

Caverzasi, Eugenio; Tori, Daniele

Working Paper

The financial innovation hypothesis: Schumpeter, Minsky and the sub-prime mortgage crisis

LEM Working Paper Series, No. 2018/36

Provided in Cooperation with:

Laboratory of Economics and Management (LEM), Sant'Anna School of Advanced Studies

Suggested Citation: Caverzasi, Eugenio; Tori, Daniele (2018) : The financial innovation hypothesis: Schumpeter, Minsky and the sub-prime mortgage crisis, LEM Working Paper Series, No. 2018/36, Scuola Superiore Sant'Anna, Laboratory of Economics and Management (LEM), Pisa

This Version is available at:

<https://hdl.handle.net/10419/203089>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

INSTITUTE
OF ECONOMICS



Scuola Superiore
Sant'Anna

LEM | Laboratory of Economics and Management

Institute of Economics
Scuola Superiore Sant'Anna

Piazza Martiri della Libertà, 33 - 56127 Pisa, Italy
ph. +39 050 88.33.43
institute.economics@sssup.it

LEM

WORKING PAPER SERIES

The Financial Innovation Hypothesis: Schumpeter, Minsky and the sub-prime mortgage crisis

Eugenio Caverzasi ^a
Daniele Tori ^b

^a Università Politecnica delle Marche, Ancona, Italy

^b The Open University Business School, UK

2018/36

November 2018

ISSN(ONLINE) 2284-0400

The Financial Innovation Hypothesis: Schumpeter, Minsky and the *sub-prime* mortgage crisis

*Eugenio Caverzasi**

*Daniele Tori***

- September 2018 -

* Università Politecnica delle Marche, eu.caver@gmail.com

** The Open University Business School, daniele.tori@open.ac.uk

The Financial Innovation Hypothesis: Schumpeter, Minsky and the *sub-prime* mortgage crisis.

ABSTRACT

Neo-Schumpeterian economics inspired by the work of Schumpeter and the financial Keynesianism of Minsky are often regarded as unrelated theoretical strands. In this paper, we try to combine these two literatures building on a parallelism between non-financial and financial firms. We focus on recent financial innovations, highlighting how the evolution experienced by US financial institutions led them to transcend their traditional role of credit providers, shaping as 'producers' of financial products, through securitization. This allows on the one hand to broaden the application of Neo-Schumpeterian insights to the financial sector and, on the other, to provide an original explanation of the so-called *sub-prime* crisis by applying the Financial Instability Hypothesis of Minsky to the alternative context of financial production. We maintain that the 2007-8 crisis was not the result of an innovation in the real sector, but came from an innovation (or a series of innovations) intrinsic to the financial system itself, which fostered credit creation. We argue that this 'cluster of innovations' can be placed under the label 'securitization', defined as the business of packaging and reselling loans, with *repo* agreements as the main source of funds.

ACKNOWLEDGMENT: We are grateful to one anonymous referee, Riccardo Bellofiore, Beniamino Callegari, and all the attendees to the parallel session on 'Innovation and Technological change' within the 30th Annual conference of the European Association of Evolutionary Economics, for suggestions and comments that improved an earlier version of this manuscript. The usual disclaimers apply.

KEYWORDS: Minsky, Schumpeter, securitization, financial firms, Great Financial Crisis

JEL CLASSIFICATIONS: B52, G21, O33

1. INTRODUCTION

The Neo-Schumpeterian literature inspired by the work of Joseph Alois Schumpeter and the financial Keynesianism of Hyman Philip Minsky are often regarded as unrelated, if not contrasting. However, we believe that the combination of some of the key elements of these two literatures provide for important insights in the understanding of most recent structural changes in capitalist economic systems and represents a promising development of the two literatures, in line with the original works of the two authors.

On the one hand, the Neo-Schumpeterian literature, besides rare exceptions, tend to overlook monetary and financial aspects. This is not only incompatible with the ambition of providing comprehensive theory of economic development (Hanusch and Pyka, 2007), but it also represents a detachment from the original work of Schumpeter. Schumpeter, as Minsky, was well aware of the endogenous nature of credit creation and identified in the financing activity of banks a crucial determinant of economic dynamics. On the other hand, the innovative nature of financial institutions is at the very core of Minsky's contribution. These innovations inherent to the broad financial sector, we argue, must be taken into account when the Financial Instability Hypothesis (FIH) is applied in the analysis of the Great Financial Crisis (henceforth GFC). In fact, both authors agreed on the necessity to combine the economic analysis with the institutional and social settings characterizing the economy in which the events occurred. Minsky's theoretical views are casted in a thorough analysis of institutional metamorphosis of the economic system. He recognized the evolutionary nature of the capitalist system and, as underlined by Knell (2015), offered important insights into the analysis of the economy as a system in evolution. It seems therefore legitimate to try to apply his theories in light of the structural changes in the economic system (of the US which is the object of our analysis), i.e. the process generally labelled as 'financialization'.

Accordingly, this paper tries to answer Minsky's explicit call: "further progress in understanding capitalism may very well depend upon integrating Schumpeter's insights with regard to the dynamics of a capitalist process and the role of innovative entrepreneurs into an analytical framework that is [financial] Keynesian in its essential properties" (Minsky, 1983:2). In so doing, we try to extend "The Schumpeterian vision of the experimenting entrepreneurs who innovates [...] to the financial firms." (Minsky, 1983:14).

These considerations motivate our contribution, which is threefold. First, we broaden the application of Schumpeterian economics to the financial system. Looking at financial institutions as financial (profit seeking) firms, rather than pure financial intermediaries, allows us to apply Schumpeterian insights to this sector and to represents a highly promising venue of research for this literature. Second, we detach Minsky's FIH from the specific institutional setting of his days. The financial system evolved, and with it the economy itself, thus Minskyian analyses should account for this transformation. Third, we apply our version of the FIH to the understanding of the GFC, putting forward an innovative interpretations of its causes, hence offering a new contribution to the debate on the coherence of the FIH with the dynamics of the recent financial crisis.

The paper is organized as follows. Section two underlines differences and similarities among the two authors. Section three discusses Minsky's contribution, both contextualizing the theoretical evolution of the FIH and trying to highlight the broad 'financial Keynesianism' standpoint. Section four presents a 'financial' reading of Schumpeter's work and discusses the innovation that characterized the financial industry in the US in the last

decades. Section five provides our 'structural' interpretation of the GFC, based on our integration of the two literatures discussed in the previous sections. Section six concludes.

2. SCHUMPETER AND MINSKY: FARAWAY SO CLOSE.

Schumpeter and Minsky have almost antithetical primary focuses of analysis. Schumpeter focused on the real side of the economy, with innovative entrepreneurs propelling the economic dynamic, whereas Minsky's theories have their core in the financial sector and in its destabilizing effects on the economic system. This might explain why in Minsky's main publications (e.g. Minsky, 1975, 1982) - in which he put forward his financial interpretation of Keynes' General Theory (henceforth GT) - the name of Schumpeter appears only in the acknowledgement for his role in the education of the author. To find some considerations about the work of his doctoral supervisor, we need to refer to Minsky's less popular publications, notably Minsky (1983), Minsky (1988) and Minsky (1990). There one can find not only Minsky's critiques to Schumpeter, but also the possible connections among the work of the two authors. The critiques are directed mostly to Schumpeter's *Business Cycle* (Schumpeter, 1939a) considered a 'retrogression' (Minsky, 1982:11) from his *Theory of Business Cycles* and a 'minor performance' (Minsky, 1982:1) with respect to Keynes' GT. The crucial fault ascribed to that book was the embracement of the Walrasian approach and its 'axiom of reals'. This choice left no space for finance, which is not only at the core of Minsky's lifetime work, but also in his view the area where Keynes and Schumpeter connect. According to Minsky, both authors analyse a monetary production economy where money and production go hand in hand (Minsky, 1988). In fact, Minsky (1990) suggests how to conceive a common monetary theory inherited by Wicksell from Schumpeter, then developed by Keynes,¹ and, we would add, in a later stage by Minsky himself. Referring to the work of Michał Kalecki (1971), Minsky notices how both Schumpeter and Keynes embraced the same view on the macroeconomic link between profit and investments. In a nutshell, Kalecki (1971), referring to social accounting identities, shows how in an economy in which the government runs zero deficit and the current account is balanced, and assuming workers consume all their wage income (i.e. saving propensity equals zero), the aggregate level of gross profit is determined by investment and capitalist consumption. Investment requires financing though. In Schumpeter, the financing of firms' investment decisions - in particular innovative investment - by banks allows to interrupt the circular flow, which characterises the otherwise stationary general equilibrium. Minsky proposes an interpretation of Schumpeter's credit-money view, under a macroeconomic (Kaleckian) perspective. The financing of investment decisions allows for the creation of profits and drives the cycle. In this scheme, money is the social artefacts that allows bankers and entrepreneur to obtain a surplus (Minsky, 1975:121).

In Minsky's view, Keynes' monetary theory encompasses this vision of Schumpeter and makes a step forward by adding the role of liquidity preference that determines the price of assets (real and financial), and therefore guide investment decisions and as a consequence the economic dynamic. For Minsky, the GT laid "foundations

¹ The potential connection among these authors - located in their respective monetary theories - can, according to Knell (2015), be enlarged to the time dimension, specifically in relation with their business cycle theories.

of an investment theory of business cycles and a financial theory of (Minsky, 1994:3).² Minsky adds a further element to this monetary theory: he enriches the picture underlying the centrality of debt. An investment decision encompasses a judgement about the source of finance, and therefore on a specific liability structure. In fact, as we will see in following sections, this impacts the stability of the system. Minsky puts the liability counterpart of investment decisions at the centre of the stage.³ This monetary view of Minsky, whose corner stone is the financing of investment, stems from Kalecki, encompasses Schumpeter's vision and includes elements by Keynes.⁴ According to Kregel (2009), Minsky learned from Keynes the importance of money and expectations, while from Schumpeter the importance of banks and other financial institutions, in financing entrepreneurial innovations, and of innovations in determining the dynamics of imperfect competition. This reflects in what, in our view, is one crucial element shared by Schumpeter, Keynes, and Minsky, which is often overlooked by the related literatures. That is the centrality of banks. As cited by Minsky (1990:122), Schumpeter dubs banks as the '*ephor*' of the economy⁵. By creating means of payment, they allow "the carrying out of new combinations" (Schumpeter, 1982:154) and they are therefore 'phenomenon of development' (ibid.). That is to say, banks allow for investment, including the entrepreneurial innovation process, to take place. This quintessential role of banks, seen as determinant of the level of economic activity through their financing decisions, can be found also in Keynes (1973b:222), where he argues that "the banking system holds the key position in the transition from a lower to a higher scale of activity". Knell (2015:201), identifies this link between Schumpeter and Keynes, and notices how both considered money and financial aggregates not to be neutral (non-neutrality principle), highlighting the fundamental role of the credit market and of banks. In Minsky, this position evolves. Banks, thanks to their ability to create purchasing power - and setting with it the level of indebtedness - together with the key for more economic activity *bear the responsibility for instability*. They are indeed portrayed by Minsky as very active and innovative profit seeking agents. Given their ability to modify their balance sheets (and their business organisation with it) - for example in order to expand credit with a given amount of reserves and overcome limitations imposed by financial authorities through liability management (Kregel, 2016) - they put the economy in motion up to instability. Minsky (1986:279) see banks as "endogenous destabilizers". This, albeit being a logical consequence of the theoretical framework developed by Minsky (see section 2 on this), is seldom at the core of Minskyian literature, which tends to focus on the decisions of firms. Moreover, their importance in his FIH does not rely exclusively on their role as credit issuer: "They actively solicit borrowing customers, undertake financing commitments, build connections with business and other bankers, and seek out funds"

² It is well-known that in the GT Keynes assumes a fix stock of money. However, albeit Minsky's interpretation of Keynes largely focuses on the GT, he embraces an endogenous money view, referring to other works of Keynes for instance underlining how his 'veil of money' (Keynes, 1973a, p.117) describes the capacity of banks to issue loans in excess of deposits, so creating money *ex nihilo*. An analysis on the monetary theory of the two authors and more specifically of the reason why Keynes assumed a fixed stock of money in the GT, is far beyond the scope of this paper (see Bibow, 2010). However, it is quite interesting to notice how, in one of the passages in which he more clearly defends an 'endogenous money' view (Schumpeter, 1954, p.1080) Schumpeter refers to Keynes' 'Treatise on Money' (Keynes, 1930), and notice that this was reverted in the GT.

