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THE MONETARY CIRCUIT IN THE AGE OF FINANCIALISATION: A STOCK-FLOW CONSISTENT MODEL WITH A TWOFOLD BANKING SECTOR

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ABSTRACT

The paper explores how the Theory of Monetary Circuit can be developed to reflect some important features of the evolution of the financial system in the past three decades, which have been associated with what may be termed 'financialisation.' For this purpose, we embed the benchmark single-period monetary circuit scheme proposed by Graziani in a richer set of institutional arrangements. The stock-flow consistent modelling technique pioneered by Godley and Lavoie is used to support our narrative.

> *All recent models including the banking sector are still based on [...] a confusion between the problem of financing production (namely of creating an adequate amount of liquidity for inputs and outputs to be circulated in the market) and financing investment (namely creating an equal amount of overall saving). The confusion between initial and final finance is still widespread in the literature.*
>
> *Graziani (2003, p. 56)*

1. INTRODUCTION

The paper explores how the Theory of Monetary Circuit (TMC hereafter) can be developed to reflect some important features of the evolution of the financial system in the past three decades, which have been associated with

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what may be termed 'financialisation' (Epstein, 2005). For this purpose, we embed the benchmark single-period monetary circuit scheme proposed by Augusto Graziani (1989, 2003) in a richer set of institutional arrangements. We focus primarily on the functions of financial institutions and markets in early-industrialised countries.

On the formal side, the stock-flow consistent modelling technique pioneered by Wynne Godley and Marc Lavoie (see, particularly, Godley and Cripps, 1983; Godley, 1999, 2004; Godley and Lavoie, 2006) is used to support our narrative. This enables us to treat consistently the changes in stock-flow relationships and norms between macro-sectors due to the process of financialisation. More precisely, the banking sector is split into two different subsets: narrowly defined clearing (or commercial) banks and other financial institutions. Clearing banks are those institutions whose liabilities (i.e. deposits in chequeable accounts) are treated as generally accepted means of payments. Other financial institutions form a rather heterogeneous group, including investment banks, saving banks, financial firms, and non-bank financial intermediaries. These institutions can provide a wide range of financial services and trade financial assets, but cannot create money (e.g. Sawyer, 2015). Although the two subsets frequently overlap in the reality, they have to be kept separate when analysing the financial sector from a theoretical perspective. Starting from this institutional setting, an examination of both the process of 'securitisation' and the growing debt of household sector in advanced economies is provided. Plainly, securitisation requires an analysis of the inter-relationships within the financial and banking sector. In this regard, it is shown that financialisation of advanced economies is associated with a somewhat paradoxical monetary-financial circuit, in which there is a tendency for households to get into debt whereas non-financial firms progressively turn into net lenders (Seccareccia, 2012; Veronese Passarella, 2012, 2014; Veronese Passarella and Sawyer, 2014).[1] In addition, a two-way relationship between income (and wealth) inequality and increasing role of financial motives, markets and institutions, is detected.

Accordingly, the rest of the paper is organised as follows. Section 2 provides the 'vocabulary' of our work. Graziani's fundamental concepts of 'initial finance' and 'final finance' are reconsidered in the light of the

[1] Overall, the cross-sector flows of funds look more complex than envisaged in the original TMC. Notice, however, that the household sector (considered as a whole) is still in a net asset position, even in Anglo-Saxon countries. Besides, from a theoretical perspective, the circuitist distinction between 'initial finance' and 'final finance' is even more relevant in a financially-sophisticated economy (e.g. Sawyer, 2013, 2015).

increasing financial sophistication of capitalist economies. In addition, the different role of clearing banks and other financial institutions, respectively, is thoroughly discussed. In section 3, we develop the narrative of our contribution and we couple it with a stock-flow consistent dynamic model. Simplified though it is, such a model allows us to reproduce and underline some fundamental changes entailed by the financialisation process in an artificial pure bank-money economy of production. In section 4, we discuss the key assumptions underpinning the formal model, along with the most significant behavioural equations. In section 5, we present the main findings of the model and we compare them with the standard understanding about financialisation. Some concluding remarks are provided in the last section of the paper.

2. FINAL FINANCE AND FINANCIAL INTERMEDIARIES

According to Graziani, most macroeconomic models rely on confusion between the 'initial finance' and the 'final finance'.[2] The two concepts should be kept clearly separate though. The former is credit-money firms (as a whole) demand in order to set up and carry on production. This finance covers the total cost of the planned production and is 'an essential element, the lack of which makes any production plan impossible' (Graziani, 2003, p. 69). The latter is the 'liquidity collected by firms either selling commodities or issuing securities' (Ibidem). Its function is to enable firms to repay back their bank debt. In other words, the initial finance refers to the relation between the banking sector and the corporate sector, whereas the final finance refers to the relation of firms with consumers (on the commodity market) and financial intermediaries (on the financial market). The former gives rise to money creation, whereas the latter concerns the *ex post* matching of corporate investment and household saving. Saving, in turn, can be either 'voluntary', if it springs from 'free decisions of wage earners', or 'forced', if 'new capital goods are bought by firms using profits' from sales (Graziani, 2003, p. 71).[3] In this sense, it is possible to define two kinds of final finance: consumption expenditure of wage earners, and narrowly-defined final finance, i.e. the liquidity deriving from

[2] This distinction can be traced back to Gurley and Shaw (1960)'s pioneering analysis of the role of financial intermediation.

[3] It seems worth noticing that forced saving 'disappears only in special cases, when voluntary savings of households are equal to investments planned by the firms. In this case, firms make no profits and investment is wholly financed by issuing securities on the financial market' (Graziani, 2003, p. 152).

household 'financial investment'. When not otherwise specified, we focus on the second component of final finance hereafter.

The distinction between initial finance and final finance is linked with the one between narrowly defined banks, call them 'clearing banks' or 'commercial banks' (CBs), and 'other financial intermediaries' (OFIs). The contrast is twofold: first, banks are not simply financial intermediaries; and, second, some banks in the legal sense are not banks in the sense used in 'circuitist' and macro-economic theory (e.g. Sawyer, 2015, p. 4). More precisely, CBs can be defined as financial institutions whose liabilities (i.e. bank deposits) are generally accepted as means of payment and are readily transferable between economic agents.[4] CBs are, therefore, the provider of the initial finance to the corporate sector. This feature makes them different from OFIs, which include both saving and investment banks (SIBs), and other non-bank financial institutions (NBFIs). Saving banks are financial intermediaries that accept deposits and make loans to households. Investment banks perform a similar function, but they service firms. Unlike clearing bank deposits, the liabilities of SIBs are not readily transferable between economic agents, though such deposits may be treated as 'near-moneys'. In addition, since SIBs are supervised by national (or international) banking regulatory agencies, they fit the legal definition of banks. However, they are not banks in circuitist terms, as their role is to expedite the final finance, not to provide the initial finance to firms. In this sense, they can be grouped with NBFIs. NBFIs include money market funds, private equity firms, hedge funds, pension funds, insurance companies, and other institutions that, unlike SIBs, do not have a full banking license, or are not supervised by a banking regulatory body.

Plainly, the legal definition of banks is broader than the macroeconomic one, and varies over time and space (e.g. Veronese Passarella and Sawyer, 2014). The services and products financial institutions can, or are allowed to, provide change too. Finance has progressively taken on a central role during the last three decades, especially in the Anglo-Saxon countries. As a result, today's financial markets look far from the 'passive' or 'residual' financial market theorised by the TCM (e.g. Seccareccia, 2012, Veronese Passarella, 2014). In some countries, banking institutions have long been on a 'universal bank' model where the same institution provides both 'initial finance' (with loans which are money creating) and 'final finance' (acting as saving bank and investment bank). In others countries (the United States being a notable example, particularly following the repeal of

[4] Notice that here money is basically viewed in terms of a means of payment (rather than a medium of exchange, a unit of account, or a store of value).

