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In Passarella (2011B) a kind of up-grading of Minsky's economic thought was proposed, in which his 'financial instability hypothesis' was inter-bred with inputs from the current heterodox literature. This up-grading was done within a one-good model where capital goods were regarded as a mere portion of firms' homogeneous output. This simplifying hypothesis did not permit us to include explicitly the ratio of the (demand) price of capital assets to the supply price of capital goods – i.e. the key analytical concept in Minsky's theory. This paper aims to improve the simplified model provided in Passarella (2011B) by considering explicitly an artificial, pure credit, closed capitalist economy in which production firms are split into two different sectors. The result is a new, although paradoxical, monetary circuit model which allows us to retrieve some of the most disputed results of Minsky's analysis of economic instability.

Key words: Post-Keynesian models, Stock-flow Consistency, Financial Instability

JEL classifications: B50, E12, E32, E44

1. Introduction

In Passarella (2011B) a kind of up-grading of Minsky's economic thought has been proposed. More precisely, the so-called 'financial instability hypothesis' has been inter-bred with inputs both from the Theory of the Monetary Circuit and from the current Post-Keynesian 'Stock-Flow Consistent' modeling. This modification was done within a one-good model where capital goods were regarded as a mere portion of firms' total (homogeneous) output. This simplifying hypothesis allowed us to take the first step towards analyzing of the effect of both 'capital-asset inflation' and

consumer credit on the financial soundness of firms' sector. However, the very hypothesis of homogeneity of output did not permit us to include explicitly the ratio of the (demand) price of capital assets to the supply price of capital goods – that ratio is the key analytical device of Minsky's theory (see, for instance, Minsky 1976, 1977, 1982, 1986). The importance of this ratio – which roughly corresponds to the well-known Tobin '*q*' – lies in the fact that, on the one hand, it allows us to regard inflation as a process of change in relative prices, and, on the other hand, it permits us to consider the relationship between financial markets and 'productive' investment. This is a crucial point in Minsky's analysis of the causes of both financial fragility and economic instability.

This paper aims to extend and improve the simplified framework provided in Passarella (2011B) by considering explicitly an artificial, pure credit, closed capitalist economy in which each production firm is assigned to one of the two separated sectors: a sector producing capital (or investment or intermediate) goods; and a sector producing consumer (or final) goods. This very feature of the model, accompanied by the macroeconomic condition of stock-flow consistency, is the reason why it can be labeled a 'Minskian-Kaleckian' model (according to the taxonomy proposed by Parguez, 2004; see also Zezza, 2004). In this current paper, section 2 will introduce the reader to the 'two-price model', regarded as the cornerstone of Minsky's 'financial instability hypothesis'. In sections 3 and 4, we will present a fairly straightforward, but stock-flow consistent, re-formulation of some of the disputed aspects of Minsky's theory within a monetary circuit model in the presence of two production sectors. In sections 5 to 8, we will use this model in order to analyze the impact of both 'capital-asset inflation' and households' autonomous consumption on the financial 'soundness' of the economy. Some concluding remarks will be provided in the last part of the paper.

2. The two-price model: an analytical overview

As is well known, Minsky aims to join together Keynes' investment theory of the cycle (given in Chapters 12 and 17 of the *General Theory*) with a financial theory of investment. The two pillars of Minskian thought are the 'two-price model' and the 'theory of increasing risk' – both inspired by Keynes (1936) and Kalecki (1971) (see Papadimitriou and Wray, 2008; see also Passarella, 2010). More specifically, Minsky's analysis starts from a financial re-reading of the *General Theory*, which he considered as a draft of fundamental insights, albeit a draft that contains some of the contradictions and contaminations of 'Neoclassical' doctrine from which Keynes claimed he wanted to break away. From a microeconomic point of view, Minsky suggests we switch our attention from the Keynesian 'ambiguous' concept of the 'marginal efficiency of capital' to the price of capital assets as the key variable for the analysis of productive investment. In short, the higher the market value of capital assets, and the lower the perception of the twin risks linked to investment, then the higher the single firm's investment – given the supply price of new capital goods.

More precisely, Minsky considers two different kinds of price: the (demand) price of capital assets; and the (supply) price of current output. This latter, in turn, can be further sub-divided into the price of production of consumer goods and the price of production of capital goods. These sets of prices are strictly linked, because capital goods 'are a part of current output, and those [capital] goods that will be like some of the existing capital assets must have prices as current output consistent with their prices as capital assets' (Minsky, 1986, p. 179). Hence, Minsky distinguishes (i) the price of capital assets, p_k, that is the highest demand price that the *single investing firm* is willing to pay (and that is linked to the trend of the equity market), from (ii) the supply price of new capital goods, p_i, which is determined by the conditions of production and the mark-up set by the *producing sector*. The former depends

positively on the long-run profit expectations of the investing firm (and on the supply of money as well); the latter depends positively on the costs of production and the short-run profit expectations of the producing firms. Notice that it is the relative dynamics of these two prices, which are set 'in different markets and by different forces' (Minsky, 1977, p. 21), that determines the real amount of productive investment which is undertaken by each single firm. In short, a demand price higher than the supply price of capital goods is what enables the investing firm to take advantage of undertaking investment.