³ It is worth noting that Minsky (1975) illustrates how the Kaleckian link between profits and investment can occasionally be broken, as it happened in the US after the Second World War when profits were generated by public deficit and new house constructions, with mortgage issuance eased by public guarantees.

⁴ See also Roncaglia (2013) on this.

⁵ In ancient Sparta, the *Ephors* formed a council of five members, which had to step in and take a decision whenever the two kings disagreed, hence avoiding a stalemate, something equivalent to a stationary general equilibrium state.

(Minsky, 1986:256-257). In our view, banks, together with other financial institutions (the term 'banks' is often used by Minsky to refer to different kinds of financial institutions) have been one of the most (if not the most) innovative actors in the US economy of the last decades. As we will see, their role goes beyond the one of issuer of loans, and put them at the centre of the functioning of a financialized monetary system of production. In the last decades, financial institutions' role appeared not to be limited to the financing of the 'real' production processes any more. The financial sector is increasingly focusing on the manufacturing of financial products - structured financial assets to nourish the appetite of rentiers - in a dynamic which is disruptive due to the lack of a clear separation between the entity that 'produces' and the one that 'finances'. We believe that this metamorphosis of the financial sector can be fruitfully analysed by updating and combining the theories of these two authors, providing an original reading of the GFC that started in the US during the summer of 2007.

3. MINSKY'S CONTRIBUTION.

Since the 2007-8 financial crisis, Minsky's theories have had a huge comeback. In the attempt to provide a theoretical ground to the understanding of the recent financial crisis, his FIH has abundantly been referred to by authors from different traditions within academia (e.g. Wray, 2011; Eggertsson and Krugman, 2012; Bhattacharya *et al.*, 2015; Charles, 2016.) and beyond (e.g. McCulley, 2009; Cassidy, 2008).⁶ Nonetheless, there are still controversies about the extent to which the Financial Instability Hypothesis can provide an explanation to the so-called 'sub-prime crisis'. Some authors have directly questioned the coherence of the FIH with the event leading to the sub-prime mortgage crisis. For example, Davidson (2008) believes that the *speculative* and *Ponzi* finance of the FIH (see next section), were ruled out by the contractual forms of the housing market. Hence he negates that the burst of the GFC can be understood as a 'Minsky Moment'. Behlul (2014), observes that the lack of a leveraged non-financial corporate sector makes the sub-prime crisis differ from the dynamic described in the FIH. On the contrary, Kregel (2008) recognises the presence of a Ponzi scheme in the sub-prime mortgage market. However, in his view this was not the result of endogenous forces, as in the original analysis proposed by Minsky. The process was determined by a structural change of the financial system, which caused the detachment of the issuer of the debt and evaluator of the credit worthiness - namely banks - from the bearer of the risk, thus the lender's risks are 'contracted out' to the final holder of the securitized mortgage. According to this reading, this transformation triggered the *Ponzi* scheme that caused the sub-prime crisis. Other authors are more clearly giving credit to Minsky for providing a valid framework to understand the recent crisis. Similar to Kregel, Wray (2012) states that the crisis is the result of a structural change in the US economy, therefore dismissing the possibility of 'black swans'. However, his idea is that the excess of optimism - motivated by the Great Moderation - led to the undertaking of riskier and riskier financial practices, heading the economy toward the crisis. In other words, Wray portrays a 'destabilizing stability', as in the traditional Minsky's analysis. Other

⁶ The term 'Minsky Moment' has become a catchy expression to define a situation in which the indebtedness of some sector of the economy (usually a private one) becomes unsustainable, ultimately triggering an economic crisis.

authors suggest what we could define as a ‘same scenario different location’ perspective, according to which a Minsky moment actually occurred, albeit not exactly where Minsky theorized it would have happened. For example, Dymski (2009) acknowledges the importance of the contribution of Minsky in the understanding of the features of the crisis. However, he recognises that events in the 2007-8 had specificities - i.e. new banking regulation, inclusion and consequent financial exploitation of minorities in the real estate market, and a US current account deficit - which made them differ from the dynamic depicted in the FIH. Similarly, a Minsky dynamics is identified by Bellofiore and Halevi (2009:16), but with different modalities. First, the boom did not occurred in relation to real investment. Second, aggregate demand was no more dependent on aggregate investment, because of the rise in debt-financed consumption. Third, the increase in prices associated with the boom was independent from wages, and rather determined by raw materials' price.

We believe that this controversy, that is the debate about whether the last crisis could be indeed explained as a ‘Minsky moment’ or not, is a clear consequence of an interpretative issue. If the FIH is slavishly taken as originally presented by Minsky - with its core in the financing decision of investment by firms - and overlapped with a summary of the main events that characterized the sub-prime crisis, a certain amount of circumstances and features over which the evolution of the crisis deviates from the dynamic depicted in the FIH will undoubtedly emerge. In case this is the route taken, the conclusion would be that it was not - at least not exactly - a ‘Minsky moment’. Our perspective differs substantially. We believe that Minsky's analysis goes far beyond his theory of investment. By using Minsky's representation as an adaptable framework, we are able to understand how the financial system can overcome its limits, and how this can affect the real economy (as Bellofiore and Halevi, 2009 and Wray, 2012, appear to have done). In our view, the FIH (Minsky, 1986) is the outcome of a complex theoretical framework developed by Minsky. Minsky's ‘financial Keynesianism’⁷ is a personal interpretation of Keynes’ GT, which highlights the financial aspects hidden in the original version: “the missing step in the standard Keynesian theory was the explicit consideration of capitalist finance within a cyclical and speculative context.” (Minsky, 1975:129). Our hypothesis is that this same theoretical framework can be applied to analyse contemporary financial markets, hence obtaining a new reading of the FIH, and consequently a structural explanation of the recent financial crisis.

3.1 The Financial Instability Hypothesis as a Component of Minsky's Financial Keynesianism

The FIH can be defined as an endogenous theory of business cycle, centred on the analysis of the financial structure of the economy. According to Minsky, the economic system is characterized by endemic forces that during a period of tranquillity - meant as a situation of more or less stable growth - lead the system towards instability: “stability... is destabilizing” (Minsky, 1975). The interpretations of this view of Minsky usually focus on the analysis of firms' investment and financing decisions. In this analysis, firms, under uncertainty, choose

⁷ According to Papadimitriou and Wray (1998), this was the definition preferred by Minsky for his own work, rather than 'Post-Keynesian'.

the level of investment by comparing two elements in Minsky's two price theory.⁸ On the one hand, the expected stream of returns diminished by a discretionary margin, which represents a 'cushion of safety' (see Kregel, 2008) to protect firms against the possibility of wrong forecasting and of not being able to repay the debt (*borrower's risk*). On the other hand, the cost of the capital asset - whenever firms have to resort to external finance - increases together with the amount of the loans, since banks claim a premium against the possibility that the borrower defaults on its debt (*lender's risk*). Broadly speaking, the bigger the loan, the higher the possibility to default, the subsequent losses, and therefore the required risk premium.⁹ As long as revenues exceed commitments, the economy is stable. Vice-versa, a crisis can occur. These considerations led Minsky to formulate his famous taxonomy of financial positions, in which he distinguishes among *hedge*, *speculative*, and *Ponzi* units.¹⁰ In the first case, firms' expect that money inflows always exceed their financial commitments. In the second case, their revenues are enough to repay interests, but not the 'principal' portion of the loan. Hence, it becomes necessary to roll over the debt. Finally, *Ponzi* units are those who need to borrow further money, or to sell assets, since expected revenues are even lower than interest payments. The overall stability of the economy depends on the relative materialization of each of this types of units: the higher the number of *hedge*, the more stable the economy will be. According to Minsky, after a prolonged period of tranquillity units' expectations - both firms' and banks' ones - tend to become more and more optimistic. The margins of safety narrow, and *speculative* and *Ponzi* finance become consuetudinary. In terms of a business cycle, this is the upward phase. The economic system endogenously moves towards a more unstable financial position and then 'something' happens. This could be for example an increase in interest rate - due to tighter monetary policy or endogenous forces - or a change in expectations.¹¹ At this point, *speculative* and *Ponzi* units are no longer able to meet their financial commitments. The upward phase of the cycle comes to an end, an economic crisis is ultimately triggered, and the downward phase of the cycle starts. Due to their financial obligations, firms may be forced to sell their assets or to default; this can lead to a Fisherian debt-deflation, hence worsening the crisis, which spreads because of the interrelationships among the various units' balance sheets.

In our opinion, limiting the analysis of the work of Minsky to the definition of the FIH does not give full justice to his work. We believe that the FIH should be understood as a corollary of a broader theoretical framework, ultimately aimed at describing the macro-dynamic features of financially complex market economies.

3.2 Minsky Beyond the Financial Instability Hypothesis: the evolutionary essence of its financial Keynesianism.

⁸ This double focus is expressed by Minsky, through a two price theory which recall the *Tobin's q*, from which it differs for two main reasons. First, Minsky considers the source of finance, since he dismisses the Modigliani-Miller theorem. Second, he takes into account radical uncertainty.

⁹ This view immediately recalls Kalecki's *principle of increasing risk*, (Kalecki, 1937, see).

¹⁰ Here we refer to the exposition of Minsky (1992a). Elsewhere, the author presents the taxonomy in slightly different terms.

¹¹ It is important to bear in mind that that 'something' must not be an exogenous shock it may well be the results "of (i) the internal dynamics of capitalist economies, and (ii) the system of interventions and regulations that are designed to keep the economy operating within reasonable bounds." (Minsky, 1992a, p.8).

Paul Krugman (Krugman, 2011) divides Keynesians scholars into two broad groups. Authors in the first group (i.e. the ‘Chapter 12ers’) focus on radical uncertainty, while the ones in the second group (the ‘Book 1ers’) underlines the refutation of ‘Say’s law’ and the importance of aggregate demand. According to Krugman, while the first group cannot do much more than stress that ‘capitalism is unstable’, the second has managed to offer, by means of equilibrium analysis, ‘intuition pumps’ that do help to deal with economic problems. Hyman Minsky (as many other so-called ‘Post-Keynesian economists’) completely overcomes this dichotomy. Following Krugman taxonomy, should we pick just one of the twenty-four chapters of the GT, he might rather be classified as a ‘Chapter 17er’. Minsky’s *financial Keynesianism* springs indeed from a personal interpretation of the GT, whose main focus is indeed Chapter 17 - in which Keynes displays his theory of portfolio choice underlying the key role of liquidity preferences. He reads the GT through a financial perspective, undoubtedly enclosing in his analysis Chapter 12 (*fundamental uncertainty*) and Book 1 (*effective demand*). It is possible to identify some of the core elements, or paraphrasing Minsky (1981:1) a ‘list of ingredients’, of its financial Keynesianism. Jointly they form the theoretical lens through which he observed the economic reality and which allowed him to outline his theories.¹²

We already presented one of these elements in the introduction, namely the centrality of investment. The level of investment is not only the main driver of the business cycle, but it is also the determinant, at the aggregate level, of profits, which are required for the economy to be able to honour debt positions. Moreover, investment decisions entail decisions about the sources of financing, which can lead to unstable financial positions.

The second element is that Minsky identified the core of a capitalist economy in the financial system: “a capitalist, or if you wish, a market economy is a financial system” (Minsky, 1992a:16). Finance is ubiquitous in Minsky’s work. Capitalism is represented as a system with complex financial markets. Portfolio choices, financing decisions, and stock-flow relations are the determinants of the economic dynamics and of the overall stability of the system. Units in this system are interlinked through a network of balance sheets (Minsky, 1975:6)¹³. What Minsky has done was to bring back from the Treatise on Money (Keynes, 1930) crucial ‘monetary [and financial] detail’ that, in the GT, Keynes let fall (see Macedo e Silva and Dos Santos, 2011) ‘into the background’ (Keynes, 1930: vii).

The third element of our list is the characterization of units as profit seekers. This might appear standard referred to a capitalist economy, but it assumes a specific connotation in Minsky’s financial Keynesianism. In facts it refers to both the real and the financial side of the economy. The pursuit of profit motivates units, both borrowers and lenders, to undertake increasingly riskier financial positions, inevitably heading the economy toward crises; “profit opportunities within a robust financial structure make the shift from robustness to fragility an endogenous phenomenon.” (Minsky, 1986:234). Profits, in this setting, might arise either from entrepreneurial, or financial activity. The shift toward financial investment by non-financial firms - which has been investigated in Post-

¹² The elements listed here should by no means be considered as an exhaustive review of Minsky’s contribution. For a thorough theoretical analysis of the work of Minsky see Bellofiore and Ferri (2001) and Papadimitriou and Wray (1998) among many others.

