology of Economics.* Cambridge: Cambridge University Press.

Maki, Uskali. 2002. *Fact and Fiction in Economics. Models, Realism and Social Construction.* Cambridge: Cambridge University Press.

Milanovic, B. 2013. 'The return of patrimonial capitalism: A review of Thomas Piketty's Capital in the Twenty-First Century.' *Journal of Economic Literature* 52: 519–534.

Minsky, H. 1985. 'The Financial Instability Hypothesis: A restatement.' In *Post Keynesian Economic Theory. A Challenge to Neo Classical Economics.* Edited by P. Arestis and T. Skouras. Sussex: Weatsheaf Books.

Minsky, H. 1986. *Stabilizing an unstable economy.* Newhaven, CT. Yale University Press.

Morck, R., Yavuz, M. D., and Yeung, B. 2011. 'Banking System Control, Capital Allocation, and Economy Performance. ' *Journal of Financial Economics* 100: 264-83.

Nikolaidi, M. 2017. 'Three decades of modelling Minsky: what we have learned and the way forward.' *European Journal of Economics and Economic Policies: Intervention* 14: 222-237.

Nikolaidi, M., Stockhammer, E. 2017. 'Minsky models: a structured survey.' *Journal of Economic Surveys* 31: 1304-1331.

Petit, P. 2010. 'The Systemic Nature of the Rise in Inequality in Developed Economies.' *International Review of Applied Economics* 24: 251-67.

Piketty, T. 2014a. *Capital in the twenty-first century.* Cambridge, MA: Cambridge University Press.

Piketty, T. 2014b. *Capital in the twenty-first century.* The technical appendix, http://piketty.pse.ens.fr/en/capital21c2.

Piketty, T. 2015. 'About Capital in the Twenty-First Century.' *American Economic Review* 105: 48-53.

Piketty, T., and Saez, E. 2014. 'Inequality in the long run.' *Science* 344: 838-843.

Piketty, T., and Zucman, G. 2014. 'Capital is back: Wealth-income ratios in rich countries 1700-2010.' *Quarterly Journal of Economics*, 129: 1255-1310.

Piketty, T., and Zucman, G. 2015. 'Wealth and inheritance in the long run.' *Handbook of Income Distribution* 2B: 1303-1368.

Rochon, L. P. and Monvoisin, V. 2019. *Finance, Growth and Inequality: Post-Keynesian Perspectives.* New Directions in Post-Keynesian Economics. Cheltenham, UK: Elgar.

Rowthorn, R. 2014. 'A note on Piketty's capital in the twenty-first century.' *Cambridge Journal of Economics* 38: 1275-1284.

Saith, A. 2011. 'Inequality, Imbalance, Instability: Reflections on a Structural Crisis.' *Development and Change* 42: 70-86.

Sala-i-Martin, X. 2000. 'The Disturbing 'Rise' of Global Income Inequality.' Department of Economics and Business, Universitat Pompeu Fabra, Economics Working Papers 8904.

Samuels, W. 1997. 'On the Nature and Utility of the Concept of Equilibrium?' *Journal of Post Keynesian Economics* 20: 77-88.

Setterfield, M. 1997. 'Should Economists Dispense with the Notion of Equilibrium?' *Journal of Post Keynesian Economics* 20: 47-76.

Seven, U. and Coskun, Y. 2016. 'Does Financial Development Reduce Income Inequality and Poverty?' Evidence from Emerging Countries. *Emerging Markets Review* 26: 34-63.

Skidelsky, R. 2018. *Money and Government: The Past and Future of Economics.* New Haven and London: Yale University Press.

Skott, P. 2011. 'Heterodox macro after the crisis.' University of Massachusetts Amherst, Department of Economics, Working Papers.

Skott, P. 2013. 'Increasing Inequality and Financial Instability.' *Review of Radical Political Economics* 45: 478-488.

Solimano, A. 2017. *Global Capitalism in Disarray: Inequality, Debt, and Austerity.* Oxford and New York: Oxford University Press.

Solow, R. 2014. 'Thomas Piketty is right.' New Republic. http://www.newrepublic.com/article/117429/capital-twenty-first-century-thomas-piketty-reviewed.

Stiglitz, J. E. 2015a. 'New theoretical perspective on the distribution of income and wealth among individuals: wealth residual.' *Cambridge. MA: National Bureau of Economic Research*, Working Paper 21189.

Stiglitz, J. E. 2015b. 'Inequality, wealth and capital'. Columbia Business School. https://www8.gsb.columbia.edu/faculty/jstiglitz/sites/jstiglitz/files/Inequality

Stirati, A. 2016. 'Wealth, capital and the theory of distribution: some implications for Piketty's analysis.' *Review of Political Economy* 29: 47-63.

Summers, L. 2014. 'The inequality puzzle.' Democracy. http://www.democracyjournal.org/33/the-inequality-puzzle.php?page=all.

Taylor, L. 2016. 'Veiled repression: mainstream economics, capital theory, and the distribution of income and wealth.' *International Journal of Political Economy* 45: 167-181.

Thioune, T. 2017. 'Financial Instability and Inequality Dynamics in the WAEMU.' *Econometric Research in Finance* 2: 43-62.

Tiberi, M. 2007. 'Poverty and Inequality in the Age of Globalization.' *Journal of European Economy* 6: 352-384.

Tridico, P. 2012. 'Financial Crisis and Global Imbalances: Its Labour Market Origins and the Aftermath.' *Cambridge Journal of Economics* 36: 17-42.

Quah, D. T. 1996a. 'Empirics for Economic Growth and Convergence.' *European Economic Review* 40: 1353-75.

Quah, D. T. 1996b. 'Twin Peaks: Growth and Convergence in Models of Distribution Dynamics.' *Economic Journal* 106: 1045-55.

Variato, A. M. 2015. 'Can we say "Minsky moment" when households matter?' In *Cycles, Growth and the Great Recession. Economic Reflections in times of uncertainty.* Edited by A. Cristini, S. Fazzari, E. Greenberg and R. Leoni. New York: Routledge.

Vercelli, A. 1982. 'Is Instability Enough to Discredit a Model?' *Economic Notes* 3: 173-90.

Vercelli, A. 2010. 'Minsky Moments, Russell Chickens and Grey Swans: The Methodological Puzzles of Financial Instability Analysis.' In *Minsky, Crisis and Development.* Edited by Tavasci D. and Toporowski J. E. London: Palgrave Macmillan.

Vercelli, A. 2011. 'A Perspective on Minsky Moments: Revisiting the Core of the Financial Instability Hypothesis.' *Review of Political Economy* 23: 49-67.

Vercelli, A. and Dimitri, N. 1992. *Macroeconomics: A Survey of Research Strategies.* Oxford: Oxford University Press.

Wallace, W. A. 1974. *Causality and Scientific Explanation. Classical and Contemporary Science.* The University of Michigan Press.

Weil, D. N. 2015. 'A discussion of Thomas Piketty's Capital in the Twenty-First Century: Capital and Wealth in the Twenty-First Century.' *American Economic Review* 105: 34–37.

Woodford, M. 2003. *Interest and Prices: Foundations of a Theory of Monetary Policy.* Princeton, New Jersey: Princeton University Press.

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