Minsky's argument is usually represented by means of the well-known 'two-price diagram'. However, we can easily translate Minsky's insights in formal analytical terms as well. We obtain a system of five equations in five unknowns (I_{0j}, p_i, p_i', p_{kj}, I_{rj}), that is:

(2.1) $I_{0j} = A_j/p_i$

(2.2) $p_i = (1+\mu)w/a_i$

(2.2') $p_i' = (1+R_i)\,p_i$

(2.3) $p_{kj} = Q/(r_j + R_{kj})$

(2.4) $p_{kj} = p_i'$

where:

$$R_i = \begin{cases} 0 \text{ if } I_{rj} \le I_{0j} \\ R_i(I_{rj}) \text{ if } I_{rj} > I_{0j};\ \frac{dR_i}{dI_{rj}}, \frac{d^2R_i}{dI_{rj}^2} > 0 \end{cases}; \quad R_{kj} = \begin{cases} 0 \text{ if } I_{rj} \le I_{0j} \\ R_{kj}(I_{rj}) \text{ if } I_{rj} > I_{0j};\ \frac{dR_{kj}}{dI_{rj}}, \frac{d^2R_{kj}}{dI_{rj}^2} > 0 \end{cases}$$

and where $I_{rj} = \Delta K_j$ is the total investment in new capital goods, I_{0j} is the part of real investment which is financed through internal funds, A_j is the amount of internal funds, w is the average wage paid to each worker, a_i is the average output per worker in the sector that produces capital goods, μ is the gross mark-up, R_i is a positive function of the lender's risk, Q is the unit 'quasi-rent' linked to the investment[1], r_j is the discount rate used by the single firm in the absence of risks[2],

and R_{kj} is a positive function of the borrower's risk. Finally, notice that the subscript '*j*' is used for indicating those magnitudes which refer specifically to the single firm.

Equation (2.1) defines the level of self-financed investment of the single (representative) *j*-th firm as the ratio between the amount of internal funds (that Minsky regards as 'given' at the micro level) and the supply price of new capital goods. This price is determined according the cost-plus pricing rule, as is shown in equation (2.2). Notice that, insofar as the amount of funds required for the planned investment is larger than the amount of internal funds, the firm needs to borrow credit-money from banks. This additional financing entails increasing costs, in the form of increasing interest payments, which are linked to the increase in lender's risk – as is shown in equation (2.2'). Equation (2.3) shows that the demand price of capital assets depends positively on the flow of quasi-rents (which are derived from the firms' investment), but depends negatively on the discount rate applied by the single firm. This rate, in turn, depends on the firm's profit expectations and on the increase in borrower's risk[3]. Finally, equation (2.4) provides the equilibrium condition, that allows the single firm to set the level of optimal real 'productive' investment.

Clearly, the single firm keeps on investing until the (decreasing) demand price equals the (increasing) 'augmented' supply price of capital goods. In other words, the single firm invests if and only if, and insofar as, the demand price to supply price ratio – which resembles the Tobin '*q*' – is higher than 1, that is say,

$$(2.5)\quad q_j = \frac{p_{kj}}{p_i'} = \frac{Qa_i}{(r_j + R_{kj})(1+\mu)(1+R_i)w} \geq 1$$

This ratio depends positively on both the quasi-rents and the productivity of labor, whereas it depends negatively on the cost of the labor-force, on the quasi-rents' discount rate, on the monopoly power of firms which produce capital goods, and on the twin-risks on the productive investment.

Lastly, the investment leverage ratio of the *j*-th firm is equal to:

$$(2.6)\quad \lambda_j = \frac{L_{kj}}{L_{kj}+A_j} = \frac{p_i(I_{rj}-I_{0j})}{p_i(I_{rj}-I_{0j})+p_i(I_{0j})} = 1 - \frac{I_{0j}}{I_{rj}} \qquad (d\lambda_j/dI_{rj} > 0)$$

where L_{kj} is the amount of external funds (i.e. bank loans) that the single firm needs in order to finance the investment.

Equation (2.6) shows that investment leverage ratio of the single *j*-th firm is an increasing function of planned real investment, I_{rj}. It is here that Minsky thought he discovered the 'arcane' aspect of the instability of capitalist economies: during period of 'tranquil growth' – Minsky argued – firms are propelled to improve their investment plans and hence they are inclined to increase the investment leverage ratio. This very behavior tends to increase the financial fragility of firms' and banks' balance-sheets and, sooner or later, it will lead to the economic instability and – in the absence of any government (and central bank) intervention – to the crisis.

3. The stock-flow consistent accounting framework

As many authors have argued (see mainly Lavoie and Seccareccia, 2001), Minsky's 'hypothesis' of an increasing leverage is vitiated by the 'fallacy of composition', since Minsky extends to the entirety of the firms' sector conclusions which are correct for the *single* representative firm only[4]. In our opinion, this conundrum can be regarded as a typical problem of (lack of) macroeconomic stock-flow consistency. Hence, in the next sections, the question of the financial fragility of a monetary economy of production will be developed – if not in the *letter*, at least in the *spirit* of Minsky – within a stock-flow consistent social accounting framework, where four different sectors are explicitly considered[5]:

(i) households (or wage-earners), which sell their labor-power to firms in return for a money-wage; which purchase consumer-goods; and which hold financial assets

(i.e. deposits and equities, in our simplified model);

(ii) a sector including (non-financial) firms which produce consumer-goods ('c-firms', hereafter) by means of employing labor and use capital goods as inputs;

(iii) a sector including (non-financial) firms which produce capital goods ('i-firms', hereafter) by means of employing labor as the sole input[6];

(iv) a macro-sector including a central bank and commercial banks (which lend credit-money to both the productive sector and the household sector) *plus* other non-bank financial operators (who create 'quasi-money' or 'derivatives').