¹³ The FIH is indeed based on a micro characterisation, where financial distress propagates through balance sheets and becoming relevant at the macroeconomic level. This might be considered as the cause for the fallacy of composition – or the missing macroeconomic link - identified by Lavoie and Seccareccia (2001): financial fragility does not need to appear in social accounting (of the firms sector, in the traditional version of the FIH) in order to represent a problem at macroeconomic level.

Keynesian literature on financialization since Orhangazi (2008) to the more recent Tori and Onaran (2017) and Tori and Onaran (2018) - jeopardises economic growth and stability due to a sort of ‘crowding-out effect’ on real investment (Minsky, 1986:18).

Fourth, inter-temporality is unequivocally a defining feature of the FIH and according to Knell (2015), when combined with a credit-money view, it is a point of contact between Schumpeter's and Minsky's business cycle theories. Investment decisions are based on a time horizon linking past, present, and future. In fact, “in a capitalist economy the past, the present, and the future are linked not only by capital assets and labour force characteristics but also by financial relations.” (Minsky, 1992a:4). Decisions taken in the past determine current financial positions. Current decisions in turn will impact on both future positions and the current ability to fulfil commitments (due to the above-mentioned role of investment). Finally, expectations on the future streams of profit (usually formed on the basis the more recent past experiences) guide current investment decision.

This leads us to the fifth element of our list. Fundamental uncertainty is at the core of Minsky's interpretation of Keynes' GT, “Keynes without uncertainty is something like Hamlet without the Prince” (Minsky, 1975:55). The mechanism through which euphoric expectations lead the economy towards increasingly speculative positions would not make sense in a world characterised by (shared) deterministic expectations and well-known probability distributions. This is the result of a decision process based on (Keynesian) convention to overcome radical uncertainty. The same holds true in periods of recession, when general negative expectations slow-down economic activity, making evident the need for government intervention.

Sixth, Minsky analyses a monetary economy. Money is a mean of financing and makes production possible, but it is also required to validate debt positions, and it determines new liability structure. The financing of economic (and financial) activities, as well as indebtedness, are always two sides of the same coin. This is true for Minsky, as it is *de facto* in any balance sheet.¹⁴ Two are, in our view, the characterising aspects of Minsky's views on money (Minsky, 2008). On the one hand, money enters the economy through credit to finance either real or financial activity and can be used ‘as a means of payment for goods and services and as an instrument by which debts are discharged.’ (*ibidem*:3). On the other hand, the money supply is considered endogenous and procyclical.¹⁵ In the upward phase of the cycle, the supply of money overcomes the limits imposed by monetary authorities and fosters the issuance of credit, feeding ‘booms’ and ‘bubbles’. This may be the result of an active and conscious effort of the financial system through balance sheet management, as well as of an endogenous increase (restrictions) in the types and amounts of liability accepted, due to euphoric (pessimistic) expectations. Within this framework, it becomes natural to identify banks as ‘endogenous destabilizers’. Whereas not directly determining them, they fuel the business cycles, supplying the credit during booms and cutting it during recession (see for example the episodes of ‘credit crunch’). In the FIH, banks are indeed the units that allow firms - and

¹⁴ We can say that enlarging the analysis of portfolio decisions in Chapter 17 of the GT to liability structures is arguably the key original contribution of Minsky to the work of Keynes.

¹⁵ Albeit money being central, the distinction between banks and other financial institutions in Minsky's works is often unclear or absent, so it is also the distinction between money and ‘quasi money’. This may be the cause of some controversies regarding Minsky's monetary theory. For instance, Rochon (1999) questions the existence of a theory of money endogeneity in Minsky. On the contrary, Wray (1992, 2015) - also referring to unpublished material - believe that Minsky had a clear understanding of the functioning of the monetary system and of the endogenous nature of the money supply. This debate can be interpreted in light of the contraposition between ‘structuralists’ and ‘accommodationists’ (or ‘horizontatlists’) Post-Keynesian monetary theories, with Minsky belonging to the first group.

the economic system in general - to undertake increasingly fragile positions. It is important to bear in mind that this behaviour of banks is not irrational, simply they live in the same economic environment of firms, with which they share the “expectations climate” (Minsky, 1986:255). Due to radical uncertainty, the euphoric expectations pushing firms to expand their business during booms is the same optimism motivating banks to expand credit. Finally, as abovementioned, Minsky considered capitalism to be a system in continuous evolution, whose different forms or stages, at times coexisting, succeed one another. The stages differ with respect to the characteristics of trades and industries, production costs, and balance of powers. Minsky (1988, 1996) characterizes them mostly according to the role and features of financial institutions. We may say that it is a ‘financial-based’ theory on the evolution of capitalism. The last stage, *Managed Money Capitalism or Money Manager Capitalism* (Minsky 1996) (henceforth MMC) sees the rise of institutional investors: on the one hand the development of private pension led to a massive accumulation of wealth in the hands of pension funds; on the other hand, due to inflation and regulations, money market and mutual funds emerged as a more convenient alternative to savings and deposits account. A large portion of corporate shares is therefore owned by funds, whose short-termed vision, due to the need to remunerate investors, influences corporate management¹⁶ and makes takeovers and merges easier.¹⁷ MMC represents a further step in the process of detachment of corporations’ financial needs from financial intermediaries toward capital markets, which resulted in banks changing their business becoming focused more on fee income related activities and providing finance to the other financial institutions.

A further characterizing feature of MMC is the rise of securitization, which deeply changed the face of the financial system. However, when Minsky identified this new stage of capitalism, major crucial financial regulations were still in place and numerous effects of this innovation had yet to emerge.

This idea motivates our attempt to provide a new reading of the FIH, by stressing its complementarity with an evolutionary perspective. Minsky (1993:106) further maintained that, “to understand the short-term dynamics of the business cycle and the longer term evolution of economies it is necessary to understand the financing relations that rule, and how the profit-seeking activities of businessmen, bankers, and portfolio managers lead to the evolution of financial structures.” For this reason, it can be argued that the FIH is just as much about evolutionary economics as it is about effective demand in a monetary economy (Knell, 2015:294).

4 INNOVATION, CREDIT, AND FINANCIAL BUBBLES

This section firstly offers a rapid overview of Schumpeter's contribution. Due to reasons of space this will necessarily be partial, nonetheless needed for the scope of our analysis. We then analyse the role of finance in both Schumpeter's framework and in neo-Schumpeterian contributions in general, in order to build a bridge

¹⁶ This is largely in line with the literature on shareholder-value orientation (Stockhammer 2005, Skott and Ryoo 2008, Hein 2010).

¹⁷ As the aim of this paper is to try to build a bridge between the Schumpeterian and Minskyian analysis, it is interesting to recall how according to Minsky, this stage of capitalism required the intervention of the State for the economy to be ‘technologically dynamic’. The short-term needs for funds could hardly be functional to the development of technological innovations.

between the Minskyian and the Schumpeterian literatures. The second part of this section presents our discussion of the key innovative features of the financial sector, contextualized into the (neo-) Schumpeterian theory of innovation.

4.1 Schumpeter's Financial Theory of Credit and the Dualism of Financial Firms

Schumpeter (1964/1939) characterized his dynamic description of economic development as a combination of endogenous determinants (i.e. innovations) and response mechanisms (i.e. business cycles) (see among others Alcoufie and Kuhn, 2004). His key argument is that the endogenous feature of this process is ultimately due to conditions inherent to the functioning of capitalist economic systems. Schumpeter's starting point in his theory of economic development is the description of a stationary state in which the economic system is merely reproducing a 'circular flow', which is characterized by competitive equilibrium. The essence of this equilibrium is the fact that firms have full control and understanding of the specific techniques in use at this specific point in time, simply because they have been actually employing them for a considerable period. This flow can be 'creatively destructed' only by economic development. In Schumpeter's view, only the entrepreneurial activity is the mean through which new 'combinations' of means of production (i.e. innovations) are introduced, thus breaking the otherwise static 'routine' (Schumpeter, 1982). As summarized by Winter (2006), Schumpeter identifies five groups of new combinations: new products, new means of production, new markets, new sources of supply, and new organization of industry. The appetite for future profits (or surplus over costs) by entrepreneurs is the key driver of innovative processes. The introduction of an innovation makes the appropriation of profits over the 'normal rate of return'¹⁸ possible, thus enhancing a new phase of accumulation.¹⁹ The dynamic feature of this process comes from the fact that "technical change is partly driven [...] by repeated attempts to cope with technological imbalances that it itself creates." (Dosi and Grazzi, 2009:180).

Along with the quite usual evaluation of Schumpeter's contribution discussed above, for the purpose of our analysis it is important to stress the connection between credit and innovation highlighted by the Austrian author, and specifically between the provision of credit and the dynamism of the economic system (Schumpeter, 1964/1939; 2014/1970). In his Treatise, Schumpeter (2014/1970) understands money as the clearing tool through which credit and debt positions, or claims and counter-claims, can cancel each other out. By modelling the economy as a system of accounts (household, firms, commercial banks, and the central bank), just as done by Minsky, Schumpeter is able to highlight the role of the banking system as the sector of the economy in which the account settlement takes place. This essential role within the capitalist system give to banks their unique ability to create new purchasing power, since "*every bank credit and every bank investment creates a deposit*" (Schumpeter, 2014/1970: 188, italic in the original). In particular, for Schumpeter (1951:153), banks are pivotal players in the innovation process, the providers of the means through which innovations are carried out by the entrepreneurial activity. The process of introduction of new combinations cannot be financed through past returns

¹⁸ This being the prevailing rate of profit within the 'circular flow'.

¹⁹ This view is criticized by Sweezy (1943), who argues that in an economic system characterized by a capitalistic class-structure, profits exists even without innovations. The accumulation process is thus not a mere consequence of innovation, rather a necessary condition imposed by the profit-making mechanism, which ultimately generates innovations that are functional to the preservation of both the mechanism itself, and the underlying class-structure.

(since in the equilibrium of the ‘circular flow’ profits and savings are assumed to be zero, and resources fully utilized), thus requiring fresh credit. In short, in the Schumpeterian scheme, innovations would simply be “impossible without new general purchasing power.” (Bellofiore, 1985:26). The provision of credit to specific (i.e. selected) firms or sectors, is the condition to provide a dynamic component to the two otherwise static elements of the system, i.e. the private property of means of production and competition in the market. Schumpeter characterizes the operation of the money market as basically “financing of production, trade, and speculation, the transactions of which ultimately require a special financing operation, since new combinations are being established with the help of “means”, of which newly created *ad hoc* means have the logical priority” (Schumpeter 2014/1970:316). Notably, Schumpeter introduced the concept of ‘functional differentiation of credit’ (Bezemer, 2014), distinguishing a ‘primary wave’ characterized by bank provision of credit for entrepreneurial productivity enhancements, from a ‘secondary wave’ of easy credit fuelling speculative activities. The financial side of the innovation processes is seldom central in the new-Schumpeterian literature, which instead largely focuses on the ‘real-side’ of the phenomenon (see for example Block *et al.*, 2017). The work of Carlota Perez on the relationship between credit provision and innovation is a praiseworthy exception. In several contributions, Perez (2002; 2009; 2010; 2011) underlines how the common trait in all the five technological revolutions²⁰ has been that, after the initial ‘irruption’ stage during which new technologies appear, the support provided by financial institutions has been a necessary condition for the establishment of a new techno-economic paradigm (Perez, 2009). The ‘risk-reduction mechanism’ inherent to the diffusion of the new paradigm attracts financiers, willing to take advantage of the increasing profit opportunities in an environment of low perceived risk (Perez, 2011:14). Entrepreneurs and financiers enter an upward spiral, or a bubble, in which more and more “entrepreneurs will offer their projects to the also growing number of financiers. If they seem to follow the new paradigm, all projects, good and bad, honest and crooked, are likely to have access to the required funds” (*ibidem.*). In order to accommodate this huge injection of funds, financial institutions introduce new instruments to support the absorption of the new paradigm by the specific economic sector(s), causing inflationary pressure on assets price. The latter and the speculative wave work as a counter-tendency to the primary one, eventually leading to the end of the cycle: when the bubble bursts, a recessionary phase kicks in. Perez (2002, 2011) identifies derivatives instruments as the main driver of ‘reckless finance’ in the ‘secondary wave’, a phase that she dubs a ‘frenzy phase’. In short, the argument is that the major financial bubbles were driven by massive processes of credit creation to install the various technological revolutions (see Perez, 2002, Chapters 10 and 13).