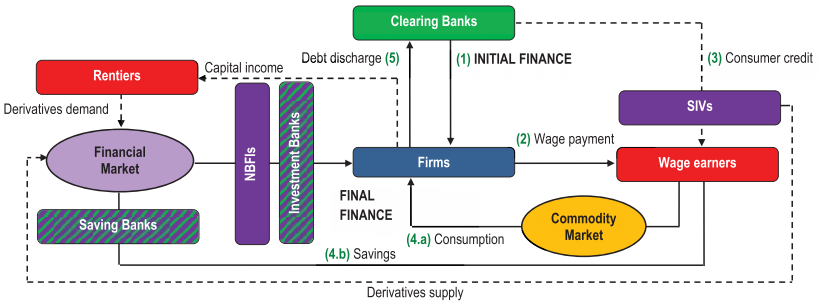

Figure 1. The monetary circuit in the age of financialisation

the Glass-Steagall Act), the previous separation between clearings banks, savings banks and investment banks, has tended to dissolve. There have been other developments, notably the move from the 'originate-and-retain' to an 'originate-to-distribute' model, which have changed the ways in which banks operate. This makes even harder to identify and separate the creation of money, in the sense of initial finance, from the destruction of money, in the form of collection of final finance and repayment of the bank debt. Consequently, some authors have argued that the original TMC model should be abandoned (e.g. Lysandrou, 2014). In contrast, while recognising the importance of above radical institutional developments, we still ground our analysis in TMC foundations. The point is that the circuitist definition of banks is a logical characterisation, not a geographical or historical description. Like Graziani's distinction between initial finance and final finance, it 'has little to do with the stage of development' of the economy (Graziani, 2003, p. 56). In our theoretical framework, CBs refer to an institution or part of an institution providing loans which create deposits which are treated as a means of payment by firms and households. By contrast, SIBs refer to an institution which accepts deposits from households and firms and which it can then lend. CBs are providers of initial finance, whereas SIBs are facilitators of final finance. It should be stressed that in this framework the institution is defined in terms of the functions which is carries out. Plainly, in the real world an organisation may carry out both sets of functions. As such, part of its operations would come within those a CB and part as a SIB.

A stylised circuit of monetary payments within a financially sophisticated capitalistic economy is portrayed in figure 1. For the sake of simplicity, both the government sector and the foreign markets are assumed away. Figure 1 shows that, in the context of the monetary circuit, 'each macro-sector

(households, corporations, banking system [and financial institutions]) and each market (consumer market, financial market) carries out a specific, and hence non-replaceable, function' (Veronese Passarella, 2014, p. 144). More precisely:

- It is the CBs which are at the start of the process of production and trade. They provide loans which generate bank deposits, thus creating the initial finance firms demand.
- By contrast, OFIs (be they either SIBs or NBFIs) can 'only' facilitate the recovery of the liquidity that the corporate sector needs to repay back bank debt.

We abide by this twofold distinction hereafter. In fact, the explicit consideration of the different functions of banks and financial intermediaries, respectively, is one of the distinctive features of both our circuitist analysis of financialisation and the formal model we develop in the next two sections.

3. A SIMPLIFIED STOCK-FLOW CONSISTENT 'CIRCUIT' MODEL

Graziani's specific formulation of the TMC can be defined as a rediscovery of the most far-reaching aspects of the radical monetary thought of the Nineteenth century and the works of dissenting economists of the early twentieth century (e.g. Wicksell, Keynes and Kalecki). The keystone of Graziani's approach is the association of Keynes's concept of initial finance with Marx's notion of money capital (e.g. Veronese Passarella, 2014). Capitalism is a circular sequence of social relations in form of monetary payments. Banks (CBs) create the flow of money firms need to start the production (i.e. to purchase labour power from workers), whereas financial markets (notably, OFIs) enable firms to repay back their debt, thereby destroying a correspondent amount of money. As we mentioned, this is a fundamental point, as the chief aim of the TMC is to account for the process of money creation and destruction (both viewed as endogenous phenomena) under a capitalist regime during 'normal times'. This is also the reason both the precautionary and the speculative motives (liquidity preference) are usually ruled out of the TMC narrative. For the focus of the TMC is on the finance motive. Bank money is regarded as the fuel (not merely the lubricant) of the economic engine in a society marked by social stratification.

The emphasis on the creation/destruction of money explains why the analytical tool chosen by Graziani to support his narrative was an accounting analysis of a single-period (pure-flow) economy. Such a simplifying assumption enabled Graziani to develop his macroeconomic analysis regardless of hypotheses on behaviour. In addition, it allowed him to argue for a multiplicity of possible 'equilibria' of the economy, and for the irrelevance of 'wealth effects' as spontaneous adjusting mechanisms, due to the endogeneity of money supply (e.g. Graziani, 1994). However, the 'single-period' nature of Graziani's framework turns out to be a limitation when a more detailed analysis of financial markets and institutions is undertaken. Accordingly, the examination of financialisation requires the explicit modelling of the dynamics of the economic system. In this regard, both stock variables and their relations with flow magnitudes have to be accounted for. In other words, the TMC benchmark framework should be revised in the light of the so-called 'stock-flow consistent' (SFC) modelling technique developed in the last two decades by Godley, Lavoie, and other heterodox economists (e.g. Godley and Cripps, 1983; Godley, 1999; Godley and Lavoie, 2006). Notice, in this regard, that the coherence of the circuit view with Godley's take has been recognised explicitly by both Graziani and SFC authors (e.g. Graziani, 2003; Godley, 2004; Lavoie, 2004; Godley and Lavoie, 2006; Zezza, 2012).

Accordingly, our model relies on a stock-flow coherent rereading of the TMC. As in Graziani (2003), a closed economy with no government sector is considered. In addition, for the sake of simplicity, we assume that production adjusts instantaneously to aggregate demand.[5] More precisely, since the unit price level of output is treated as an exogenous variable, the adjustment occurs via quantity.[6] In so doing, we distance ourselves from the benchmark single-period circuit model, in which the unit price of output is derived in such a way that there is never excess or lack of demand. The reason is that the standard circuitist price setting is potentially at odds with the Keynesian advocacy for an active fiscal policy to support and stabilise output (e.g. Seccareccia, 2015). For any increase in aggregate demand components leads to a corresponding increase in the price level, with no effect on employment

[5] Plainly, one could relax this hypothesis by considering the change in inventories due to the gap between expected and actual sales.

[6] In the spirit of Sawyer (1995), we assume that firms manage to set long-term strategic prices, depending on a number of institutional factors. Alternatively, one could suppose that firms set the costing margin, thereby determining the unit price (which would become an endogenous variable). Our qualitative findings would not be affected by such a different hypothesis though.

and production.[7] Cleary, this only makes sense when an abstract single-period economy is assumed. By contrast, following Godley and Lavoie (2006), we model an economy that moves forward non-ergodically along a sequence of periods. As a result, output composition is still eventually determined by firms through the cost-plus pricing, as advocated by Graziani, whereas output level is demand-led (both in the short run and in the long run), as traditionally advocated by Keynesian economists.

Looking at the production side, we assume that labour supply is plentiful and does not form a binding constraint on the level of employment. Actual employment adjusts to the corporate demand for labour inputs. Different types of output are overlooked, and we proceed as though firms produce a single homogeneous output by means of labour and the same output-good used as an additional input (of capital goods). Notice that both the production of goods (including the production of capital goods) and investment plans (i.e. the purchase of capital goods) have to be financed in order to be undertaken. Accordingly, the *ex ante* corporate demand for bank loans is made up of two components: first, the narrowly defined 'initial finance', covering the total cost of production and corresponding to the total wage bill; second, an additional amount of loans, covering the residual investment that is not financed by issues of corporate securities and internal funds. This is coherent with Graziani's clarification that, in order to examine 'the way in which purchases made by firms in the commodity market are financed [...] it seems advisable to [...] revert to the more realistic image of a multiplicity of firms, not only selling goods to consumers but also exchanging finished products among themselves. [...] To buy finished [capital] goods, firms need finance as much as they need finance for paying the wage bill' (Graziani, 2003, p. 99). We discuss further this point in Section 4.

[7] When household consumption (and saving) decisions do not match corporate production plans (i.e. the composition of real output), the costing margin and hence the unit price adjust to clear the market. This allows Graziani (2003) to argue that investment is always *ex post* covered by savings, be they 'voluntary' or 'forced'. In other words, household savings never constrain corporate investment. The 'neoclassical' consumer sovereignty is therefore replaced with the producer sovereignty. In algebraic terms, the price of output is derived from the market clearing condition in a single-period economy: $p_y \cdot N \cdot pr = N \cdot w \cdot (1-s) + b \cdot p_y \cdot N \cdot pr$, where: N = employment, pr = labour productivity, w = nominal wage rate, b = share of output devoted to investment, and s = propensity to save out of wages. As a result, the unit price of output is: $p_y = (w/pr) \cdot (1-s)/(1-b)$. Graziani (2003) assumes that the scale of production (N) is set by the corporate sector, along with the composition of output (via the propensity to invest, b). Consequently, household consumption decisions affect only the unit price, with no effect on quantity. Consumer sovereignty is an empty concept in the TMC model.