Both the government and foreign sector can be ignored at this stage of our analysis. More precisely, we will adopt an accounting structure – which represents the analytical 'skeleton' of our model – where all interest rates and rates of return (on bank loans, i_L, on bank deposits, i_D, and so on) are set at a level that remains fixed during a given accounting period and the corresponding interest-payments and returns are settled at the end of the same period[7]. Furthermore, it is assumed that:

(i) households hold financial assets (bank deposits and equities), but do not directly purchase capital goods;

(ii) c-firms not only purchase capital goods and issue equities, but can also decide to buy/hold financial assets (equities and derivatives);

(iii) i-firms finance their current production by means of bank loans only, whereas they do not purchase capital goods[8], do not issue equities and do not buy financial assets;

(iv) banks and financial intermediaries issue financial assets (i.e. newly issued equities – which are bought by households – and 'derivatives' – which are bought by c-firms) and hold a percentage of c-firms' capital stock.

Finally, following both Minsky (1986) and other today's Post-Keynesians (see, for

instance, Dos Santos, 2006), we reject the traditional distinction among commercial banks, on the one hand, and investment banks *plus* other non-bank financial intermediaries, on the other hand. We will include all these actors in the same sector, labeled 'Banks and NBFI' (where 'NBFI' stands for 'Non-Banking Financial Intermediaries'). Notice that this allows us to consider the deep changes which have occurred (especially) in the Anglo-Saxon banking system during the last twenty years. Moreover, we assume here that households are able to obtain bank loans in order to finance consumption, even beyond the limit of their disposable income. More specifically, we will assume that the amount of bank loans received by households is an increasing function of their wealth (and hence of the inflation in the stock market). The reason is that in the last few decades, Anglo-Saxon households have been embedded in the frenzy of financial markets by virtue of their holdings of shares, of their 'stakes' in supplementary pensions, and so on. This process has also allowed households to borrow on the basis of the value of their own stock of assets[9].

Previous assumptions are summarized in a consistent set of sectoral balance-sheets where every financial asset has a counterpart liability, and the budget constraints of each sector describe how the balance between flows of expenditure, factor income and transfers generate counterpart changes in the stocks of assets and liabilities (see Lavoie and Godley, 2001-02)[10]. More precisely, the top part of Table 1 is the transaction flow matrix of a capitalist, 'pure credit', closed economy that has two 'productive' sectors. For instance, row 1 of Table 1 shows the flow of final consumption expenditure from the household sector to c-firms; row 4 shows the flow of 'passive' interest-payments on bank loans going from private sector (households and firms) to banking-financial sector; and so on. The bottom part of the matrix shows the uses and sources of funds of the economy – that is to say, shows the monetary *budget constraint* faced by each economic sector. More

precisely, this part shows 'how the sectoral balance sheets are modified by current flows' (Dos Santos, 2005, p. 719). Notice that loans borrowed by firms are of a 'residual' and 'revolving' kind (namely, as the external resources that firms need to fund both non-self-financed investment and current production), whereas bank lending to households is of a different 'nature', since it entails an additional and (potentially) lasting debt. Finally, notice that each column (representing a sector) and each row (representing a flow of transactions) of Table 1 must sum to zero. This means that, within this accounting framework, 'every flow comes from somewhere and goes somewhere' (Godley, 1999B, p. 394) and, hence, 'there are no [accounting] black holes' (Godley, 1996, p. 7).

4. The 'new' monetary-financial circuit

We know that a distinctive feature of a growth-oriented productive system – such as the one analyzed by Keynes and, in the wake of him, further analyzed by Minsky (until the 1980s at least) – is the major role of banks in the financing of production (and investment in capital goods), where security market plays a passive role in channeling household saving towards production firms. However, as Mario Seccareccia has asserted in a recent (unpublished) work, since the end of the 1970s financial markets have taken on a central role in Western economies. In fact, 'growing profits and retained earnings associated with a relatively weak business investment have slowly transformed (or "rentierized") the non-financial business sector itself into a net lender' (Seccareccia, 2010, p. 4) that seeks higher financial returns on its internal funds. At the same time, households' saving has fallen drastically: since the 1990s, the household sector in many Anglo-Saxon countries has increasingly become a net borrower, rather than a net lender (which has long been considered as one of the 'traditional' economic roles of the household sector).

On the money-supply side, banks have become 'financial conglomerates' that seek to maximize their fees and commissions by issuing and managing assets in off-balance-sheet affiliate structures. This has produced a change in the structure of the monetary circuit, where the banking system is assumed to finance the activity of the business sector (current production and, at a lower level of abstraction, investment plans). In the era of the so-called 'Money Manager Capitalism', the traditional link between production firms and banks 'has been largely severed […] and it is the dynamics of the banks/financial markets axis […] which has taken center stage' (Seccareccia, 2010, p. 6).

In Fig. 1 the simplest version of the monetary circuit is represented by the sequence (1)-(5). For the sake of simplicity, we assume that households use their incomes (i.e. both labor- and capital-incomes) to buy commodities and/or securities issued by c-firms, and we exclude (again by assumption) any possibility of an increase in households' holdings of bank deposits. In short, within a closed monetary economy of production, the *logical* sequence is: (1) banks grant credit to the industrial firms, enabling them to start the process of production (as well as to finance each single investment plan – but notice that the purchase of capital-goods is an exchange 'internal' to the production sector); (2) firms use the initial finance to pay the money wage-bill to households in return for the labor-power that those firms need; (3.a and 3.b) once the production process in any given period is completed, households spend a percentage of their income in the commodity market and hold the rest in the form of financial assets (equities issued by c-firms, in our simplified model); (4) the liquidity (notably credit-money) that is spent in both the equity market and the commodity market comes back to the production sector; (5) insofar as this sector gets back its monetary advances, it is able to repay (the 'principal' of) its bank debt[11].