After this discussion, it becomes clear how Perez' work, by disclosing the financial aspects of new-Schumpeterian innovation-based business cycle theory, recalls Minsky's FIH²¹ and the above mentioned financial theory of business cycle. Indeed, the shift from the first (productive) wave of finance to the second (speculative) wave evokes the passage from *hedge* to *speculative* finance in Minsky's taxonomy. Jan Kregel

²⁰ These are the ‘The Industrial Revolution’, the ‘Age of Steam and Railways’, the ‘Age of Steel, Electricity and Heavy Engineering’, the ‘Age of Oil, the Automobile and Mass Production’, and the ‘Age of Information and Telecommunications’. See Table 1 in Perez (2011, p.190) but also Freeman (1995).

²¹ Somehow as Minsky did with the financial aspects of the GT (Macedo and Silva, 2008).

suggests a possible combination of the two theories: 'Financial regulation that is introduced in response to the crisis in the installation period provides the financing for the deployment period, and at the same time lays the seeds of financial innovation in the form of regulatory arbitrage that provides the financing for the installation period of the emerging paradigm' (Kregel, 2009:204). There are nonetheless non-trivial differences among the two theories. First, innovations in the real sector are not the driving force in the FIH. Second, unlike Perez, Minsky warned about the crucial role of the government in contrasting the recession following the boom in order to prevent 'it' (the Great Depression) to happen again. (Minsky, 1982). Third, and most important, Minsky focused on the liability side of firms' balance sheet and on their indebtedness, hence the inflow of money from the banking sector is central in his analysis. Perez refers instead to capital gains (bubbles), and therefore to a specific kind of financial instrument, namely shares, and to 'idle money'. In her view, financial markets, rather than commercial banks, are the core financial actors. However, her characterization does not devote much space to the complexity or to the evolving nature of the financial system (Kregel, 2009). Schumpeter himself did not devote many considerations to the innovative nature of the financial system. In fact, as we have seen, for him the source of the rupture of the equilibrium has to be located in the innovation process taking place within traditional entrepreneurial activities. In his framework, finance is confined to a complementary role, i.e. to make the innovation in the entrepreneurial real sector possible. The banking and the innovative sectors are functionally intertwined, since credit creation is seen as the "monetary complement of innovation" (Schumpeter, 1964/1939:111). Furthermore, the rupture of the equilibria determined by the innovative processes is not seen as negative, as these are rather instrumental to the renewal, hence strengthening, of the economy in what he famously deemed as a process of 'creative destruction'. However, we think that a Schumpeterian theoretical perspective can give interesting insights to understand the functioning of financial systems and, once combined with Minsky's contribution, its inherent destabilising effects.

Contrary to Schumpeter, Minsky focused on the innovations of the financial system considered to be highly innovative (Minsky, 1990) and saw this kind of innovation bound to determine instability: "Nowhere is evolution, change and Schumpeterian entrepreneurship more evident than in banking and finance and nowhere is the drive for profits more clearly a factor in making for change." (Minsky, 1993:106). In this sense, as underlined by Knell (2015), Minsky offered important insights to the analysis of the economy as a system in evolution. It has to be noticed that, for him 'evolution' was not necessary a synonym for progress. Quite the contrary, for instance he feared that the transformations of the financial sector in the 1980s could represent a 'retrogression' (Minsky, 1990). Within Minsky's financial Keynesianism, financial institutions' innovative character is mostly reflected in their ability to circumvent regulation through liability management, and more generally to increase the supply of credit finding "new ways to finance activities." (Minsky, 1986:220). This was bound to feed speculative positions and lead the system towards instability. Despite the undeniable crucial importance of finance even in the analysis of Minsky, as we have seen in section 2.1, the need for finance comes primarily from the production and investment decisions arising from the real sector.

We believe that, in order to grasp the extent of the impact of recent financial innovations, a radical change of perspective is needed. The evolution experienced by financial institutions led them to transcend their traditional role of credit providers, making them become 'producers' of financial commodities.

Although recognizing the emergence of a new stage of capitalism (MMC), Minsky did not have the time to observe fully its unfolding (hence, he never interpreted his FIH accordingly). Building on Perez (2011), Table 1 provides an updated list of technological revolutions and related techno-economic paradigms, and presents our reading of recent financial innovations: the financial system has experienced a technological revolution that characterizes a new regime of accumulation, having the financial sector at its core.

[Table 1 about here]

We argue that this ‘cluster of innovations’ can be placed under the label ‘securitization’. We believe that this interpretation of financial institutions as innovative entrepreneurs highlights the link that can be established between the work of Schumpeter and Minsky. In this sense, it is quite interesting to notice that this double role of financial institutions (being both credit provider and financial enterprises) had been somehow already noted by Schumpeter himself: “Financial institutions and practices enter our circle of problems in three ways: they are ‘auxiliary and conditioning’; banking may be the object of entrepreneurial activity, that is to say, the introduction of new banking practices may constitute enterprise and bankers (or other ‘financiers’) may use the means at their command in order to embark upon commercial and industrial enterprise themselves.” (Schumpeter, 1951:153, footnote 8). Taking into account this double role makes the combination between Schumpeter and Minsky possible, and allows us to present a valid framework for a novel understanding of the GFC. In our view, it was exactly the coincidence of this double role within the same entity that made the dynamic in the credit provisioning system so explosive.

4.2 Production and Innovation in the Financial Industry

This section describes the relatively recent innovation of financial firms (also stressing their peculiarity with respects to banks), building on a parallelism with the non-financial firms. We do this by firstly exposing the basic features of the ‘traditional’ firm, and then trying to understand the functioning of what we will identify as ‘financial enterprises’.

In one of his seminal papers, Dosi (1982) provided a very powerful understanding of technological advancement: “a technological paradigm is as an ‘outlook’, a set of procedures, a definition of the ‘relevant’ problems and of the specific knowledge related to their solution. We shall argue also that each ‘technological paradigm’ defines its own concept of ‘progress’ based on its specific technological and economic trade-offs.” (Dosi, 1982:148).²² Moreover, within a specific paradigm, “the way in which the direction of advance is programmed defines what the author named as technological trajectory” (Dosi, 1982, *ibidem.*). The selection and establishment of a particular technological trajectory, Dosi argues, happens according to two selection layers, i.e. an *ex ante* institutional one (the role of public or political forces) and an *ex post* one in which the market forces are predominant.

²² “The capitalist economic system is thus seen as characterized by a complex structure of feed-backs between the economic environment and the directions of technological changes.” (Dosi, 1982, p.151).

Reading the evolution of the financial sector using these building blocks provides valuable insights. It is important to note how today's financial system “bears little resemblance to that of our parents' generation. The changes in the past three decades alone have been remarkable. The financial markets have become increasingly globalized. Technology has transformed the efficiency, speed, and complexity of financial instruments and transactions” (The Financial Crisis Inquiry Commission, 2011, xvii). In our reading, financial institutions embodied the novel 'entrepreneur', with the traditional banking sector (on their same side) as the provider of credit. Even though most of the financing through *repo* agreements²³ (more on this below) took place within the investment banks sector, at the aggregate level commercial banks represented the main external source of funds (see Caverzasi *et al.*, 2018). The weakening and then the demise of the Glass-Steagall Act made the distinction between ‘financial entrepreneurs’ and ‘credit providers’ purely conceptual, resulting in the presence of almost fictitious counterparts. This institutional feature made the process of 'installing' the new paradigm even faster. In fact, the usual bargaining process between the entrepreneur and the banker (both in terms of interest rate setting, and *ex ante* evaluation of the project) hardly applies to this new environment.²⁴ In this new setting, the importance that the evaluation of projects and the expectation on profits had in the traditional relationship between banks and corporations is downplayed. On top of this, financial firms were able to implement all the different steps of the securitization process within the same institution. These features made the credit provision mechanism explosive. Looking again at Table 1, this peculiarities can be brought as a partial explanation for the relatively short period elapsed between what we identified as the most recent innovation (mid-1980s) and the explosion of the bubble (i.e. the 2007-8 crisis), if compared with the periods between the previous technological revolutions and the subsequent specific crisis (e.g. the introduction of Intel microprocessor in 1971 and the *dot.com* bubble in 2001).

In our view, the 2007-8 crisis was not the result of an innovation on the real sector that fostered credit creation (as argued by Perez for the previous crises), but came from an (or better, a series of) innovation intrinsic to the financial system itself, namely *securitization* defined as the business of packaging and reselling loans, with *repo* agreements as the main source of funds (Gorton and Metrick, 2012:425). The process is rather complex and encompasses several steps, which involve different kinds of financial entities. Banks issue loans, which are moved into the balance sheets of Special Purpose Vehicles (SPVs) in exchange for deposits. Loans were then merged into mortgage pools and distinguished according to their level of riskiness. These were then sold to financial firms, such as investment banks, often financing their purchases through *repos*, and then used to produce Asset-backed Securities (ABSs), commonly mortgage backed securities (MBS, i.e. with the underlying being a mortgage), but also increasingly complex financial products (e.g. collateralised debt obligations (CDOs), and even more complex products such as the so-called ‘squared-CDOs’). Securities were so complex and often obscure, and made of numerous pieces from various loans with uncorrelated assets underlying the instruments

²³ “A *repo* is the sale of a security, or a portfolio of securities, combined with an agreement to repurchase the security or portfolio on a specific future date at a prearranged price. Aside from some legal distinctions concerning bankruptcy treatment, a *repo* is similar to a collateralized loan” (Copeland *et al.*, 2012, p.18).

²⁴ See Bertocco (2001) for a discussion and Caiani *et al.* (2014) for a model of this issue.

that were easily being considered safe, hence obtaining the notorious ‘AAA’ class by rating agencies.²⁵ *Repos* had a crucial role in this scheme as they represented on the one hand a safe source of finance and a very liquid safe form of short term investment for financial institutions, and on the other hand a source of demand since MBS were used as collaterals in this kind of collateralised loans. In brief, this financial production process entails four steps, among which two transformation procedures: a) the issuance of the loans, b) its transformation into a financial commodity through standardisation and partition, c) the transformation of financial commodity into complex financial products, and d) the sale of the structured asset to wealth owners.

The basic economic role of a ‘traditional’ firm within a capitalist system of production can be summarized as the coordinated transformation of inputs in goods and/or services to be sold to the market in order to obtain a profit. Again simplifying, the two key building blocks of the functioning of a firm are the technological possibilities (what the firm can do) and the behavioural objectives (what the firm wants to do). The first component is usually described through a production function in which inputs (usually labour and capital) are combined, whilst the second component is usually summarized with the ‘profit maximization’ goal.²⁶

Following Winter (2006), a theory of firm's behaviour that aim at being consistent with the contribution by Schumpeter (Schumpeter, 1982, Chapters 1 and 2) would be a “historical theory in the sense that significant differences among firms would be regarded as historically determined; it would be as dynamic theory because only in the context of such a theory can the traditional problems of price theory be confronted anew, and, ideally, it would be probabilistic - the existence of a multiplicity of unobservable factors that shape firm behaviour would be explicitly recognized.” (Winter, 2006:140). In more recent contributions, the evolutionary theory of the firm also stresses the importance of dynamic resource-based, and process-oriented functioning to explain the introduction of new resources and capabilities (see among others Rahmeyer, 2007).

As briefly discussed above, innovation can take multiple forms (see Winter, 2006). In the last three decades, the banking sector experienced technological changes more in the form of new services and products, rather than in terms of organizational structure (Fram and White, 2014). Thus, without neglecting the organizational side of financial innovation, we will focus on the ‘new combinations’ in form of new products and services.²⁷ According to the technical definition, the financial system can be divided into two main groups, i.e. ‘depository’ and ‘non-depository’ institutions. The first group identifies financial institutions that provide loans, and collect deposits on which interests are paid (i.e. banks, and credit unions). The second group consists of all those institutions that produce and sell financial products (i.e. brokerage firms, mutual funds, and insurance companies).²⁸

²⁵ As for example in the infamous fraud case of ‘Abacus’ by Goldman Sachs. See for example this article available at: <https://www.theguardian.com/business/2010/jul/16/goldman-sachs-record-abacus-fine> (last accessed June 27, 2018) for a summary of this case.

²⁶ Among the various ways of challenging this conventional assumption, it can be argued that firms' behaviours are actually multidimensional, and ultimately respond to a vector of different objectives. In addition, as argued by Lavoie (2014, p.128-129), these objectives can be seen as means to the ultimate goal of the firm, which is the increase in its power over the different features of the environment in which it is actively operating (e.g. investment financing, pricing, legislation, etc.)