Households are made up by two social groups: workers (wage earners) and rentiers (e.g. Dos Santos and Zezza, 2006; Van Treeck, 2009). Workers sell their labour-power to firms in return for a money-wage. They spend their income on consumption goods and financial assets, including bank deposits and low-yield corporate securities. Workers are free to decide the form of their savings, but have no power whatsoever on corporate decisions. This hypothesis is coherent with the 'class divide' nature of the TMC and is clarified below. By contrast, rentiers are the owners of both non-financial firms and financial institutions. Therefore, they are the recipients of all of non-labour incomes, except for interest payments on securities and bank deposits held by workers.[8] Like workers, rentiers subdivide their income into consumption and financial investment, including bank deposits and high-yield financial derivatives. Taken together, wage-earners and rentiers constitute the household sector. As we discuss further in the next section, the composition of household savings depend on both their income and the relative rates of return on financial assets. From a household perspective (demand side), there is no qualitative distinction between corporate securities and other financial assets. By contrast, from a corporate perspective (supply side), while the holding of securities allows firms to pay back their initial debt, the holding of bank deposits (and financial derivatives) prevents them from reimbursing banks.[9] This point is repeatedly stressed by TMC authors. Notice also that, unlike other SFC modellers (e.g. Godley and Lavoie, 2006; Van Treeck, 2009), we allow that both rentiers and workers can borrow to undertake spending in excess of their current incomes. More precisely, we assume that the amount of new bank loans demanded by rentiers is a positive function of their wealth, the latter being used as collateral, whereas bank loans obtained by workers are a positive function of workers' wealth, the degree of 'securitisation' of their debt, and other factors. We discuss this point in Section 4.

Finally, we split the financial sector into two subsectors, i.e. CBs and OFIs (including both SIBs and NBFIs).[10] Unlike loans to firms, loans to households are created by CBs and then 'handed' to special OFIs (think of

[8] In principle, we might assume that firms could sell new shares to rentiers. However, as rentiers are the owners (or the majority shareholders) of all of firms and financial institutions yet, the qualitative results of our simplified circuit model would be unaffected by such an amendment.

[9] This is shown by equation (6), where the change in the stock of loans obtained by firms is net of issues of corporate securities.

[10] Similarly, Pilkington (2009) amends standard SFC accounting matrixes by adding what he terms 'haute finance' institutions (in the sense of Karl Polanyi). The latter cover all of the activities carried out by NBFIs, including securitisation and asset-management activities.

Table 1. Nominal balance sheets

	Households			*Banking sector*		
	Workers	*Rentiers*	*Production firms*	*Clearing Banks*	*OFIs*	Σ
Deposits	$+M_w$	$+M_r$		$-M_s$	$+M_o$	0
Loans	$-L_w$	$-L_r$	$-L_f$	$+L_f$ $+L_h$ $(-L_h)$	$(+L_h)$	0
Capital			$+K$			$+K$
Securities of firms	$+B_w$		$-B_s$			0
Derivatives		$+d_r \cdot p_d$			$-d_s \cdot p_d$	0
Balance (net worth)	$+V_w$	$+V_r$	0	0	0	$-V_h$
Σ	0	0	0	0	0	0

Notes: A '+' before a magnitude denotes an asset, whereas '−' denotes a liability. Round brackets show that household loans are originated by CBs, but are then securitised by OFIs.

structured investment vehicles or SIVs). The role of OFIs is not to create money, but to transform a portion of household loans into 'financial derivatives' (securitisation). On the demand side, these financial products are sold to rentiers who seek for high rates of return on their financial investment. Notice that the central bank is not explicitly modelled here. Under a pure bank-money economy of production, with no government spending, the central banker simply steers the target interest rate on bank refinancing. Therefore, a change in the monetary policy stance is captured by a change in the exogenous target rate on loans in our circuitist model [namely, r_l^t in equation (49)]. As mentioned, the latter is redefined in a dynamic and stock-flow consistent fashion. The nominal balance sheets and the transactions-flow matrixes are provided by tables 1 and 2, respectively. Taken together, they assure that there is no accounting amnesia. A key to symbols is provided by table 3.

4. KEY BEHAVIOURAL EQUATIONS

A number of works have been published aiming to provide an analysis of financialisation by means of dynamic stock-flow consistent aggregative models with endogenous money. These works have focused on a variety of changes entailed by the increasing power of financial markets and institutions, such as: the growing shareholder value orientation of corporate

Table 2. Transactions-flow matrix

			Production firms		*Clearing Banks*		*OFIs*		
	Workers	*Rentiers*	*Current*	*Capital*	*Current*	*Capital*	*Current*	*Capital*	Σ
Consumption	$-C_w$	$-C_r$	$+C_s$						0
Investment (change in capital stock)			$+I_s = +\Delta K$	$-I_d = -\Delta K$					0
Wages	$+WB_d$		$-WB_s$						0
Depreciation allowances			$-DA$	$+AF = +DA$					
Interest on loans	$-r_{l,-1} \cdot L_{w,-1}$	$-r_{l,-1} \cdot L_{r,-1}$	$-r_{l,-1} \cdot L_{f,-1}$		$+r_{l,-1} \cdot L_{f,-1}$		$+r_{l,-1} \cdot L_{h,-1}$		0
Interest on deposits	$+r_{m,-1} \cdot M_{w,-1}$	$+r_{m,-1} \cdot M_{r,-1}$			$-r_{m,-1} \cdot M_{s,-1}$		$+r_{m,-1} \cdot M_{o,-1}$		0
Return on securities	$+r_{b,-1} \cdot B_{w,-1}$		$-r_{b,-1} \cdot B_{s,-1}$						0
Return on derivatives		$+r_{d,-1} \cdot p_d \cdot d_{r,-1}$					$-r_{d,-1} \cdot p_d \cdot d_{s,-1}$		0
Entrepreneurial profits		$+F_f$	$-F_f$						0
Bank profits		$+F_b$			$-F_b$				0
Financial profits		$+F_o$					$-F_o$		0
Change in loans	$+\Delta L_w$	$+\Delta L_r$		$+\Delta L_f$	$-\Delta L_f - \Delta L_h$ $(+\Delta L_h)$			$(-\Delta L_h)$	0
Change in deposits	$-\Delta M_w$	$-\Delta M_r$				$+\Delta M_s$		$-\Delta M_o$	0
Change in securities	$-\Delta B_w$			$+\Delta B_s$					0
Change in derivatives		$-\Delta d_r \cdot p_d$						$+\Delta d_s \cdot p_d$	
Σ	0	0	0	0	0	0	0	0	0
Memo: capital gains		$-\Delta p_d \cdot d_{r,-1}$						$+\Delta p_d \cdot d_{s,-1}$	

Notes: A '+' before a magnitude denotes a receipt or a source of funds, whereas '−' denotes a payment or a use of funds. Round brackets show that household loans are originated by CBs, but are then securitised by OFIs.

Table 3. Key to symbols and values

Symbol	*Description*	*Kind*	*Value*	*Symbol*	*Description*	*Kind*	*Value*
add_0	Spread of loans rate over the deposit rate	Exo	0.04	pr	Productivity of labour	End	
add_1	Premium over risk-free interest rate	Exo	0.02*	pr^t	Normal productivity of labour	Exo	1
add_2	Parameter of derivatives return rate function	Par	0.04*	r_b	Rate of return on securities	End	
add_3	Parameter of derivatives return rate function	Par	0.1	r_c	Interest rate on loans to workers	End	
AF	Amortisation funds	End		r_d	Rate of return on derivatives	End	
B_s	Supply of corporate securities	End		r_l	Interest rate on loans to firms and rentiers	End	
B_w	Demand for corporate securities	End	0*	r_l^t	Target interest rate (monetary policy stance)	Exo	0.04
C_d	Total demand for consumption	End		r_m	Rate of interest on bank deposits	End	0*
c_s	Real supply of consumption goods	End		rep_1	Debt repayment rate of workers	Exo	0.2
C_s	Nominal supply of consumption goods	End		rep_2	Debt repayment rate of rentiers	Exo	0.2
c_w	Real demand for consumption by workers	End		V_r	Wealth of rentiers	End	
C_w	Nominal demand for consumption by workers	End		V_w	Wealth of workers	End	25*
c_r	Real demand for consumption by rentiers	End		w	Nominal wage rate	End	
C_r	Nominal demand for consumption by rentiers	End		w^t	Bargained wage rate	Exo	0.86**
CG	Capital gains on financial derivatives	End		WB_s	Wage bill	End	

Table 3: Continued

Symbol	*Description*	*Kind*	*Value*	*Symbol*	*Description*	*Kind*	*Value*
d_s	Real supply of derivatives	End		y	Real output	End	100*
D_s	Nominal supply of derivatives	End		Y	Nominal output	End	
d_r	Real demand of derivatives	End	0*	YD	Total disposable income	End	
D_r	Nominal demand of derivatives	End		yd_w	Real disposable income of workers	End	50*
da	Real depreciation allowances	End		YD_w	Nominal disposable income of workers	End	
F_b	Profit of commercial banks (CBs)	End		yd_r	Real disposable income of rentiers	End	50*
F_f	Entrepreneurial profit	End		YD_r	Nominal disposable income of rentiers	End	
F_o	Profit of other financial institutions (OFIs)	End		α_0	Autonomous consumption of workers	Par	25
h_1	Rentiers to workers ratio (net of random component)	Exo	0.03	α_1	Workers' propensity to consume out of income	Par	0.75
h_2	Parameter of rentiers population function	Par	0***	α_2	Loans to wealth ratio of workers	End	0.05*
i_d	Real demand for investment	End		α_3	Parameter in consumer credit function of workers	Par	1
I_d	Nominal demand for investment	End		α_4	Parameter in consumer credit function of workers	Par	0.9
i_s	Real investment in capital goods	End		β_0	Autonomous consumption of rentiers	Par	2
I_s,	Nominal value of investment goods	End		β_1	Rentiers' propensity to consume out of income	Par	0.7