As has already been mentioned, the process of 'financialization' has involved a remarkable change in the *historical* structure of the monetary circuit. The strategic position of the banking system and the financial market in the new capitalism is depicted in Fig. 2. On the one hand, the creation of credit-money has been increasingly sustained by households' debt, L_h, rather than by the demand for finance of the production sector (see arrow (1) in Fig. 2). On the other hand, households' debt has fuelled the transactions on the financial markets (both on the equity market and on the market for derivatives – i.e. 'bank bonds', within our simplified model) because of the demand arising from the growth in 'saving' (i.e. money profits) of the c-firms (see arrow (3) in Fig. 2)[12]. In short, the sequence which marks the 'new' monetary circuit is virtually opened by the decision of banks to grant credit (not only to industrial firms, but also) to households on the basis of their wealth – i.e. the stock of financial assets hoarded by households (arrow (1)). Households spend both this credit-money and (a proportion of) their income in the commodity market (arrow (2)). Insofar as c-firms are able to fund their desired real investment plans, they can assign a percentage of their retained earnings to both the equity market and the market in derivatives. In the former, c-firms can re-purchase a proportion of their own shares – either from other c-firms or from households and banks (arrows (4.b)-(4.c))[13]. In the latter, banks and NBFI place derivatives (for instance, collateralized debt obligations or CDOs) which are indirectly 'monetized' by c-firms' saving (arrows (3)-(4.a))[14]. This happens because, in the presence of rising prices and returns in the financial markets, it may become profitable for over-capitalized c-firms 'to allocate excess capital to financial assets in preference to engaging in real investment' (Michell, 2010, p. 20). The final outcome is that production firms assume the role of net lender, whereas households become net borrowers.

5. Initial finance and the financing of investment

The paradoxical form of the new monetary circuit, which is depicted in Fig. 2, can be analyzed in a SFC manner with the assistance of Table 1[15]. In this regard, it is assumed that productive firms express two different kinds of demand for bank loans: (i) the *stricto sensu* 'initial finance' ($L_w = L_{cw} + L_{iw}$) which the industrial sector as a whole needs to fund current production and which covers the cost of production (i.e. the wage-bill); (ii) a further demand for credit (L_k), allowing each single c-firm to fund that part of investment which cannot be financed by internal resources[16]. The amount of initial loans demanded (and obtained, by assumption), respectively, by c-firms, by i-firms and by the production sector as a whole, are[17]:

(5.1) $\Delta L_c = L_{cw} + L_k = W_c + \lambda_c p_i \Delta K$

(5.2) $\Delta L_i = L_{iw} = W_i$

(5.3) $\Delta L_f = \Delta L_c + \Delta L_i = W + \lambda_c p_i \Delta K$

where λ_c is the *residual* share of investment funded by bank loans (namely, the investment leverage ratio of c-firms).

At the end of the process of production, households can purchase consumer goods and/or save a share of their income, thereby increasing their stock of (financial) assets. If we assume that households can also borrow credit-money in order to fund their 'extra' consumption (i.e. in order to achieve the 'desired' level of consumption), then their 'augmented' budget constraint is[18]:

(5.4) $W + F_{ch} + F_b + i_D \Delta D + \Delta L_h - i_L \Delta L_h = p_c C + \Delta V_h$

For the sake of simplicity, let us assume that: (i) bank loans (i.e. consumer credit) to households can be expressed as a proportion, c_2, of the value of households' stocks of assets (including capital gains, see the last row of the first column of Table 1); (ii) the interest rate on bank deposits is negligible; (iii) banks and NBFI do not face any cost of production, and use entirely any level of their net receipts to purchase

equities issued by c-firms[19]; (iv) banks and NBFI do not issue shares; (v) households divide their savings between c-firms' equities and zero-interest bank deposits only. Given these premises, we have:

(5.5) $\Delta L_h = c_2(V_{h(-1)} + \Delta p_{Ec} E_{ch(-1)})$

(5.6) $\Delta V_h = \Delta D + p_{Ec}\Delta E_{ch}$

(5.7) $p_{Ec}\Delta E_{cb} = i_L \Delta L + F_{cb} - i_B \Delta B$

(5.8) $\Delta E_{Nc} = \Delta E_c(1 - \sigma)$

(5.9) $p_{Ec}\Delta E_{Nc} = p_{Ec}\Delta E_{ch} + p_{Ec}\Delta E_{cb} = \Delta V_h - \Delta D + i_L \Delta L + F_{cb} - i_B \Delta B$

where V_{h-1} is the households' wealth at the end of the previous period, ΔE_{Nc} is the quantity of new shares issued by c-firms net of any stock buy-back, and σ is the ratio of stock buy-back to current issues.

Equation (5.9) shows that the 'net' demand for equities of c-firms arises from households' saving (although in decreasing terms as the process of financialization takes off) and banks' net receipts. Notice that if firms decide to use their retained earnings in order to re-purchase part of their capital stock from households, then the current net change that is described by the left-hand term of (5.8) may become negative – this will be so if $\sigma > 1$. In this case, households and banks could *spend* the resulting additional flow of credit-money only for consumption. Consequently, even in the presence of any re-purchasing of shares, there is only one circumstance which can produce a net loss of liquidity for c-firms as a whole: the decision of the other sectors to save a percentage of their income in the form of liquid balances (i.e. bank deposits, in this simplified model). Finally, if we divide (5.9) by ΔE_{Nc} (and then substitute, using (5.8), for ΔE_{Nc}), we obtain:

(5.9') $p_{Ec} = \frac{\Delta V_h - \Delta D + i_L \Delta L + F_{cb} - i_B \Delta B}{\Delta E_c(1-\sigma)}$

that is to say, the price of a share in a c-firm is, *ceteris paribus*, a positive function both of the banks' demand (and hence of the banks' profits) and of the buy-back of c-

firms' shares[20].