²⁷ It is also helpful to keep in mind that, in terms of structure, a model of either firms' process or product innovation should integrate multiple perspectives, i.e. “economics (firm size and market structure, product costs and price elasticity, trade flows) management and engineering (type of innovation, cost impact on production process, degree of technical change required) and organization theory and behaviour (organization structure, formality, planning process, communication).” (Utterback and Abernathy, 1975, p.634).

²⁸ As explained by Gorton and Metrick (2010), these disaggregation, and further disaggregation within the non-depository institutions is evident from a legal point of view. However, after different waves of financial deregulation this distinction became blurred. In

We argue that, among a variety of businesses, the key output produced by financial firms are structured financial products, which production is ultimately made possible by a generalised process of *commodification of financial relationships* (Botta *et al.*, 2015).²⁹ Essentially, as for ‘traditional’ firms, this production is carried out through the use of acquired inputs (the raw materials), or what we can call ‘primary’ financial assets or liabilities such as mortgages, for the production of structured financial instruments. As noted by Sealey and Lindley (1977) for depositary institutions, this type of production “is essentially analogous to the manufacturing firm where one production department produces and supplies an output which is used directly as an input in another process. Eventually, the intermediate outputs culminate in the final economic output of the firm, i.e., earning assets. The output of the financial firm is, therefore, produced with capital, labour, material, and loanable fund inputs where loanable funds are ‘produced’ through other production operations of the financial firm.” (Sealey and Lindley, 1977:1254).

In the case of financial firms, as we saw securitized mortgages (MBSs) are used as inputs for the production of collateralized debt obligation (CDOs), a structured financial product that pools and repackage cash-flow generating assets (the collateral). In a similar way to what explains the appetite of entrepreneurs to innovate, the key driver for a financial innovation like securitization has been the opportunity for an increase in profitability for the whole financial sector (Botta *et al.*, 2018). In brief, the “business of banking is a trade-off between the appeal of profits and fear of losses. Profits are made by lending more, and by innovating in providing new financial products.” (Lavoie, 2014:255). The various financial innovations³⁰ can have multiple, complementary, impacts on the functioning of the economic system. In fact, they are likely to a) reduce costs, b) reduce risks, and c) improve the supply financial services both qualitatively and quantitatively (Fram and White, 2014). Accordingly, asset securitization provides less expensive (or lower-cost financing) and more broadly available credit. In addition, if past innovations generated within the real side of the economy were fuelled by increasing credit availability, with securitization we are in a situation of ‘credit for credit’. The innovative aspect of securitization is therefore twofold. On the one hand it represents an evolution in the ‘form of balance sheet management’, as banks - moving from an ‘originate and hold’ to an ‘originate and distribute’ scheme - were indeed able to overcome any limitation based on the composition of their balance sheets. Kregel (2009) explains how US banks in the 60s had moved from *asset management* (that is to say profit-seeking through resource allocation) to *liability management* (i.e. to seek new kinds of funding) in order circumvent regulation and maintain competitiveness with other financial institutions. Securitization can be conceived as an innovative form of ‘*asset management*’, with long term risky assets removed from the balance sheet. On the other hand, securitised asset represented a new product, and a hence new source of profit, arising mainly from fee income.

If following Dosi and Grazzi (2009:180), we broadly define technology as “a set of pieces of knowledge ultimately comprising selected physical and chemical principles, know-how, methods, experiences of successes and failures, and also, of course, physical devices and equipment”, it is glaring how this new business is

addition, it has been shown how financial firms pursued strategical vertical integration in order to appropriate profits in all the layers of the mortgage industry (Goldstein and Fligstein, 2017).

²⁹ See also Lysandrou (2005) on this specific point.

³⁰ An exhaustive discussion of the many financial innovations introduced since the 1960s is beyond the scope of this work. The interested reader can find a comprehensive description in Fram and White (2014).

technologically advanced, as testified also by its voracious absorption of high skilled labour (Cecchetti and Kharroubi, 2012; Kneer, 2013). The parallelism with standard (*i.e.* non-financial) technological revolution holds also with respect to the aforementioned selection and establishment process, with a primary institutional role played by Government Sponsored Enterprises (GSE) and a second layer of selection and advancement led by the financial markets.

The similarities between traditional and financial firms are very significant, nonetheless, the differences are non-trivial, and determine major impacts on the functioning of the economy. The key difference is that the former experiences constraints on potential utilisation from “the physical limits of the process technology, but with intangible financial products, process technology does not constrain output in the same way.” (Nightingale and Spears, 2010:18).³¹ Theoretically, financial firms have no constraints in their production, apart from the inherent ‘scarcity’ of creditworthiness in the system. Indeed, banks, while endogenously creating money through loans, at the very same time they create the (raw) commodity that is essential to the financial production process. This determines a condition of *endogenous creation of commodity*, a unique privilege of the financial industry, for which a counterpart in the realm of traditional industries cannot be found. Moreover, even the constraint to commodity creation posed by the presence of creditworthy borrowers has been relaxed due to securitization. Banks are now able to clean their balance sheet from risky assets, whenever these are moved to the balance sheets of Special Purpose Vehicles, transformed into structured financial assets and then sold. This erases what in Minsky's view represented the real limit to credit supply, given the aforementioned ability of financial institutions to circumvent regulation, namely borrower's risk: “The ruling borrower's and lender's risk sets limits upon the rapidity with which the opportunities for profits through liability management are exploited.” (Minsky, 1986:235). The rupture of the legal boundaries between credit provider (commercial banks) and financial producer (investment banks), together with the weakening of the limits posed by lenders' risk, set the stage for the explosive dynamic we witnessed. Through the words of one of the experts interviewed, the Inquiry Commission perfectly captures the (Schumpeterian) innovative character of securitization, and the related Minskyian dynamic in which the economy endogenously transit from sustainable growth to financial instability, and ultimately *Ponzi* behaviours: “Securitization was one of the most brilliant financial innovations of the 20th century.” Mr. Rokakis told the Commission. Minsky acknowledged the centrality of securitization in the new phase of capitalism: ‘There is a symbiotic relation between the growth of securitization and of money managed capitalism’ (Minsky 1988:36). He recognised the capacity of securitization to allow to overcome balance sheet limitations and to transfer the risk to the holder of the securities. However, he did not have the chance to observe the evolutions of the financial system - *in primis* the deregulation of the financial system which led to the dismissal of the Glass Steagall Act – which eliminated crucial boundaries to the securitizing system. He believed that institutional fragility would have been replaced by inability to perform of particular financial instruments. He could not witness the large diffusion of securities in the balance sheets of financial institutions nor their systemic role as collateral for repo operations in the money market. The financial system and the MMC itself

³¹ See also Nightingale and Poll (2000) on this.

evolved to something different from what he witnessed. A mutation that, as we will try to show in the next section ultimately led to the *sub-prime crisis*.

5 AN ALTERNATIVE READING OF THE GREAT FINANCIAL CRISIS

Once the entrepreneurial innovative feature of financial institutions is acknowledged, it is possible to look at the GFC through the lens of Minsky's financial-Keynesian framework, thus obtaining an explanation of the events that does not substantially differ from the original FIH. Differences are limited to the 'location': unlike in the original exposition of the FIH, the destabilising dynamic in the building up of the recent crisis was not linked to the indebtedness of firms in the real sector, and rather took place among what we defined as 'financial firms'. In fact, a pretty standard Minskyian dynamic was ignited by innovations in the financial sector. As it should be clear by now, the process of securitization represented a sensational business for the financial sector, thus attracting an increasing number of financial firms. The business was at first both remunerative and secure, with financial firms playing the role of Minsky's *hedge* units. The *destabilizing stability* then exerted its effects, also thanks to the deregulation of financial markets (Sherman, 2009), and the units involved in the securitizing system shifted toward increasingly *speculative* and *Ponzi* positions (Acharya and Richardson, 2009; Dagher and Fu, 2017) up to the point in which the system was not sustainable anymore.

The issuers of the loans, namely banks and other depository institutions, significantly lowered their credit standard. This translated in a dramatic deterioration of the financial commodities. The average Loans-to-Value ratio³² reached its peak of 94% in 2005 and the sub-prime mortgages which used to represent an exception - 8% of total mortgages in 2003 - became almost consuetudinary, reaching the climax of one fifth of new originated mortgages in 2005 and 2006.³³ Also, the financing of financial activities became much easier. A measure of this can be found in the chain of repledgement of collaterals in the *repo* market, which Singh (2011, 2012) shows to have peaked before the crisis, and in the sky-rocketing increase in the amount of *repo* deals by investment banks (see Caverzasi *et al.*, 2018). The boom in production of financial assets is well described by the words of 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" (cited in Goda and Lysandrou, 2014:314). Exactly like described by Minsky, when monetary authorities tried to counteract the booming supply of credit by raising interest rate, the crisis started.

The new 'location' of the financialized FIH brings aspects of novelty in its consequences. First, financial firms panicked and started selling their assets (i.e. securities) whose values collapsed, as in the first stages of the standard Fisherian debt-deflation story recovered by the FIH. This time, however, the 'fire sale' of assets affected mainly securities. The aforementioned obscurity of CDOs, which was actually a pro in the upward phase of the cycle (also allowing them to obtain triple AAA ratings), became a severe drawbacks due to the fact that it became

³² See Duca *et al.* (2011) for a more accurate analysis of this measure.

³³ See Joint Center for Housing Studies of Harvard University (2008).

impossible to determine their values. The destabilising effects were augmented by the vast use of these assets in the *repo* market. The Fisherian debt-deflation of this financialized FIH underpinned what Gorton and Metrick (2012) defined as a ‘run on *repo*’. Second, it is undeniable that the sub-prime mortgage crisis was characterized also by an unsustainable level of households’ indebtedness. It is also true that Minsky's taxonomy of financial positions can be fruitfully applied to the household sector, with households rolling over on debt in order to be able to meet their financial commitments perfectly representing *Ponzi* units. However, without neglecting the existence of speculative behaviours in the real estate market, we argue that the unsustainable dynamic primarily sprang from the behaviour of financial firms, with the debt trends in the household sector representing a reverberation of destabilizing dynamics inherent to the financial sector itself. This last argument is supported by the descriptive evidence about the historical evolution of the sizes of household’s and financial firms’ respective debts. In facts, as can be seen from Figure 1, the accumulation of debt by US financial firms has been huge in comparison to the household sector, both in terms of levels and growth rates.

[Figure 1 about here]

Figure 1 is highly telling, showing a dramatic increase for both households and financial firms, although between 1970 and 2008 the debt of the latter showed an astonishing growth rate of about 970% (against a still important 139% growth for household debt, which still remains relatively less important than the debt dynamics in the non-financial sector). In addition, in the various decades the growth rate of household debt has always been lower than the one of financial firms.³⁴ This empirical comparison between the relative evolution of households' and financial firm's debt suggest that, in the long-run, and especially since the mid-1980s, the GFC could be read as a story of progressive and unsustainable indebtedness of the financial sector. Following Botta *et al.* (2015), the increasing demand of securitized debt from financial firms (i.e. brokers and dealers or investment banks) triggered the supply of credit by the banking sector to be securitized, which was then sold to non-banking financial institutions. Albeit developing within a new ‘location’, in addition to the aforementioned differences, the crisis can be read through the lens of Minsky's financial Keynesianism in each of its components recalled in section 3.2. First, the very attempt of actualising the FIH by putting financial firms and the production of financial assets at the centre of the stage is deeply in line with Minsky's view of Capitalism, namely an evolving system whose core is within the financial sector. Second, Minsky's inter-temporal dimension according to which the “capital development of a capitalist economy is accompanied by the exchange of present money for future money” (Minsky, 1992b: 2), perfectly describes the market of securities, where deposits (i.e. present money) are exchanged for financial assets, which are nothing but ‘claims’ on future streams of money.³⁵ The securitization process captures the very gist of this description of a capitalist economy abstracting from (or trying

³⁴ Data source FRED: <https://fred.stlouisfed.org/series/> (last accessed November 2018), Federal Reserve Bank of St. Louis; Debt for the household (and no-profit organization) sector is the sum of credit market instruments and home mortgage (codes CMDEBT + HHMSDODNS); non-financial corporate debt consists of their debt securities (code NCBDBIQ027S), and for financial firms it is the sum of their debt securities and total loans including security repurchase agreements (codes FL794122005.Q + FL794135005.Q).