Table 3: Continued

Symbol	*Description*	*Kind*	*Value*	*Symbol*	*Description*	*Kind*	*Value*
k	Stock of investment goods, i.e. real capital	End		β_2	Loans to wealth ratio of rentiers	Par	0.05*
k^t	Target stock of real capital	End		γ	Adjustment rate of investment to target capital	Exo	0.08
k_0	Parameter in target capital stock function	Par	1	δ	Rate of depreciation of capital	Exo	0.1
k_1	Parameter in target capital stock function	Par	0**	η_1	Parameter in workers' loans/wealth function	Par	0.03
L_d	Total demand for loans	End		η_2	Parameter in workers' loans/wealth function	Par	0.05
L_f	Corporate demand for bank loans	End	50	θ_1	Parameter in rentiers' loans/wealth function	Par	0.05
L_r	Demand for bank loans of rentiers	End	25	λ_0	Parameter in securities demand function	Par	0.1
L_s	Total supply of loans	End		λ_1	Parameter in securities demand function	Par	0.1
L_w	Demand for bank loans of workers	End	25	λ_2	Parameter in securities demand function	Par	0.01
M_d	Total demand for bank deposits	End		λ_3	Parameter in derivatives demand function	Par	0.1**
M_o	Bank deposits held by OFIs	End		λ_4	Parameter in derivatives demand function	Par	0.1
M_r	Bank deposits held by rentiers	End		λ_5	Parameter in derivatives demand function	Par	0.01

Table 3: Continued

Symbol	*Description*	*Kind*	*Value*	*Symbol*	*Description*	*Kind*	*Value*
M_s	Total supply of bank deposits	End		ξ_1	Random component in price of derivatives	Exo	ξ
M_w	Bank deposits held by workers	End		ξ_2	Random component in number of rentiers	Exo	ξ
N_d	Labour demand	End		π	Premium over risk (on loans to workers)	End	
N_r	Number of rentiers	End		π_0	Parameter of risk premium function	Par	0.03
N_s	Labour supply (number of workers)	End		π_1	Parameter of risk premium function	Par	0.8
p_d	Unit price of financial derivatives	End		ρ	Profit margin over labour cost	End	
p_d^t	Issue price of financial derivatives	Exo	1	τ	Parameter of derivatives price function	Par	0***
p_y	Unit price of output	End		φ	Share of 'securitised' loans	End	
p_y^t	Strategic price of output	Exo	1				

Notes: *Starting values for stocks and lagged endogenous variables. **Shocked parameters. Scenario 1: $w^t(1)=0.855$. Scenario 2: $\lambda_3(2)=0.15$. Scenario 3: $k_1(3)=0.1$. ***No impact of random components in above simulations (so that: $CG=0$ and $N_r=h_1 \cdot N_d$).

management; the reduction in the rate of retention of profits; the increase in the propensity of households to hold equities and other financial assets; the increase in household loans to disposable income (or to wealth) ratio; the financial asset inflation; the change in portfolio preferences; and the change in corporate norms (e.g. Lavoie, 2008; Van Treeck, 2009; Hein and Van Treeck, 2010; Michell and Toporowski, 2012; Caverzasi and Godin, 2015; Reyes and Mazier, 2014). While these changes are certainly worth being examined and, in fact, the above contributions are all of great value, we take a slightly different perspective. The skeleton of our model resembles the benchmark stock-flow consistent model with private bank money of Godley and Lavoie.[11] There are several differences or amendments relative to that model though. The full list of equations is provided in Appendix A.

Before discussing the main features of the model, it is worth examining the 'initial finance' issue in depth. We have already mentioned that the *ex ante* corporate demand for new bank loans must cover both the total costs of production and the residual investment expenditure (i.e. the purchase of capital goods net of amortisation funds and newly issued securities). It should now be noticed that the *ex post* change in the stock of corporate loans amounts to the summation of the cost of unsold output and the residual investment expenditure. In our simplified model, the former component is nil, as we assumed away any lack of demand.[12] Consequently, in each period the final change in loans to firms is fully determined by investment decisions. In formal terms, it is derived residually from the corporate sector entry of the transactions-flow matrix (i.e. the fourth column of table 2).[13] Turning to the main features of our model, equations (27) and (28) define disposable income of workers and rentiers, respectively. It is shown

[11] Such a discrete-time dynamic model is presented in chapter 7 of Godley and Lavoie (2006). A basic circuitist stock-flow consistent model is developed also by Godley (2004). Finally, a continuous-time formulation has been developed by Keen (2009).

[12] Differently, the production cost of final inventories (in terms of wages) should be accounted for.

[13] In other words, by adopting a SFC approach, we focus 'on balance sheet accounts at the end of the period, rather than on the need for initial finance' (Zezza, 2012, p. 7). By contrast, Graziani (2003) focuses on an earlier step of the monetary circuit, when goods have been produced but not sold yet. Plainly, the value of such an unsold output 'is exactly equal to the production costs' and 'must be financed by the new loans initially obtained' (Godley and Lavoie, 2007, pp. 49–50). As a result, the following *ex ante* identity must hold: value of (unsold) output = costs of production (i.e. wage bill) = new bank loans to firms = new bank deposits held by households. However, once wages have been spent for consumption and other transactions have taken place, the *ex post* change in the stock of loans to firms must be calculated net of sale revenues.

that rentiers are the recipients of the most of capital incomes, as workers can only place their savings in banks deposits and/or low-yield securities. Profits of CBs [equation (16)] are determined in a conventional fashion as the amount of net interest payments. It is therefore assumed that CBs do not face any production or transaction cost. For the sake of simplicity, OFIs' revenues are defined as the summation of the interest revenues they earn on bank deposits and the yields that accrue on household loans. In other words, we assume that CBs hand household loans to OFIs for free.[14] As OFIs use household loans as 'collaterals' for the derivatives they place on the financial market, OFI's profits equal their revenues net of interest payments on derivatives [equation (21)]. Derivatives, in turn, are subscribed by rentiers who look for high return rates from their 'financial investment'. Equation (53) shows that the return rate on financial derivatives is made up by two components. The value of the first component is set in such a way to include a given mark-up over the return rate on low-yield corporate securities. The second component is a direct function of the interest rate paid by workers on bank loans. Therefore it mirrors the financial risk associated with the degree of indebtedness of wage-earners. This is pointed out by equations (50) and (41). Plainly, the overall return on financial derivatives includes capital gains (or losses) too. These are defined by equation (38). Notice, in this regard, that the unit market price of derivatives is assumed to be a function of both the issue price and a random component reflecting the volatility of financial markets [equation (18)].

Equation (39) is very important, as it defines the amount of new loans (in form of consumer credit) demanded by workers as a function of four factors. First, workers' demand for new loans depends positively on their own wealth. The wealth-based borrowing ratio of workers, in turn, is taken to depend negatively on their degree of indebtedness (i.e. on their leverage ratio) and positively on the level of securitisation. The latter is regarded as a proxy of the intensity of financialisation in equation (40). The rationale of such a positive relation is as follows. On the one hand, financialisation is associated with a particular 'culture', reducing the individual perception of risk of high debt ratios. On the other hand, wage earners find it easy to obtain loans, due to the presence of new financial intermediaries and products.[15] Consequently, we assume that workers' demand for new loans is

[14] We might assume that CBs charge OFIs for the transfer of loans. However, in no way this would affect the qualitative results of our model.

[15] Clearly, this would require a more detailed analysis of the supply side too, that is, of the lending policy of banks. However, for the sake of simplicity, we focus here on the demand side only.

positively associated with the spread of financial derivatives. Second, such demand depends negatively on the scale of repayment of bank debt. Third, a Veblenian 'conspicuous consumption' component is considered, as workers' demand for new loans is also a positive function of the consumption gap between rentiers and workers.[16] Finally, a smoothing component of consumption is included as well. As a result, a reduction (increase) in workers' income does not lead to a correspondent reduction (increase) in consumption in the short run, but only in the long run. Turning to rentiers, their demand for new loans is assumed to be a function of their wealth and the debt repayment rate only. As we mentioned, rentiers are the provider of the demand for financial derivatives. This latter is defined in a quite standard fashion [by equation (47)], as a positive function of both rentiers' wealth and the return rate on derivatives, and a negative function of their available income. The rationale is that the higher rentiers' income, the higher will be their demand for bank deposits (i.e. the money demand for transaction motives) and thus the lower will be the demand for other financial assets. Equation (10) defines the real capital stock targeted by firms. This is used in equation (11) to determine firms' real demand for new investment (or intermediate) goods. We assume that the targeted capital stock is negatively affected by the rate of return on financial derivatives. Here the rationale is that, in our simplified economy, the higher the financial profitability, the lower will be the propensity of firms' owners and managers (i.e. rentiers) to undertake productive investment. In other words, rentiers will try to rebalance their portfolio of assets by increasing the financial component relative to the productive one. As a result, the targeted capital stock will be smaller.