In order to analyze – still within a SFC basic model of monetary circuit – the effect of inflation in the prices of capital assets on the behavior of the productive sector, we have to introduce the Kaleckian macroeconomic equations of profits. From the second column of Table 1 we obtain:

(5.10) $P_c = p_c C - W_c - i_L \Delta L_c + i_B \Delta B$

(5.11) $P_i = p_i \Delta K - W_i - i_L \Delta L_i$

(5.12) $P_f = p_i \Delta K + p_c C - W - i_L \Delta L_f + i_B \Delta B$

Notice that equation (5.10) is determined before investment: profits from sales are one of the sources used by c-firms in order to fund the purchase of capital goods (which will be employed from the next period). Notice also that the rate of return on bank bonds (i_B) is directly linked to the rate of interest on households' debt (i_L). More precisely, banks and NBFIs issue 'bonds' which are subscribed by c-firms which are looking for higher returns on their capital[21]. This process allows banks and NBFIs to 'monetize' a percentage (call it α) of their credit with households without waiting until the maturity-date. However, in order to do so, the rate of return on issued bonds must be higher than the rate on bank deposits and lower than (or equal to) the rate on bank loans to households ($i_D < i_B \leq i_L$).

6. The effect of 'financialization' on firms' profits

Now, let us consider two different cases. *Case* 1. We assume initially that: (i) the investment in capital goods is entirely financed by the issuing of new equities (so that $p_i \Delta K = p_{Ec} \Delta E_{Nc}$ and $\Delta L_f = L_{cw} + L_{iw}$); (ii) c-firms do not distribute dividends and banks do not issue shares (so that $F_c = 0$, $\theta_c = 1$ and $\Delta E_b = 0$)[22]; (iii) the rate of return on bank bonds is negligible ($i_B = 0$). Using (5.9) and (5.4) into (5.10), (5.11) and (5.12), we get:

(5.10') $P_c = W_i + \Delta L_h(1 - i_L) - \Delta V_h - i_L \Delta L_c$

(5.11') $P_i = (\Delta V_h - \Delta D) + i_L(\Delta L_c + \Delta L_h) - W_i$

(5.12') $P_f = \Delta L_h - \Delta D$

and hence:

(6.1) $W_i + \Delta L_h > \Delta V_h + i_L(\Delta L_c + \Delta L_h) \Longrightarrow P_c > 0$

(6.2) $p_{Ec}\Delta E_{ch} + i_L(\Delta L_c + \Delta L_h) > W_i \Longrightarrow P_i > 0$

(6.3) $\Delta L_h > \Delta D \Longrightarrow P_f > 0$

Inequality (6.1) shows that c-firms' profits from sales are positive if the 'external' demand for consumption (i.e. consumer credit *plus* wages paid by i-firms) is larger than the sum of interest-payments (paid to banks by households and c-firms) and households' savings. Inequality (6.2) shows that i-firms' profits are positive if the sum of c-firms' equities purchased by households and interest-payments to banks (paid by households and c-firms) is larger than i-firms' cost of labor. Finally, inequality (6.3) shows that total receipts from sales – made by production sector as a whole – are enough to pay back what the firms have borrowed (i.e. principal *plus* interest) and to provide a positive total net money profit, if the amount of bank credit to households is larger than the amount of deposits that households (decide to) hold. The conclusion is that production firms (considered as a wholly integrated sector) realize money profits if households are net debtors with the banking sector – and, hence, firms are net creditors.

Case 2. Let us suppose that: (i) c-firms' investment in capital goods can be debt-financed; (ii) the rate of return on bank bonds is positive, allowing c-firms to realize financial gains. If we continue to assume that c-firms do not distribute dividends and banks do not issue shares, then the amount of money profits of firms becomes:

(5.10'') $P_c = W_i + \Delta L_h(1 - i_L) + i_B \Delta B - \Delta V_h - i_L \Delta L_c$

(5.11'') $P_i = \Delta L_k + (\Delta V_h - \Delta D) + i_L(\Delta L_c + \Delta L_h) - W_i$

(5.12'') $P_f = (\Delta L_h + \Delta L_k + i_B \Delta B) - \Delta D$

and, remembering (5.5), we obtain:

(5.12''') $P_f = c_2(1 + \alpha i_L)(V_{h(-1)} + \Delta p_{Ec} E_{ch(-1)}) + \lambda_c p_i \Delta K - \Delta D$

where α is the percentage of the loans made by banks to households which have been turned into bank bonds (or 'securitized')[23]. Equation (5.10'') shows that c-firms' profits depend positively (also) on the return on bank bonds. Equation (5.11'') shows that i-firms' profits are affected positively (also) by the amount of bank financing for investment. Finally, equations (5.12'') and (5.12''') confirm that, *ceteris paribus*, the higher the amount of loans borrowed by production sector, the higher will be the level of investment in capital goods, and the higher will be the net money profit gained by the production sector as a whole.

Notice, however, that the profitability of the production sector is now positively affected also by both the level of the receipts from the 'investment' in financial assets (i.e. bank bonds, in this simplified model) and the wealth of households, including capital gains realized on the equity market. More precisely, the inflation in the price of equities has two positive effects: first, it increases the amount of consumer credit and hence sustains c-firms' profits from sales; second, the interest accruing to the debt of households is a financial gain for c-firms. Notice also that, since inflation in the price of capital assets allows c-firms to replace their borrowings (from the banks) by equity financing, then 'capital-asset inflation' reduces the monetary cost of such financing. Nonetheless, if we admit that banks spend all of their receipts, then interest-payments on loans are never a 'real' cost for the production sector, because they flow back to it in the form of higher consumption and/or higher equity-financing. This is the reason why interests accruing on bank loans to firms do not appear in the equation (5.12''')[24].