³⁵ A very similar vision about the basic function of the money market can be found also in Schumpeter's *Treatise on Money* (see Schumpeter 2014/1970; 316).

to get rid of) the direct link with real production. Uncertainty played its crucial role, inducing 'euphoric expectations' in the securitization system, a blind confidence on the continuous growth in the house price, and a (over)confidence in the liquidity of Asset-Backed Securities as collateral. Hence, increasingly unsustainable speculative behaviours within the financial system became conventional. Similarly, uncertainty was central in the unfolding of the crisis, as financial markets froze, and trust vanished (Gorton and Metrick, 2012). This led a *deb-deflation*, just as described in the original version of the FIH. Moreover, money and its creation has never been so central and, albeit the production process has changed, a monetary theory of production can fully grasp the securitization process.

As described in section 3, Minsky enlarged Keynes' portfolio analysis to the liability side: any investment, real or financial, requires to be financed, therefore it is linked to debt. Here, we somehow expand the FIH along this very same lines and adopting his view of the economy as a set of interrelated balance sheet. Applying Minsky's insights to the new economic scenario with financial firms at the centre of the stage allows to consistently apply the FIH (see Appendix 1), hence obtaining an original Minskyian interpretation of the crisis. The very same debt (e.g. mortgage) that is used to finance the acquisition of an asset (house) represents an asset for someone else, which is usually located in the financial sector. This asset is then 'commodified' in the first step of the securitization process, and used in the manufacturing of financial products. Therefore, money creation through credit has the double role of financing the purchase of the asset on the one hand, and of creating a financial commodity on the other hand. Furthermore, credit, usually in the form of *repos*, is needed by financial institutions in order to purchase their financial raw material (e.g. mortgages) to be transformed (e.g. into MBS) and sold. Therefore, the link between money and production that is at the core of both Schumpeterian and Minsky' analysis is still present in this *financialized monetary theory of production*. A crucial and characterizing element of this form of production is that the endogenous nature of money creation made the dynamic self-feeding, hence highly explosive. Banks were able to create the commodity *ad libitum* and, at the same time, to finance their purchase through *repo* for the production of structured finance. The macroeconomic implications of the link between money and investment discussed in the introduction - which Minsky views as the connection between Schumpeter and Keynes - takes here a peculiar form. Just as Minsky described happening after the Second World War, with housing at the centre of the US economy and residential investment taking the place of entrepreneurial investment in the Kaleckian scheme. Residential investment in 2005 amounted to 6.6% of the US GDP from being around 4% during the 90s. The banking system was at the very centre of the securitization scheme. It supplied liquidity in form of *repo* agreements to financial firms (i.e. brokers and dealers and investment banks), which in turn used this funds to purchase Asset-Backed Securities (e.g. mortgage-backed securities, home equity loans) that had been previously assembled by the banking system itself. Financial firms obtained access to *repo* using Asset-Backed securities held as collateral. From this, it becomes clear how banks have been able to stimulate the demand for these securities. We might say that Schumpeter's *ephors* led the economy toward a dangerous path, as the banks took on their Minskyian role of endogenous destabilizer. The dynamic described above stimulated the production of structured financial products by financial firms, with a counterpart in the increasing indebtedness of households. In fact, the expansion of credit from banks to back the 'diffusion' of the new financial innovation has been sustained by an 'enforced indebtedness' of households. To

sustain demand of Asset-Backed Securities from financial firms, banks had to induce households to get indebted. How they managed to do this? It is worth reminding that the main reason behind indebtedness of households, and especially the US ones, is the purchase of a dwelling. The peculiar environment of the US market from 1996 to 2005 saw house prices rising by 45%, an increase not driven or explained by fundamental factors such as income or population growth (Baker, 2005). Within this context, securitization allowed banks, and the financial system as a whole, to leave their 'usual' position in which lending is hedged against default, and in which the borrower could always pay back both interests and principal through mortgage re-payments. Banks encouraged lending also by altering the risk assessment ratio used in the decision for conceding a loan: instead of the 'mortgage-to-income' ratio, they started employing the 'loan-to-value' ratio, where the denominator indicates the appraised value of the asset (i.e. dwellings). It is easy to see that when considering the latter relation, if there is a situation of apparently everlasting increase in the price of houses, the amount lent will be higher.³⁶ In addition, with increasing houses' prices the new stipulated mortgages will have to be relatively larger. In a context of sluggish household income as in the US in the period before the crisis (Cynamon and Fazzari, 2008; Barba and Pivetti, 2011), substituting the mortgage to income ratio with the loan-to-value one proved to be a real boost to banks' lending. The relative importance of house prices as a determinant of households' borrowing has been modelled Ryoo (2016)³⁷ and empirically assessed by Wildauer and Stockhammer (2018) for a sample of OECD countries. Moreover, Wildauer and Stockhammer (2018) shows how, specifically for the US, the 'expenditure cascade hypothesis' (Frank *et al.*, 2014) seems to hold, thus household may also take higher consumption norms as a reference, and be more willing to borrow on top of their more valued houses. As a result of the increase in house prices, a perverse dynamic in which on the one side the banking system was pushing lending, and on the other side the households sector was increasing demand for borrowing, emerged. Furthermore, banks became less strict about the screening of potential borrowers, and there is evidence that this behavioural twist has been incentivized specifically by securitization practices (Keys *et al.*, 2010), which allowed them to substantially get rid of lender's risk. The reason that make mortgages the ideal instrument for the securitization system is twofold, and linked to the double nature of banks' business, which were both credit provider and creator of financial commodities. On the one hand, as a source of funds mortgages were highly demanded by borrowers for their housing needs, and for speculative reasons in face of the aforementioned boom. On the other hand, mortgages appeared as very attractive financial commodities since considered safe due to the increasing prices of the underlying collateral, i.e. dwellings. In brief, especially in the case of sub-prime mortgage lending, the increase in house prices temporarily put a veil on the potential negative effects of both pro-lending risk assessment ratio, as well as a poor screening of borrowers (Demyanyk and Van Hemert, 2009).³⁸ When a condition in which both

³⁶ Qi and Yang (2009) discuss the importance of the usage of this new ratio in banks' lending by empirically showing how current loan-to-value has been the most important, and positive, determinant of the size of banks' losses when the borrower default on loans.

³⁷ Ryoo (2016, p.471) explains that his "framework combines household debt dynamics with behavioural asset price dynamics in a Keynesian macro model. [...] endogenous boom-bust cycles can emerge through the interaction between household debt and housing price dynamics".

³⁸ In addition, another feature securitization that is similar to what happened for previous innovations has been its impact on the relative cost structure, which further promoted the rise of this new 'paradigm'. In fact, going back to the discussion about financial innovation (Section 3.2), and again borrowing the terminology from Perez (2009), this new input a) provided relatively cheap credit, b) was unlimited in the foreseeable future, and was c) all-pervasive in its applications (on these three points see also Botta *et al.*, 2018).

house prices rise and economic growth is sustained materializes, the credit provision mechanism rest on the optimism of both lenders and borrowers, which are becoming less and less risk averse. Exactly as Minsky described in the FIH. The growth in bank lending pushes house prices up, at the same time increasing broad confidence and fostering expectations about further rising prices (and profits). At the same time, within the financial system itself, this condition was translated to an intensification of the *repo-for-ABS* mechanism described above. In sum, financial firms increasing demand for securitized assets was sustained through the novel banks-households credit relationship. During this phase, credit, (and thus profits) for financial firms seemed to have no limits. ‘Speculative lending’ replaced ‘hedged borrowing’, on the basis of rising asset (houses) prices, and thus the perceived high liquidity of Asset-Backed Securities. This situation embodied the switching point from *hedge* to *speculative* and eventually *Ponzi* positions described by Minsky in the case of firms (Minsky, 1992b), in which ‘success breeds excess’. *Ponzi* positions are by definition not sustainable in the long period, and the bubble inevitably had to burst. As discussed above, we can identify two interconnected drivers of overconfidence that were distinctive of this phase: the rising price of houses and the consequential high liquidity of ABS. Following Gorton and Metrick (2012), the explosion of the bubble for this financial innovation started in the summer of 2007. We saw that the activity in the financial system became so complex and decoupled from the real system such that counterparties' risks became unidentifiable and unmeasurable (Botta *et al.*, 2015).

The obscurity of the structured securities, from being the driver of high credit ratings, became a motive for panic, due the impossibility of pricing the assets.³⁹ This situation led to a fire sale of securities that took the form of a ‘run on *repo*’ (Gorton and Metrick, 2012). The increase in *repos* haircut presented by Gorton and Metrick (2012) in Figure 4, which is the amount of collateral demanded for these transactions (thus measuring the supposed underlying risk of the collateral) mirrored a decrease in the valuation of the asset compared to its market value: “With declining asset values and increasing haircuts, the US banking system was effectively insolvent for the first time since the Great Depression” (Gorton and Metrick, 2012:425). The second ‘run on *repo*’, with a 20 percentage points increase in the haircut in just one month, occurred in September 2008 (see again Figure 4 in Gorton and Metrick, 2012), when Lehman Brothers was declared bankrupt: “In this second event, we see parallels to 19th century banking crises, with a famine of liquidity leading to significant *premia* on even the safest of assets” (Gorton and Metrick, 2012:448). These fire sales of securities and their subsequent fall in price represent nothing more than the last step of the FIH, i.e. the start of a Fisherian debt-deflation. As abovementioned, Minsky captured the new phase in the evolution of capitalism (MMC), and was able to grasp the cornerstone role that securitization played in it. However, he did not have the chance to observe the unfolding of the new financial practices, together with the changes in financial regulations that made an innovation (securitization) at the centre of a whirlpool of speculation. This innovation evolved from the financial

³⁹ In a press release, on the 9 of August 2007 BNP Paribas suspended the calculation of the Net Asset Value of major investment funds, given the “complete evaporation of liquidity in certain market segments of the US securitisation market”. See the full statement here: <https://group.bnpparibas/en/press-release/bnp-paribas-investment-partners-temporally-suspends-calculation-net-asset-funds-parvest-dynamic-abs-bnp-paribas-abs-euribor-bnp-paribas-abs-eonia> (last accessed June 27, 2018) and a comment here: <https://www.reuters.com/article/us-bnpparibas-subprime-funds/bnp-freezes-2-2-bln-of-funds-over-subprime-idUSWEB612920070809> (last accessed June 27, 2018).

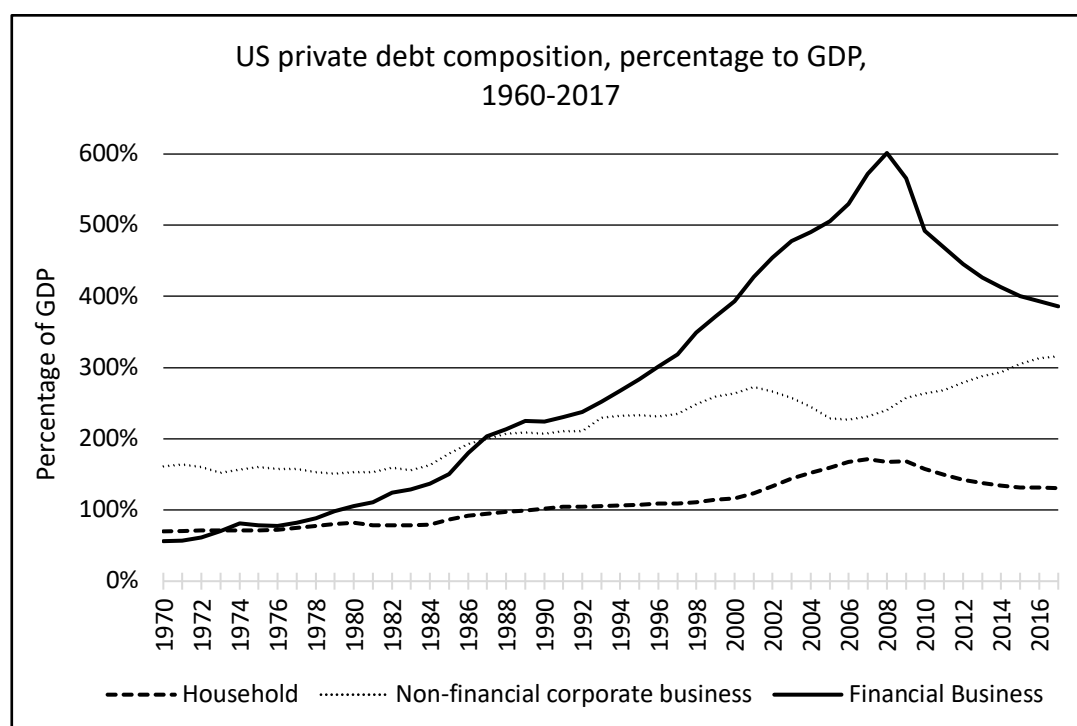
sector and involved the 'real side' of the economic system, in particular what was believed to be one of its most stable components, namely the real estate market.