5. MAIN (PRELIMINARY) FINDINGS

We simulate the effects of three different 'shocks' on the model. The first shock is a cut in the nominal wage rate earned by workers. It has been argued that the process of financialisation, especially the removal of barriers to capital flows since the 1970s, has gone along with a reduction in the purchasing power of workers across advanced economies.[17] Therefore,

[16] For the sake of simplicity, equation (30) defines the number of rentiers as a steady percentage of the population plus a random component. We then use this magnitude to calculate rentiers' per capita values.

[17] The relation between financialisation and inequality is the subject of plenty of works published in the last decades. While a full review of recent literature is out of the purpose of our contribution, we refer the reader to FESSUD Studies in Financial Systems (available at: http://fessud.eu/deliverables/).

this first experiment aims to test the impact of a reduction in labour incomes on our simplified but financially-augmented circuitist economy. The second shock is an increase in demand for financial derivatives by rentiers. In a sense, this echoes 'the insatiable demand for assets' pointed out by Lysandrou and Nesvetailova (2015) as the factor which had 'causal primacy' in the financial crisis. Finally, we test the effect of an increase in sensitivity of investment in capital goods to financial profitability. This test reflects the idea that investors could be tempted by shifting from traditional productive real assets to financial assets when the latter are marked by a higher expected return rate.

Following the method developed by SFC modellers, after checking for the steady state of the endogenous variables of the model, we tested the effects of above parameter changes on (some of) the most significant magnitudes, notably: the aggregate household consumption and the real output; the disposable income of workers and rentiers, respectively (i.e. income distribution); the leverage ratios of workers and rentiers, respectively; the rate of return on financial derivatives (regarded as an indicator of financial profitability); CBs and OFIs profitability (relative to total output); and, finally, the total amount of derivatives, along with their percentage to total output. When possible, parameter values have been taken from Godley and Lavoie (2006), chapter 7, which must be regarded as the benchmark model.[18] In fact, our model reproduces the same results of the benchmark one when class divisions and financial intermediation are not included. All of parameter and exogenous variable values, as well as starting values for stocks and lagged endogenous variables, are reported in table 3.

When the two-fold distinction between wage-earners and rentiers, and between CBs and OFIs, is taken into consideration, the model sheds light on additional causal relations. The dynamics of the variables considered is represented in figures 2−4 and 5−7, whereas the main preliminary results are summed up in table 4. Plainly, our findings are purely qualitative and it would be premature to credit them with specific real world timing. However, for the sake of explanatory convenience, we split the dynamics of the model into two logical time horizons. In particular, we assume that the 'short run' extends to 10 periods after the shock (i.e. the shaded area in figures 2–4), whereas we term 'long run' the dynamics towards the new steady state (i.e. up to time 3000 in our simulations, shown in figures 5–7).

[18] We refer the reader to the website sfc-models.net, containing the macros to replicate results in Godley and Lavoie (2006). Notice also that the robustness of our model has been checked by running it under many different parameter values. Different versions of the model (including a three household sector model) have been tested as well.

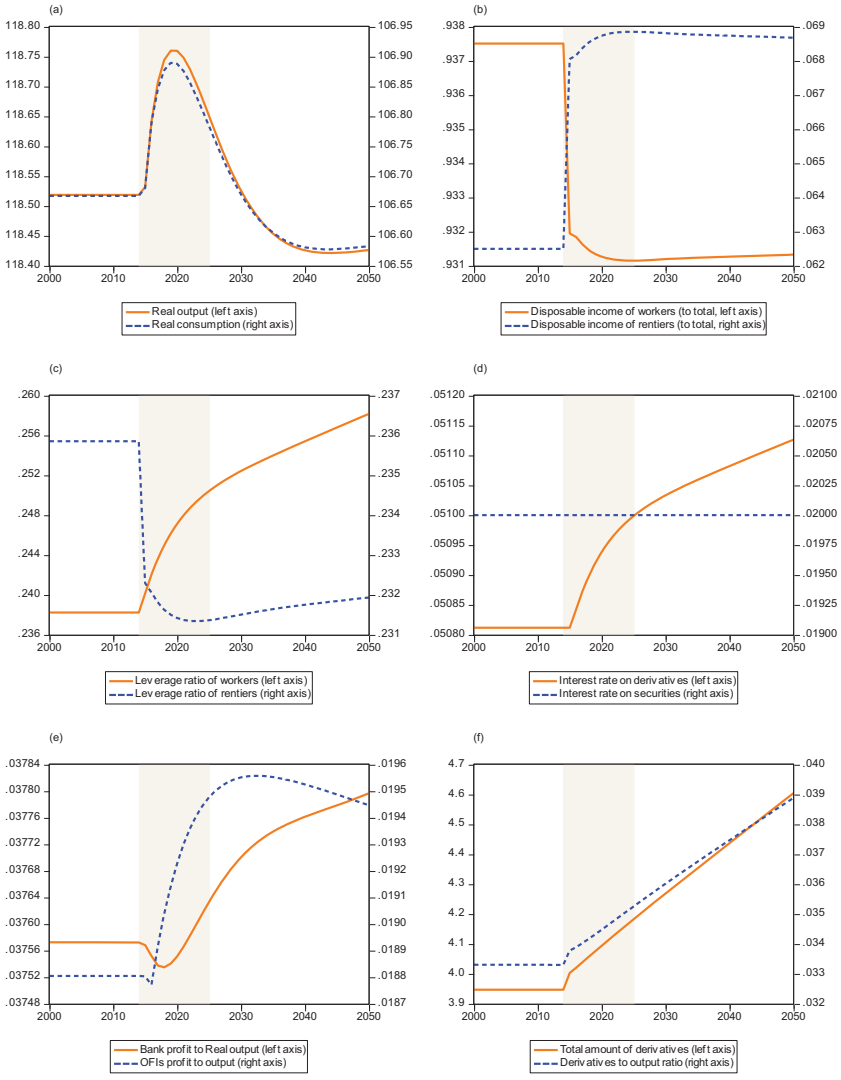

Figure 2. Short-run dynamics following a wage cut. (a) Evolution in output and total consumption. (b) Evolution in income distribution. (c) Evolution in leverage ratios of households. (d) Evolution of interest rates on financial assets. (e) Evolution of financial profitability. (f) Evolution of derivatives.