7. Prices, distribution and growth

As is well known, Post-Keynesians and 'circuitist' authors reject the neoclassical theory (both the early 'marginalist' one and its subsequent developments) of prices, distribution and employment. In its stead, they follow a formulation which is very close to the approach developed by Nicholas Kaldor, Joan Robinson and – although with some differences – by Michał Kalecki (see Graziani, 2003). In the course of this section, we will follow the specific approach adopted by Minsky, according to whom the investment decision is linked to the assessment of financial markets. However, we will substitute the demand function of capital goods, adopted by Minsky in his 'two-price model', with a modified version of the 'accelerator' of investment. Furthermore, we will suppose that, in the medium-run, the price of capital goods is linked to the demand price of new equities issued by c-firms in order to finance (a portion of) the 'productive' investment[25].

For the sake of simplicity, we assume also that: (i) the effect of the lender's risk is exogenously given (and incorporated in the interest rate, i_L); (ii) the borrower's risk is a function, R, of the excess of planned investment over internal funds[26]; (iii) prices are fixed according to the Kaleckian principle of *cost-plus pricing*; (iv) c-firms can distribute dividends, so that their share of retained earnings (net of bank interest) is $0 \leq \theta_c \leq 1$; (v) banks issue 'derivatives' (but not equities), and they use their profits in order to purchase equities issued by c-firms only; (vi) the interest rate on deposits is nil; (vii) households spend a share of their income for consumption and hold the rest in the form of c-firms' equities; (viii) there is an infinite supply of labor at the going wage; (ix) c-firms sell whatever is demanded, no more and no less; (x) households have correct expectations regarding their incomes; (xi) the *gross* mark-up is exogenously given[27]. Finally, we consider a medium-run (logical) time-horizon, characterized by the presence of free mobility of capital and output between

sectors[28]. We obtain a system of twenty-one equations in twenty-one unknowns[29], that is:

(7.1) $Y = p_c C + p_i \Delta K$

(7.2) $\Delta K = \frac{k_1 \Delta Y^e}{p_i(1+k_2 i_L + k_3 R + k_4 \alpha)}$ $\left(k_1 = \frac{p_i \Delta K}{\Delta Y} \geq 1;\ k_{2,3,4} \geq 0\right)$

(7.3) $p_i = (1+\mu)\frac{w}{a_i}$ $\left(a_i = \frac{I_r}{N_i} = \frac{\Delta K}{N_i}\right)$

(7.4) $R = R(I_k)$ $\left(\frac{dR}{dI_k} > 0;\ \frac{d^2R}{dI_k^2} \geq 0\right)$

(7.5) $p_c = (1+\mu)\left(\frac{w}{a_c} + \frac{p_i}{b}\right)$ $\left(a_c = \frac{C}{N_c};\ b = \frac{C}{\Delta K}\right)$

(7.6) $C = \frac{c_1(Nw + F_{ch}) + \Delta L_h(1-i_L)}{p_c}$ $(0 < c_1 \leq 1)$

(7.7) $\Delta L_h = c_2 V_{h(-1)}$ $(c_2 > 0)$

(7.8) $\Delta V_h = (1-c_1)(Nw + F_{ch})$

(7.9) $F_{ch} = (1-\theta_c) P_c \frac{\Delta V_h}{p_{Ec} \Delta E_{Nc}}$

(7.10) $N_c = \frac{C}{a_c}$

(7.11) $N_i = \frac{\Delta K}{a_i}$

(7.12) $N = N_c + N_i$

(7.13) $I_k = \Delta K - \frac{\theta_c P_c + p_{Ec} \Delta E_{Nc}}{p_i}$

(7.14) $P_c = p_c C - N_c w - i_L \Delta L_c + \alpha i_L \Delta L$

(7.15) $P_i = p_i \Delta K - N_i w - i_L \Delta L_i$

(7.16) $\Delta L_c = N_c w + p_i I_k$

(7.17) $\Delta L_i = N_i w$

(7.18) $q = \varepsilon \frac{p_{Ec}}{p_i}$

(7.19) $\varepsilon = \frac{\Delta E_{Nc}}{\Delta K(1-\lambda_c - \pi_c)}$ $(\pi_c = \frac{\theta_c P_c}{p_i \Delta K};\ \lambda_c = \frac{I_k}{\Delta K})$

(7.20) $p_{Ec} = \frac{\Delta V_h + i_L \Delta L(1-\alpha) + F_{cb}}{\Delta E_{Nc}}$

(7.21) $F_{cb} = (1 - \theta_c)P_c - F_{ch}$

Equation (7.1) defines the well-known national income identity in a closed economy without government sector. Equation (7.2) provides a modified version of the 'accelerator' of productive investment. It shows that investment planned by c-firms is an increasing function of the expected demand and it is a decreasing function of the rate of interest, of the borrower's risk and of the degree of securitization, given the supply price of capital goods[30]. Equation (7.3) provides the supply price of new capital goods (which is fixed by i-firms). Equation (7.4) shows that the borrower's risk is an increasing function of the excess of investment over internal funds. Equation (7.5) provides the supply price of consumer goods. Equation (7.6) defines the equilibrium condition between supply and households' demand of consumer goods, from which we obtain the quantity of this kind of goods. Equation (7.7) shows that loans to households are a percentage of their own wealth. Equation (7.8) defines the change in the households' wealth. Equations (7.9) and (7.21) define dividends to households and banks, respectively. Equations (7.10), (7.11) and (7.12) show that the amount of supplied labor adjusts to labor demand coming from production firms[31]. Equation (7.13) defines the (proportion of) debt-financed *real* investment as the ratio of external funds to the price of one capital good. Equations (7.14) and (7.15) replicate equations (5.10) and (5.11), respectively. Equations (7.16) and (7.17) correspond to (5.1) and (5.2), respectively. Equations (7.18) to (7.20) show the link between the capital good market and the equity market. More precisely, they jointly determine the price of new equities issued by c-firms (and purchased by banks and households).