6 CONCLUDING REMARKS

In this paper we propose a description and an explanation of the so-called 'Great Financial Crisis', which builds on both Schumpeter's (and neo-Schumpeterian) and Minsky's contributions. We developed and described a new version of Minsky's Financial Instability Hypothesis, which is consistent with the key features of a *financialized monetary theory of production*. We explained how, in our view, the FIH is the outcome of a complex theoretical framework developed by Minsky, in which the investment (and financial) decision is paramount in driving the business cycle. The 'ingredients' of Minsky's financial theory of business cycles shed new light on the importance of the FIH beyond its traditional representation. We discussed Schumpeter's contribution by proposing a 'financial' reading of his theory of innovation, also referring to the recent neo-Schumpeterian theories about the 'innovation-credit-crisis' cycle. We then presented our argument according to which the evolution experienced by US financial institutions led them to transcend their traditional role of credit providers, making them become 'producers' of financial products, through securitization. The coincidence of this double role within the same entity made the dynamic in the credit provisioning system explosive. Our 'evolutionary' reading of Minsky's work in combination with Schumpeter's contribution, which we centred on the innovative features of financial institutions, allowed us to achieve the key goal of this paper. In fact, the resulting theoretical framework has been employed to provide a novel explanation of the GFC. According to our argument, the pathogens that led to the crisis were congenital to the specific (innovative) form that the US capitalism assumed since the early 1980s, and that the bursting happened in the sub-prime mortgage market precisely because of the specific forces fostered by the new role that financial firms acquired through securitization. Our analysis aimed at providing a 'structural interpretation' of the GFC, that is the identification and understanding of the endogenous forces that progressively drove the US economy towards an unsustainable financial position, making the crisis an inescapable event. This papers calls for future research about a deeper understanding of the novel, active, and ultimately innovative role of financial firms within developed capitalist systems. Future research would explore the steps of financial production in more details, the specific phases of the formation of a financial bubble, as well as the role of technological innovation in financial production.

FIGURES AND TABLES

Figure 1. An historical view on household and financial firms' debts. US private debt composition as a percentage to GDP, and growth rates per period 1970-2017.



	1970 - 1979	1980 - 1989	1990 - 1999	2000 - 2008	1970-2008
Household debt to GDP	14.89%	21.14%	12.09%	43.51%	139.28%
Financial firms debt to GDP	74.20%	113.62%	65.88%	52.98%	969.58%

Source: Authors' calculation based on series provided by Federal Reserve Economic Data (FRED).

Table 1. An updated taxonomy of technological revolutions

Technological Revolution	Popular name for the period	‘Big-bang’ initiating the revolution	Year	Core country (or countries)
First	The Industrial Revolution	Arkwright’s mail opens in Cromford	1771	Britain
Second	Age of Steam and Railways	Test of the Rocket steam engine for the Liverpool-Manchester railway	1829	Britain (spreading to Europe and USA)
Third	Age of Steel, Electricity, and Heavy Engineering	The Carnegie Bessemer steel plant opens in Pittsburgh, PA	1875	USA and Germany (and later Britain)
Fourth	Age of Oil, the Automobile and Mass Production	First Model-T comes out of the Ford plant in Detroit, MI	1908	USA spreading to Europe
Fifth	Age of ICT	The Intel microprocessor is announced in Santa Clara, CA	1971	USA to Europe and Asia
<i>Sixth</i>	<i>Securitization</i>	Fannie Mae issues its first <i>Mortgage Backed Security (1981)?</i> First <i>Asset Backed Security (1985)?</i> First <i>Collateralized Debt Obligation (1987)?</i>	<i>1981-1987</i>	<i>USA to Europe and worldwide</i>

Source: Authors' elaboration based on Perez (2011)

REFERENCES

- Acharya, V. V. and M. P. Richardson (2009). Causes of the financial crisis. *Critical Review* 21(2-3), 195-210.
- Alcoufie, A. and T. Kuhn (2004). Schumpeterian endogenous growth theory and evolutionary economics. *Journal of Evolutionary Economics* 14(2), 223-236.
- Arestis: and M. Glickman (2002, March). Financial Crisis in Southeast Asia: Dispelling Illusion the Minskyian Way. *Cambridge Journal of Economics* 26(2), 237-260.
- Baker, D. (2005). The housing bubble fact sheet. *CEPR Issue Brief*, Washington DC, 1-5.
- Barba, A. and M. Pivetti (2011). Changes in income distribution, financial disorder and crisis. In G. F. E. Brancaccio (Ed.), *The Global Economic Crisis New Perspectives on the Critique of Economic Theory and Policy*. Routledge, London.
- Behlul, T. (2014). Was it really a Minsky moment? *Journal of Post Keynesian Economics* 34(1), 137-158.
- Bellofiore, R. (1985). Money and development in Schumpeter. *Review of Radical Political Economics* 17 (1-2), 21-40.
- Bellofiore, R. and P. Ferri (2001). Things Fall Apart, the Centre Cannot Hold. In R. Bellofiore and P. Ferri (Eds.), *Financial Keynesianism and Market Instability: the Economic Legacy of Hyman Minsky*, Volume I, pp. 1-30. Cheltenham Edward Elgar.
- Bellofiore, R. and J. Halevi (2009). A Minsky Moment? The Subprime Crisis and the New Capitalism. In C. Gnos and L. Rochon (Eds.), *Credit, Money and Macroeconomic Policy. A Post-Keynesian Approach*. Cheltenham, Edward Elgar.
- Bellofiore, R., J. Halevi, and M. Passarella (2010). Minsky in the New Capitalism. The New Clothes of the Financial Instability Hypothesis. In R. W. D. Papadimitriou (Ed.), *The Elgar Companion to Hyman Minsky*, pp. 84-99. Cheltenham, Edward Elgar.
- Bertocco, G. (2001). Is Kaldor's theory of money supply endogeneity still relevant? *Metroeconomica* 52(1), 95-120.
- Bezemer, D. J. (2014). Schumpeter might be right again: the functional differentiation of credit. *Journal of Evolutionary Economics* 24(5), 935-950.
- Bhattacharya, S., C. A. Goodhart, D. P. Tsomocos, and A. P. Vardoulakis (2015). A reconsideration of Minsky's financial instability hypothesis. *Journal of Money, Credit and Banking* 47(5), 931-973.
- Bibow, J. (2010). On exogenous money and bank behaviour: the Pandora's Box kept shut in Keynes' theory of liquidity preference? *The European Journal of the History of Economic Thought* 7(4), 532-568.
- Block, J. H., C. O. Fisch, and M. Van Praag (2017). The Schumpeterian entrepreneur: a review of the empirical evidence on the antecedents, behaviour and consequences of innovative entrepreneurship. *Industry and Innovation* 24(1), 61-95.
- Botta, A., E. Caverzasi, and D. Tori (2015). Financial-real-side interactions in an extended monetary circuit with shadow banking: Loving or dangerous hugs? *International Journal of Political Economy* 44(3), 96-227.
- Botta, A., E. Caverzasi, and D. Tori (2018). The macroeconomics of shadow banking. *Macroeconomic Dynamics*, <https://doi.org/10.1017/S136510051800041X>
- Caiani, A., A. Godin, and S. Lucarelli (2014). Innovation and finance: a stock flow consistent analysis of great surges of development. *Journal of Evolutionary Economics* 24(2), 421-448.
- Cassidy, J. (2008). The Minsky moment - subprime mortgage crisis and possible recession. The New Yorker, February 4. Available at: www.newyorker.com
- Caverzasi, E., A. Botta, and C. Capelli (2018). The Endogeneity of Money and the Securitizing System. *Greenwich Papers in Political Economy*, GPERC#56
- Cecchetti, S. G. and E. Kharroubi (2012, July). Reassessing the impact of finance on growth. *BIS Working Papers Monetary and Economic Department* (381).
- Charles, S. (2016). Is Minsky's financial instability hypothesis valid? *Cambridge Journal of Economics* 40(2), 427-436.
- Copeland, A., D. Dufie, A. Martin, and S. McLaughlin (2012). Key mechanics of the US tri-party repo market. *Federal Reserve Bank of New York Economic Policy Review* 18(3), 17-28.
- Cynamon, B. Z. and S. M. Fazzari (2008). Household debt in the consumer age: source of growth-risk of collapse. *Capitalism and Society* 3(2), 1-30.

- Dagher, J. C. and N. Fu (2017). What fuels the boom drives the bust: Regulation and the mortgage crisis. *The Economic Journal* 127 (602), 996-1024.
- Davidson: (2008). Is the Current Financial Distress Caused by the Subprime Mortgage Crisis a Minsky Moment? Or is it the Result of Attempting to Securitize Illiquid Noncommercial Mortgage Loans? *Journal of Post Keynesian Economics* 30(4), 669-676.
- De Antoni, E. (2006). Minsky on Financial Instability. In M. S. P. Arestis (Ed.), *A Handbook of Alternative Monetary Economics*. Cheltenham, Edward Elgar.
- Delli Gatti, D., E. Gafieo, and M. Gallegati (2010). Complex Agent-Based Macroeconomics: a Manifesto for a New Paradigm. *Journal of Economic Interaction and Coordination* 5(2), 111-135.
- Demyanyk, Y. and O. Van Hemert (2009). Understanding the subprime mortgage crisis. *The Review of Financial Studies* 24(6), 1848-1880.
- Dos Santos, C. H. (2005). A Stock-Flow Consistent General Framework for Formal Minskyian Analyses of Closed Economies. *Journal of Post-Keynesian Economics* 27(4), 712-735.
- Dosi, G. (1982). Technological Paradigms and Technological Trajectories: A Suggested Interpretation of the Determinants and Directions of Technical Change. *Research Policy* 11(3), 147-162.
- Dosi, G. and M. Grazzi (2009). On the nature of technologies: knowledge, procedures, artefacts and production inputs. *Cambridge Journal of Economics* 34(1), 173-184.
- Duca, J. V., J. Muellbauer, and M. A. (2011). House Prices and Credit Constraints: Making Sense of the U.S. Experience. *The Economic Journal* 121, 533-551.
- Dymski, G. A. (2009). Why the subprime crisis is different: a Minskyian approach. *Cambridge Journal of Economics* 34 (2), 239-255.
- Eggertsson, G. B. and P. Krugman (2012). Debt, deleveraging, and the liquidity trap: A Fisher-Minsky-Koo approach. *The Quarterly Journal of Economics* 127(3), 1469-1513.
- Ferri, P. (2010). Growth cycles and the financial instability hypothesis. In D. Papadimitriou and L. Wray (Eds.) *The Elgar Companion to Hyman Minsky*. Edward Elgar.
- Fontana, G. (2003). Post-Keynesian approaches to endogenous money: A time framework explanation. *Review of Political Economy* 15(3), 291-314.
- Fram, W. S. and L. J. White (2014). Technological change, financial innovation, and diffusion in banking. In A. N. Berger: Molyneux, and J. O. Wilson (Eds.), *The Oxford handbook of banking* (2, ed.), pp. 271-291. Oxford: Oxford University Press.
- Frank, R. H., A. S. Levine, O. Dijk, (2014). Expenditure cascades. *Review of Behavioural Economics* 1 (1-2), 55-73.
- Freeman, C. (1995). The 'National System of Innovation' in Historical Perspective. *Cambridge journal of Economics* 19(1), 5-24.
- Goda, T. and P. Lysandrou, (2014). The contribution of wealth concentration to the subprime crisis: A quantitative estimation, *Cambridge Journal of Economics*, 38(2), 301-327.
- Goldstein, A. and N. Fligstein (2017). Financial markets as production markets: the industrial roots of the mortgage meltdown. *Socio-Economic Review* 15(3), 483-510.
- Gorton, G. and A. Metrick (2010). Regulating the shadow banking system. *Brookings papers on economic activity* (2), 261-297.
- Gorton, G. and A. Metrick (2012). Securitized banking and the run on repo. *Journal of Financial economics* 104(3), 425-451.
- Hein, E. (2010) Shareholder value orientation, distribution and growth – short- and medium-run effects in a Kaleckian model. *Metroeconomica* 61(2), 302-332.
- Joint Center for Housing Studies of Harvard University (2008). The State of the Nation's Housing 2008. Technical report, Harvard.
- Hanusch, H., and Pyka, A., (2007). 'Manifesto' for Comprehensive Neo-Schumpeterian Economics. *History of Economic Ideas*, vol. 15, no. 1, pp. 23-41. JSTOR, JSTOR, www.jstor.org/stable/23723314.
- Kalecki, M. (1937). The Principle of Increasing Risk. *Economica* 4(16), 440-447.
- (1971). *Selected Essays on the Dynamics of the Capitalist Economy*. Cambridge University Press.
- Keynes, J. M. (1930). *A treatise on money: in 2 volumes*. Macmillan & Company.
- (1937). The General Theory of Employment. *The Quarterly Journal of Economics*, 209-223.
- (1973a). The consequences to the banks of the collapse of money value. In London and Basingstoke: (Eds.), reprinted in *The Collected Writings of John Maynard Keynes*, Volume 9, Essays in Persuasion. Macmillan, for the Royal Economic Society.