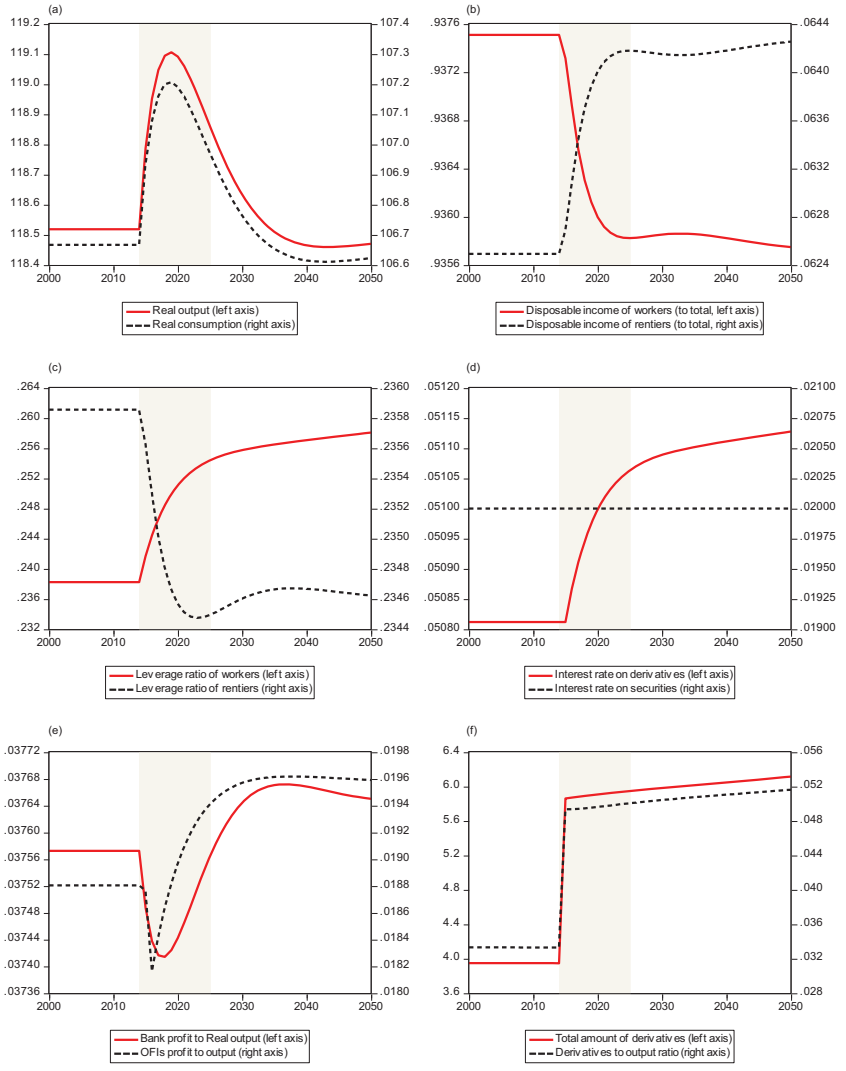

Figure 3. Short-run dynamics following an increase in demand for derivatives. (a) Evolution in output and total consumption, (b) Evolution in income distribution. (c) Evolution in leverage ratios of households. (d) Evolution of interest rates on financial assets. (e) Evolution of financial profitability. (f) Evolution of derivatives.

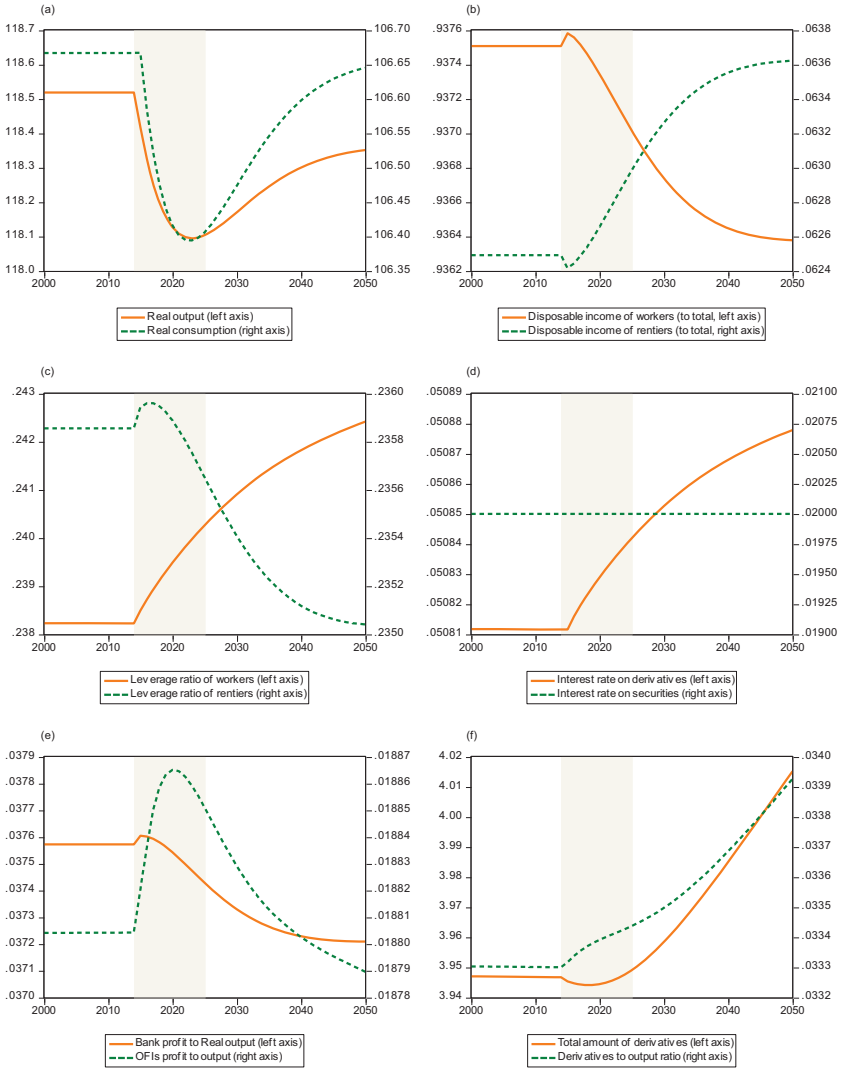

Figure 4. Short-run dynamics when financial profitability affects negatively real investment. (a) Evolution in output and total consumption. (b) Evolution in income distribution. (c) Evolution in leverage ratios of households. (d) Evolution of interest rates on financial assets. (e) Evolution of financial profitability. (f) Evolution of derivatives.

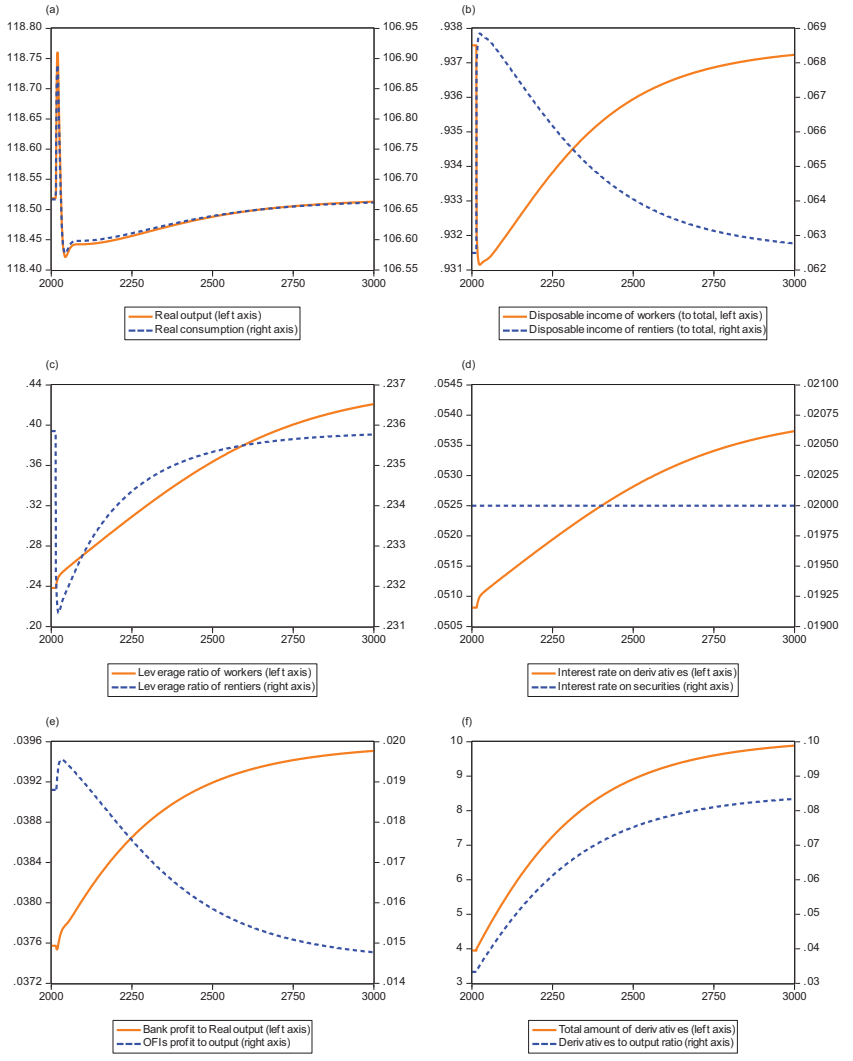

Figure 5. Long-run adjustment to the new equilibrium following a wage cut. (a) Evolution in output and total consumption. (b) Evolution in income distribution. (c) Evolution in leverage ratios of households. (d) Evolution of interest rates on financial assets. (e) Evolution of financial profitability. (f). Evolution of derivatives.