As we have already mentioned, c-firms keep on investing until the (decreasing) demand price of capital assets is equal to the supply price of capital goods – that is to say, until:

$$(7.18') \quad q = \varepsilon \frac{p_{Ec}}{p_i} = \left[\frac{\Delta V_h + i_L \Delta L(1-\alpha) + F_{cb}}{\Delta K(1-\lambda_c-\pi_c)} \cdot \frac{a_i}{w(1+\mu)}\right] \geq 1$$

Notice that this latter refers to the entirety of c-firms, and not to the single representative firm. Equation (7.18') shows that the higher the households' saving and the higher the banks' net receipts (both held in the form of c-firms' equities), the higher will be the profitability of engaging in productive investment (given both the condition of the production of capital goods and the quantity of equity-financed investment).

There is also another relative price (within this model) that is worth some comment – namely, the relative price of manufactured goods:

$$(7.22) \quad \frac{p_c}{p_i} = \frac{(1+\mu)(w/a_c + p_i/b)}{(1+\mu)w/a_i} = \frac{a_i}{a_c} + \frac{1+\mu}{b}$$

which is seen to depend not only on the technique of productions, but also on the general (gross) mark-up. More precisely, the lower the productivity of c-firms and the higher the mark-up, the higher will be the price of consumer goods with respect to the price of capital goods.

Finally, it is easy to verify that (within this simplified model) the distribution of income among sectors depends on both the mark-up (μ) set by firms (on the ground of their degree of monopoly) and the level of the bank interest rate (i_L). More precisely, the former defines the composition of output (i.e. the 'division' of output between capital goods and consumer goods – given both the scale of production, N, and the technique of production embedded in a_c, a_i and b), whereas the latter (i.e. the interest rate) defines the share in consumption of the banking-financial sector[32]. Consequently, the potential purchasing power (i.e. the total real wage, Nw/p_c) of households can be regarded – in Sraffa's words – as the 'dependent variable' in income distribution[33].

8. Leverage ratios and firms' financial fragility

As usual in the post-Keynesian literature, the bank debt that has been incurred by c-firms in order to fund the purchase of capital goods is the residual term to close the gap between planned investment and internal funds (i.e. equity finance *plus* retained earnings)[34], that is:

(8.1) $L_k = \lambda_c p_i \Delta K = p_i \Delta K - (\theta_c P_c + p_{Ec} \Delta E_{Nc})$

This latter is none other than the Kaldorian budget-constraint for investment-expenditure undertaken by the c-firms' sector; this constraint is derivable from the second column of Table 1.

We are now able to determine the *marginal* leverage ratio associated with c-firms' investment decisions, that is:

(8.2) $\lambda_c = 1 - \frac{\theta_c P_c + p_{Ec} \Delta E_{Nc}}{p_i \Delta K}$

from which – after a number of algebraic manipulations, and remembering equations (7.1) to (7.21) – we obtain:

(8.2') $\lambda_c = \frac{1 - \left[\frac{\theta_c}{k}(c_h + v_i) + q\frac{e}{\varepsilon}\right]}{1 - i_L}$ $\qquad (d\lambda_c/dk > 0)$

where c_h is the share of households' 'autonomous' consumption (i.e. consumer credit net of interest-payments owed to the banks) in national income, k is the share of new 'productive' investment in national income, v_i is the share of wages paid by i-firms (minus total households' saving) in national income, and e is the number of new shares per unit of real investment. It is easy to verify that c-firms' investment leverage ratio increases as the real investment proceeds (i.e. as k increases). This situation corresponds precisely to the well-known Minskian hypothesis. Notice further that c-firms' leverage is affected positively by the bank interest rate, whereas it is affected negatively by the current 'net' demand for consumption (i.e. consumer credit *plus* wages paid by i-firms), by the share of retained earnings and by the

percentage of equity-financed investment[35].

By contrast, the financial 'soundness' of i-firms is affected positively as investment increases. Indeed, a rising rate of investment entails rising flow of receipts (in the form of bank deposits) into the coffers of i-firms. This is the reason why, provided that we regard productive firms as an integrated and consolidated sector, the investment marginal leverage ratio needs not to grow. In formal terms, if, for the sake of simplicity, we assume that $c_1 = 1$, then:

$$(8.3)\ \lambda_f = 1 - \frac{P_i + P_c + p_{Ec}\Delta E_{Nc}}{p_i \Delta K} = -\frac{\frac{\theta_c}{k} c_h + q\frac{e}{\varepsilon}}{1 - i_L}$$

Consequently, if at least one of households' autonomous consumption or the share of equity-financed investment is positive (i.e. $c_h > 0$, given $\theta_c > 0$; and/or $qe/\varepsilon > 0$), then the resulting *variation* in the investment leverage ratio of the production sector is negative. However, in the presence of firms' stock-buyback the number of new shares per unit of real investment, *e*, can become negative, thereby producing an increase in the leverage ratio.