- (1973b). The “ex ante” theory of the interest rate. In *The Collected Writings of John Maynard Keynes*, Volume XIV: The General Theory and After: Defence and Development [1938], pp. 215-223. London: Macmillan for the Royal Economic Society.
- Keys, B. J., T. Mukherjee, A. Seru, and V. Vig (2010). Did securitization lead to lax screening? Evidence from subprime loans. *The Quarterly journal of economics* 125(1), 307-362.
- Kneer, C. (2013). The Absorption of Talent into Finance: Evidence from U.S. Banking Deregulation. *DNB Working Paper, De Nederlandsche Bank* 1(391), 1-37.
- Knell, M. (2015). Schumpeter, Minsky and the financial instability hypothesis. *Journal of Evolutionary Economics* 25(1), 293-310.
- Kregel, J. (2008). Minsky's Cushion of Safety Systemic Risk and the Crisis in the U.S. Subprime Mortgage Market. *Public Policy Brief - The Levy Economics Institute of Bard College* 1(93).
- Kregel, J. (2009). Financial Experimentation, Technological Paradigm Revolutions and Financial Crises, in Drechsler, W., E. S. Reinert, and R. Kattel (eds.) *Techno-Economic Paradigms: Essays in Honour of Carlota Perez*, Anthem Press.
- Kregel, J. 2016. The Regulatory Future. Working papers 164, Financialisation, Economy, Society & Sustainable Development (FESSUD) Project.
- Krugman: (2011, June). Mr. Keynes and the “Moderns”. Prepared for the Cambridge conference commemorating the 75 anniversary of the publication of The General Theory of Employment, Interest, and Money.
- Lavoie, M. (2014). *Post-Keynesian economics: new foundations*. Edward Elgar Publishing.
- Lavoie, M. and M. Seccareccia (2001). Minsky's Financial Fragility Hypothesis: A Missing Macroeconomic Link? In P. F. R. Bellofiore (Ed.), *Financial Fragility and Investment in the Capitalist Economy: The Economic Legacy of Hyman Minsky*, Volume II. Cheltenham, UK: Edward Elgar.
- Lysandrou: (2005). Globalisation as commodification. *Cambridge Journal of Economics* 29(5), 769-797.
- Macedo e Silva, A. C. (2008-9). Missing details and conspicuous absences: from the treatise to the general theory. *Journal of Post Keynesian Economics* 31(2), 325-344.
- Macedo e Silva, A. C. and C. H. Dos Santos (2011). Peering over the Edge of the Short Period? The Keynesian Roots of Stock-Flow Consistent Macroeconomic Models. *Cambridge Journal of Economics* 35(1), 105-124.
- McCulley: (2009). The shadow banking system and Hyman Minsky's economic journey. PIMCO: *Global Central Bank Focus* (GCBF), 1-12.
- Minsky, H. P. (1975). *John Maynard Keynes*. Columbia University Press.
- (1978). The Financial Instability Hypothesis: a Restatement. *Thames Papers in Political Economy*, North East London Polytechnic.
- (1981, April). Debt deflation processes in today's institutional environment. *Hyman P. Minsky Archive Paper* (229).
- (1982). *Can “it” Happen Again? Essays on Instability and Finance*. Armonk, N.Y.: M.E. Sharpe.
- (1983). Money and crisis in Schumpeter and Keynes. *Hyman P. Minsky Archive Paper* (334).
- (1986). *Stabilizing an Unstable Economy*. Yale University Press, New Haven and London (2008).
- (1988). Schumpeter: Finance and Evolution. *Hyman P. Minsky Archive*. Paper 314.
- (1990). Schumpeter e la finanza. In *Istituzioni e mercato nello sviluppo economico: saggi in onore di Paolo Sylos Labini*, pp. 117-131. St. Martin's Press, New York.
- (1992a, May). The Financial Instability Hypothesis. *Working Paper No. 74, The Levy Economics Institute Working Paper Series*.
- (1992b, May). The Financial Instability Hypothesis. *The Levy Economics Institute Working Paper* (74), 1-25.
- (1993, March). Finance and Stability: The Limits of Capitalism. Paper prepared for the conference “Structure of Capitalism and the Firm in Contemporary Society”.
- (1994). Financial Instability and the Decline (?) of Banking: Public Policy Implications. *The Jerome Levy Economics Institute Working Paper Series* (127), 1f17.
- (1996, June). Uncertainty and the Institutional Structure of Capitalist Economies. *Journal of Economic Issues* XXX (2).
- (2008). Securitization. *The Levy Economics Institute of Bard College - Policy Note* (2).
- Nightingale: and R. Poll (2000). Innovation in investment banking: the dynamics of control systems within the Chandlerian firm. *Industrial and Corporate Change* 9(1), 113-141.

- Nightingale, and T. Spears (2010). The nature of financial innovation. *Finance, Innovation & Growth (FINNOV)* 8 (1), 1-52.
- Orhangazi, Ö. (2008). Financialisation and Capital Accumulation in the Non-Financial Corporate Sector: A Theoretical and Empirical Investigation on the US Economy: 1973-2003. *Cambridge Journal of Economics* 32(6), 863-886.
- Palley, T. (2013). Horizontalists, verticalists, and structuralists: the theory of endogenous money reassessed. *Review of Keynesian Economics* 1(4), 406-424.
- Papadimitriou, D. B. and L. R. Wray (1998). The Economic Contributions of Hyman Minsky: Varieties of Capitalism and Institutional Reform. *Review of Political Economy* 10(2), 199-225.
- Perez, C. (2002). *Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages*. Elgar, Cheltenham.
- (2009). The Double Bubble at the Turn of the Century: Technological Roots and Structural Implications. *Cambridge Journal of Economics* 33-4(4), 779-805.
- (2010). Technological Revolutions and Techno-Economic Paradigms. *Cambridge Journal of Economics* 34-1, 185-202.
- (2011). Finance and technical change: a long-term view. *African Journal of Science, Technology, Innovation and Development* 3(1), 10fi35.
- Qi, M. and X. Yang (2009). Loss given default of high loan-to-value residential mortgages. *Journal of Banking & Finance* 33 (5), 788-799.
- Rahmeyer, F. (2007). From a routine-based to a knowledge-based view: towards an evolutionary theory of the firm. *Elgar companion to neo-Schumpeterian economics*, 159.
- Rochon, L. (1999). *Credit, Money and Macroeconomic Policy. A Post-Keynesian Approach*. Edward Elgar, Cheltenham, UK.
- Rochon, L. and S. Rossi (2013). Endogenous money: the evolutionary versus revolutionary views. *Review of Keynesian Economics* 1(2), 210:229.
- Roncaglia, A. (2013). Hyman Minsky's monetary production economy. *PSL Quarterly Review*, Vol. 66(265), 77-94.
- Ryoo, S. (2016). Household debt and housing bubbles: a Minskyian approach to boom-bust cycles. *Journal of Evolutionary Economics* 26(5), 971:1006.
- Schumpeter, J. A. (1951). The Creative Response in Economic History. In R. V. Clemence (Ed.), *Essays on Economic Topics of J. A. Schumpeter*, pp. 216fi226. Kennikat Press.
- (1954). *History of Economic Analysis*. Taylor & Francis e-Library, 2006.
- (1964/1939). *Business Cycle. A Theoretical, Historical and Statistical Analysis of the Capitalist Process*. Abridged Ed., McGraw Hill: New York.
- (2014/1970) *Treatise on Money*, edited by F. K. Mann, Wordbridge Publishing: Aalten, The Netherlands.
- (1982). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle* (1912/1934). Transaction Publishers. January 1, 244.
- Sealey, C. W. and J. T. Lindley (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions. *The Journal of Finance* 32(4), 1251-1266.
- Sherman, M. (2009, July). *A short history of financial deregulation in the United States*. Available at: <http://www.openthegovernment.org/otg/dereg-timeline-2009-07.pdf>
- Singh, M. (2011). Velocity of pledged collateral: Analysis and implications. *IMF Working Paper* 11 (256), 1-25.
- Singh, M. (2012, July). The (other) deleveraging. *IMF Working Paper* 12 (179), 1-22.
- Skott, P. and S. Ryoo (2008) Macroeconomic implications of financialisation. *Cambridge Journal of Economics* 32(6), 827–862.
- Stockhammer, E. (2005). Shareholder value orientation and the investment-profit puzzle. *Journal of Post Keynesian Economics*, Vol. 28(2), 193-215.
- Wildauer, R. and E. Stockhammer (2018). Expenditure cascades, low Interest rates or property booms? Determinants of household debt in OECD countries. *Review of Behavioral Economics*, Vol. 5(2), 85-121.
- Sweezy, M. (1943). Professor Schumpeter's theory of innovation. *The Review of Economic Statistics*, 1 (25), 93-96.
- The Financial Crisis Inquiry Commission (2011, January). *The Financial Crisis Inquiry Report*.
- Tori, D. and Ö. Onaran (forthcoming). Financialization, Financial Development, and investment. Evidence from European non-financial corporations. *Socio-Economic Review*.

——— (2018). The effects of financialization on investment: Evidence from firm-level data for the UK. *Cambridge Journal of Economics*, Vol. 42(5), 1393-1416.

Utterback, J. M. and W. J. Abernathy (1975). A dynamic model of process and product innovation. *Omega* 3(6), 639-656.

Winter, S. G. (2006). Toward a neo-Schumpeterian theory of the firm. *Industrial and Corporate Change* 15(1), 125-141.

Wray, L. R. (1992). Minsky's Financial Instability Hypothesis and the Endogeneity of Money. In S. M. Fazzari and D. Papadimitriou (Eds.), *Financial Conditions and Macroeconomic Performance: Essays in Honour of Hyman P. Minsky*, pp. 161-180. M.E. Sharpe.

——— (2011, March). Minsky's Money Manager Capitalism and the Global Financial Crisis. *The Levy Economics Institute and University Working Paper Series* (661), 1-23.

——— (2012). *Modern Money Theory: A Primer on Macroeconomics for Sovereign Monetary Systems*. New York and Basingstoke: Palgrave Macmillan.

——— (2015, Jan). On Banking: Early Work on Endogenous Money and the Prudent Banker. *Economics Working Paper Archive WP 827*, Levy Economics Institute.

Wray, L. R. and E. Tymoigne (2008). Macroeconomics Meets Hyman P. Minsky: The Financial Theory of Investment. *The Levy Economics Institute and University Working Paper Series* (543), 1-24.

Table 2 shows the evolution of Minsky's FIH. Its financialized version (right column) has financial firms at the centre of the stage, the structure and the sequence of events remain the same. This new version of the FIH provides an innovative Minskyian explanation of the crisis.

Table 2. A financialized Financial Instability Hypothesis

Phase	Financial Instability H.	Financial Innovation H.
	Firms	Financial Firms
T_0	Period of 'Tranquillity'	Period of 'Tranquillity' (<i>securitization</i> phase zero)
<i>Start</i>	Expectations (firms and banks) become more and more optimistic	Expectations (financial firms and banks), become more and more optimistic: confidence in house price growth and a (over)confidence in the liquidity of ABS (MBS) as collateral
<i>Upward</i>	Narrowing 'margins of safety' (speculative and Ponzi units) and over-indebtedness of firms	Decrease in <i>repo</i> haircut (value of collateral), and easy credit within financial system - Over-indebtedness of financial firms with household's debt as a major but side-effect (see graph)
<i>Crisis</i>	'Something happens' (increases in interest rates, change in expectations)	'Something happens': the FED from June 2004 starts increasing interest rate to contain tendency in inflation to rise
<i>Downward</i>	Defaults, selling of assets (can lead to a Fisherian debt-deflation -interrelationships between balance sheets)	Fire sale of assets (i.e. securities) whose values collapsed. Increase in the 'repo haircut' (collateral). Repo-run as first stages of a Fisherian debt-deflation.