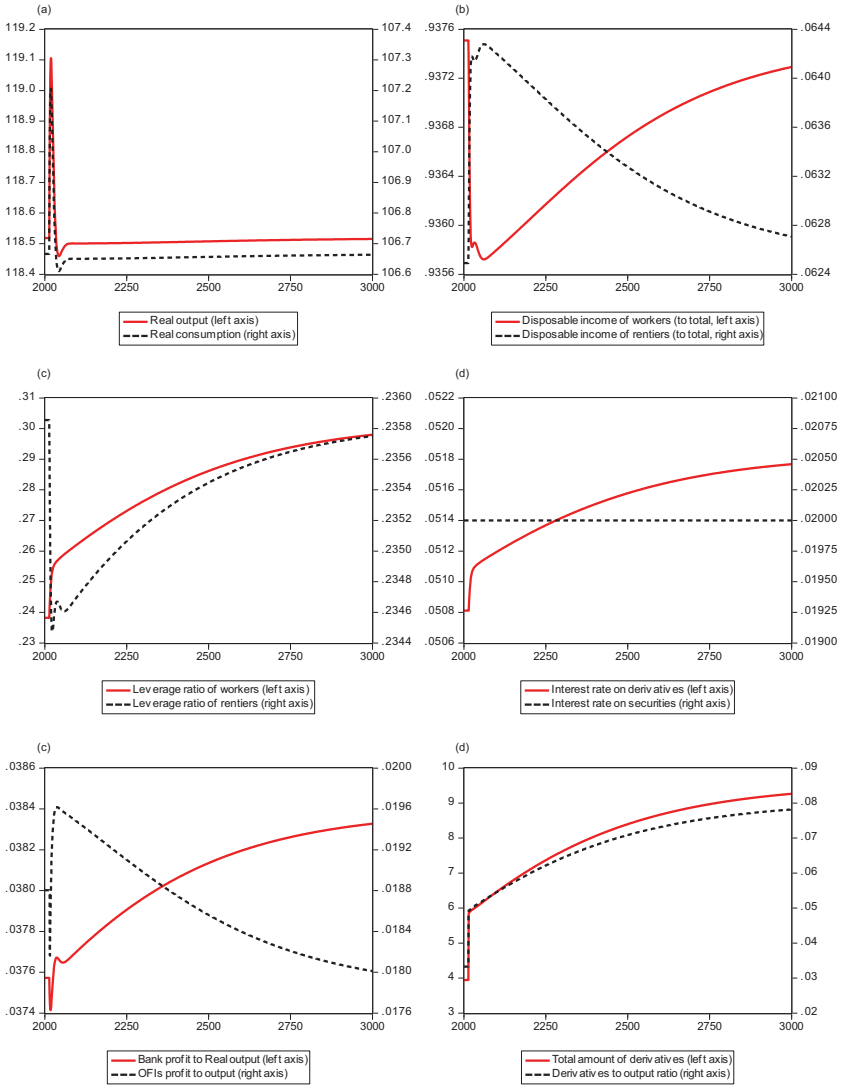

Figure 6. Long-run adjustment to the new equilibrium following an increase in demand for derivatives. (a) Evolution in output and total consumption. (b) Evolution in income distribution. (c) Evolution in leverage ratios of households. (d) Evolution of interest rates on financial assets. (e) Evolution of financial profitability. (f) Evolution of derivatives.

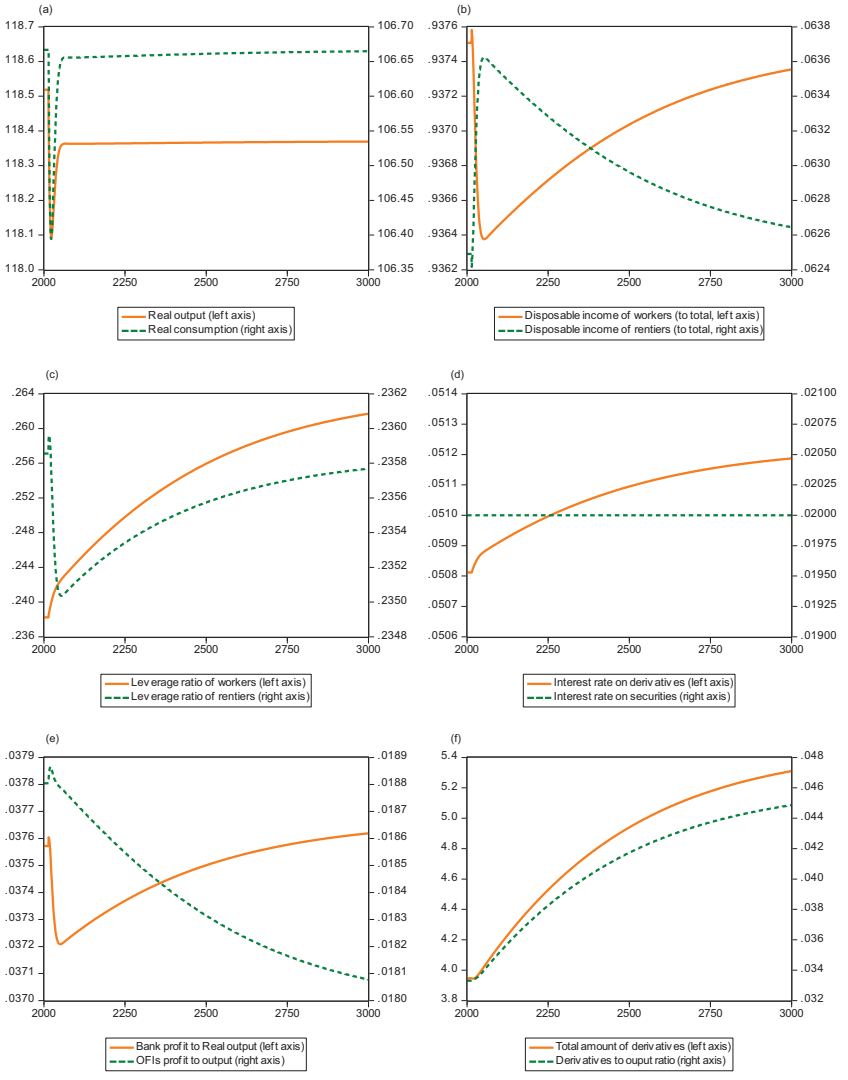

Figure 7. Long-run adjustment to the new equilibrium when financial profitability affects negatively real investment. (a) Evolution in output and total consumption. (b) Evolution in income distribution. (c) Evolution in leverage ratios of households. (d) Evolution of interest rates on financial assets. (e) Evolution of financial profitability.

Table 4. Summary of main results of simulations

		Short-run and long-run effects											
		GDP and consumption		*Income inequality**		*Workers leverage ratio*		*Financial profit rate*		*CBs and OFIs profits*		*Derivatives amount*	
Shocks	Timing	S	L	S	L	S	L	S	L	S	L	S	L
1. Wage cut		↑↑	≪	↑	>	↑	>	↑	>	↑↑	> <	↑	>
2. Higher demand for derivatives		↑↑	≪	↑	>	↑	>	↑	>	↓↓	> <	↑	>
3. Finance affects real investment		↓↓	≪	↑	>	↑	>	↑	>	↓↑	> <	↑	>

Notes: 'S' = up to 10 periods after the shock; 'L' = long-run trend (towards the new steady state); '↑' = increase; '↓' = decrease; '>' = higher than baseline; '<' = lower than baseline; * = disposable income of workers relative to disposable income of rentiers.

It turns out that all of the shocks considered (i.e. wage cut, higher demand for derivatives, and negative effect of financialisation on traditional investment) entail an increase in income of rentiers relative to workers (i.e. income inequality), workers' leverage ratio, financial profitability, and issues of financial derivatives, in the short run. By contrast, the effect on aggregate consumption and total output (and investment) is more variegated. For instance, a wage cut leads to an increase in both variables in the very short run. The reason is that workers try to offset the reduction in their purchasing power by borrowing from banks (whereas the higher income of rentiers leads them to spend more for consumption). Clearly, this is not sustainable in the long run, so that consumption and output eventually reduce. A similar trend is generated by a higher demand for derivatives by rentiers: total output increases in the short run, due to the temporary increase in disposable income of rentiers, but a sharp decrease follows, thereby returning output back to the baseline value. Plainly, an increase in sensitivity of current productive investment to financial profitability (measured by the return rate on derivatives) negatively affects output as the latter rises. This effect is not of permanent nature. The long run (partial) recovery of output brings along a (partial) recovery in target capital stock and investment. However, our findings are coherent with the claim that the adjustment process may be very slow in practise. In fact, 'it may well go by way of hell' (Minsky, 1986, p. 177).

Finally, the profitability of banks and OFIs does not show a unique trend. A wage cut generates an increase in CBs and OFIs profits (to total output) in the short run. Traditional banking benefits from the increase in demand level. Similarly, 'shadow banking' benefits from the increase in indebtedness of working-class households. However, OFIs profit turns out to be lower than the baseline value in the long run, due to the reduction in household debt exposure. An increase in rentiers' demand for financial derivatives goes along with a short-run fall in profitability of both CBs and OFIs, followed by a recovery in profit of CBs in the long run. Likewise, an increase in the sensitivity of productive investment to financial profitability goes along with a decrease in OFIs profits and an increase in CBs profits in the long run, despite of the initial increase in shadow banking profitability to total output (both in absolute terms and compared to traditional banking).

To sum up, our model 'forecasts' a rise in income inequality and an increase in the degree of indebtedness of working-class households associated with the process of financialisation, i.e. with recent institutional changes affecting the 'final finance' phase of the monetary circuit. The spread of financial products (both in absolute terms and as a percentage to total output) and the increase in the related rate of return are additional

features clearly pointed out by the model. The long run effect on profitability of traditional banking and shadow banking looks more variegated though. However, this is likely to be the by-product of the simplicity of our framework. In this regard, a further development of the institutional setting of the model seems to be necessary, and it can be the subject of future circuitist (stock-flow consistent) works.

6. FINAL REMARKS

The aim of this paper was to explore how Graziani's Theory of Monetary Circuit could be developed to reflect some important features of the evolution of the financial system in the past three decades, which have been associated with the word 'financialisation'. We made our analysis by embedding the benchmark monetary circuit scheme in a richer set of institutional arrangements. More precisely, in section 2, we reconsidered the essential circuitist distinction between initial finance and final finance in the light of the increasing weight of financial markets and institutions. Such very taxonomy turns out to be fundamental for the examination of the different functions of commercial banks and other financial institutions, respectively. In section 3, we developed the narrative of our article and we supported it by setting up a (simplified but) stock-flow consistent and financially-augmented dynamic model, in the wake of Godley and Lavoie (2006). Such a device allowed us to examine three fundamental changes entailed by the financialisation process in an artificial pure bank-money economy of production. As we argued in sections 4 and 5, our preliminary findings are consistent with the common belief that financialisation was associated with a worsening in income distribution and an increase in the indebtedness level of working-class households. The presence of financial intermediaries, transforming household loans into financial products, and the effect of class divide on access to bank credit, are pinpointed as the two main drivers of this dynamics. Plainly, the proposed formal model suffers of some limitations, due to its simplified nature. However, this very feature enabled us to highlight some simple causal relations between financial and macroeconomic variables, while allowing for possible future theoretical developments.

APPENDIX A. LIST OF EQUATIONS

The production decisions of the firms

Production of consumption goods: $c_s = c_d$ (1)

Production of investment goods: $i_s = i_d$ (2)

Real output: $y = c_s + i_s$ (3)

Nominal output: $Y = p_y \cdot y$ (4)

Amortisation funds: $AF = \delta \cdot k_{-1} \cdot p_{y,-1}$ (5)

Demand for bank loans of firms:

$L_f = L_{f,-1} + p_y \cdot i_d - AF - (B_s - B_{s,-1})$ (6)

Entrepreneurial profit (residual):

$F_f = Y - WB_s - r_{l,-1} \cdot L_{f,-1} - r_{b,-1} \cdot B_{w,-1} - AF$ (7)

The investment behaviour of firms

Real accumulation of capital: $k = k_{-1} + i_d - da$ (8)

Real depreciation allowances: $da = \delta \cdot k_{-1}$ (9)

Real capital stock target: $k^t = (k_0 - k_1 \cdot r_d) \cdot y_{-1}$ (10)

Real demand for investment goods: $i_d = \gamma \cdot (k^t - k_{-1}) + da$ (11)

The traditional banking (CBs)

Total (stock of) loans demanded: $L_d = L_f + L_w + L_r$ (12)

Total loans: $L_s = L_{s,-1} + (L_d - L_{d,-1})$ (13)

Total deposits held: $M_d = M_w + M_r + M_o$ (14)

Total supply of deposits: $M_s = M_{s,-1} + (L_s - L_{s,-1})$ (15)

Profit of the CBs: $F_b = r_{l,-1} \cdot L_{f,-1} - r_{m,-1} \cdot M_{d,-1}$ (16)

The shadow banking (OFIs)

Supply of derivatives: $D_s = d_r \cdot p_d$ (17)

Unit price of derivatives: $p_d = p_d^t + \tau \cdot \xi_1$ (18)

Share of securitised loans: $\varphi = p_d \cdot d_s / (L_{w,-1} + L_{r,-1})$ (19)

Bank deposits held by OFIs: $M_o = D_s$ (20)

Profit of the OFIs:

$F_o = r_{l,-1} \cdot L_{r,-1} + r_{c,-1} \cdot L_{w,-1} + r_{m,-1} \cdot M_{o,-1} - r_{d,-1} \cdot D_{s,-1}$ (21)

The wage setting

Labour demand: $N_d = y/pr$ (22)

Labour employed: $N_s = N_d$ (23)

Wage rate: $w = w^t$ (24)

Wage bill: $WB_s = w \cdot N_s$ (25)

Labour productivity: $pr = pr^t$ (26)

Household behaviour

Disposable income of workers:

$$YD_w = WB_s + r_{m,-1} \cdot M_{w,-1} + r_{b,-1} \cdot B_{w,-1} - r_{c,-1} \cdot L_{w,-1} \quad (27)$$

Disposable income of rentiers:

$$YD_r = r_{m,-1} \cdot M_{r,-1} + F_f + F_b + F_o + r_{d,-1} \cdot p_{d,-1} \cdot d_{r,-1} - r_{l,-1} \cdot L_{r,-1} \quad (28)$$

Household disposable income: $YD = YD_w + YD_r$ (29)

Number of rentiers: $N_r = h_1 \cdot N_d + h_2 \cdot \xi_2$ (30)

Real consumption by workers: $c_w = \alpha_0 + \alpha_1 \cdot yd_w^e + \left(L_w - L_{w,-1}\right)/p_y$ (31)

Real consumption by rentiers: $c_r = \beta_0 + \beta_1 \cdot yd_r^e + \left(L_r - L_{r,-1}\right)/p_y$ (32)

Expected real income of workers: $yd_w^e = YD_{w,-1}/p_{y,-1}$ (33)

Expected real income of rentiers: $yd_r^e = YD_{r,-1}/p_{y,-1}$ (34)

Total demand for real consumption: $c_d = c_w + c_r$ (35)

Wealth of workers: $V_w = V_{w,-1} + YD_w - c_w \cdot p_y$ (36)

Wealth of rentiers: $V_r = V_{r,-1} + YD_r - c_r \cdot p_y + CG$ (37)

Capital gains on derivatives: $CG = \left(p_d - p_{d,-1}\right) \cdot d_r$ (38)

Demand for loans by workers:

$$L_w = L_{w,-1} + \alpha_2 \cdot V_{w,-1} - rep_1 \cdot L_{w,-1} + \alpha_3 \cdot (c_r/N_r - c_w/N_d) - \alpha_4 \cdot (w - w_{-1} \cdot p/p_{-1}) \quad (39)$$

Loans/wealth ratio of workers:

$$\alpha_2 = \eta_1 \cdot \left\{1 - \left[L_{w,-1} \cdot (rep_1 + r_c)\right]/V_w\right\} + \eta_2 \cdot \varphi \quad (40)$$

Risk premium: $\pi=\pi_0+\pi_1 \cdot \left(L_{w,-1} \cdot rep_1\right)/V_{w,-1}$ (41)

Demand for loans by rentiers: $L_r=L_{r,-1}+\beta_2 \cdot V_{r,-1}-rep_2 \cdot L_{r,-1}$ (42)

Loans/wealth ratio of rentiers:
$\beta_2=\theta_1 \cdot \left\{1-\left[L_{r,-1} \cdot (rep_2+r_l)\right]/V_r\right\}$ (43)

Portfolio choice of households

Demand for securities of workers: $B_w=\lambda_0 \cdot V_w+\lambda_1 \cdot r_b \cdot V_w-\lambda_2 \cdot YD_w$ (44)

Bank deposits held by workers: $M_w=V_w-B_w+L_w$ (45)

Supply of securities of firms: $B_s=B_w$ (46)

Demand for derivatives of rentiers: $d_r \cdot p_d=\lambda_3 \cdot V_r+\lambda_4 \cdot r_d \cdot V_r-\lambda_5 \cdot YD_r$ (47)

Bank deposits held by rentiers: $M_r=V_r-p_d \cdot d_r+L_r$ (48)

Interest and return rates

Interest rate on loans: $r_l=r_l^t$ (49)

Interest rate on loans to workers: $r_c=r_l+\pi$ (50)

Rate of interest on deposits: $r_m=r_l-add_0$ (51)

Rate of return on securities: $r_b=r_m+add_1$ (52)

Rate of return on derivatives: $r_d=\ add_2+add_3 \cdot r_c$ (53)

Price setting

Strategic unit price of output: $p_y=p_y^t$ (54)

Unit price of output: $p_y=(1+\rho) \cdot w/pr$ (55A)

Costing margin: $\rho=Y/WB_s-1$ (55B)

Hidden or residual equation

-. Supply of deposits: $M_s=M_d$

Notes: we assume that the endogenous variable in equation (55A) is not the unit price of output, p_y, but the costing margin, ρ. Therefore, equation (55A) can be replaced with equation (55B). Adaptive expectations about disposable incomes are assumed in equations (33) and (34).

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