Notice that, although the financial soundness of the *whole* productive sector does not seem to deteriorate as the investment proceeds (given both the rate of retention and the percentage of stock-buyback), it remains true that the very interconnection of firms' cash-flows, in the presence of high imbalances in firms' balance-sheets, could make the economic system more and more fragile[36]. More precisely, during phases of euphoric growth, signed by increasing asset prices and high 'autonomous' consumption, the perception of the risk linked to the investment decreases and this makes the demand price of capital goods, and hence *q*, grow. Notice that, to that extent that any 'extra' profits from sales are enough to fund the investment, c-firms do not need to get into debt and hence they are characterized by hedge financing (i.e. λ_c and λ_f decrease). In this phase, inflation in the money values of capital assets transforms financial markets into a (potential) source of 'low-cost' financing –

thereby making these markets an alternative to bank loans as source of finance. Initially at least, this process may have effects that are stabilizing – and not de-stabilizing, as Minsky would have expected – on c-firms' balance-sheets; and the same goes for the i-sector, because it benefits from the increasing demand for capital goods induced by such 'low-cost' funding[37].

However, we can suppose that, as the process of 'financialization' proceeds, c-firms are prone to use (a growing part of) their liquidity in order to purchase financial assets (i.e. derivatives and/or their own shares), instead of purchasing capital goods. In the presence of an 'easy' monetary policy of the central bank – i.e. a policy that allows asset-values to keep on growing – this process can, theoretically, continue without end. However, notice that: (i) if c-firms reduce their purchase of capital goods (below a given threshold), then i-firms may have selling problems; (ii) c-firms are driven to use leverage (and hence to have 'over-resort' to bank debt) by purchasing financial assets, in order to increase the return on their capital; (iii) in the course of time, the buy-back of stock reduces the resilience of the c-sector's balance-sheet, because it increases the leverage ratio on real (and financial) investments – as e decreases more quickly than q increases[38]. The combined effect of these factors can drive the system from a 'hedge' position to a 'speculative' situation – according to the well-known Minskian taxonomy.

9. Final remarks

In this paper, we have tried to provide a simplified, but stock-flow consistent, re-interpretation of some of the most disputed aspects of Minsky's theory of financial fragility and economic instability, by cross-breeding his 'two-price model' with inputs both from the Circulation approach and from current Post-Keynesian modeling. The result is a new, although paradoxical, monetary-financial circuit

model in which the creation of credit-money is sustained by households' debt, rather than by the demand by firms for finance – and it is this selfsame debt of households that fuels the expansion of the financial market. In short, the sequence which leads (within this simplified circuit model) to financial fragility and to the crisis can be split into two different phases. Initially, consumer credit and (the resulting) 'capital asset inflation' have a positive effect on the financial structure of the production sector. We can assume that both factors are the result of households' attempt to keep a given 'desired' level of consumption – for instance, in spite of a long-term decrease in their wage-receipts[39]. In the course of this phase, c-firms are driven to use their receipts in order to purchase financial assets, and this very inflow of new funds stimulates activity in the financial markets. During the second phase of 'financialization', this latter shows its negative face, because of the combined effect of: (i) the stagnation of 'productive' investment; (ii) the 'financialization' – and the resulting over-indebtness – of firms producing final goods; (iii) the reduction in the percentage of equity-financed investment (linked to firms' buy-back of shares) along with the decline in the percentage of retained earnings. Eventually, both the increase in the price of assets and the decreasing creditworthiness of firms can lead to an increase in the *effective* rate of interest[40]. In the course of time, the growing financial fragility of firms, the increase in the bank interest-rate, and the resulting reduction in the value of households' stock of assets, affect consumption and investment, thereby giving rise to the crisis.

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Footnotes

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(1) Minsky's definition of 'quasi-rents' is: the (expected) income cash-flows net of current costs – which roughly correspond to the (expected) money profits. For the sake of simplicity, we assume that capital goods last indefinitely and that the flow of quasi-rents can be likened to a perpetual revenue.

(2) Notice that, since we have implicitly assumed that the amount of quasi-rents is 'given' and 'certain', it is the discount rate that embodies the firm's profit expectations. This rate can be likened to Keynes' 'marginal efficiency of capital' (in its genuine meaning).

(3) Following Keynes, Minsky distinguishes two different kinds of risk – the borrower's risk and the lender's risk – both increasing as the real investment increases. The borrower's risk has a 'subjective' nature and is linked to the reduction of the firm's margins of safety. As a firm incurs more and more debt, the rate at which the firms' flow of quasi-rents is discounted grows, thereby generating a decrease in the expected current value of investment and a fall in the price of capital assets. Even the nature of the lender's risk is subjective, since it depends on the expectations of banks that lend to firms, but this risk becomes 'objective' when quantitative magnitudes become incorporated in credit agreements in terms of higher interest-payments (and other financial burdens).

(4) As Toporowski has effectively argued, the point is that, even if rising investment entails rising debt (in the form of bank loans), it also entails rising profits (in the form of bank deposits held by firms producing capital goods), with the asset side of firms' balance sheets becoming 'more, not less, liquid as debt-financed investment proceeds' (Toporowski, 2008, p. 734). In formal terms, the amount A_j of internal funds of the single firm (in equation (2.1)) is not 'given', but it is determined, in turn, by investment decisions undertaken by firms as a whole. At the macro-level, internal funds correspond to the total amount of (retained) profits and, hence, to (a share of) the aggregate investment.

(5) Notice that, although, in principle, it should be valid for any consistent model, the definition 'stock-flow consistent' usually refers to a specific set of Post-Keynesian simulation models mainly developed by Wynne Godley (see Godley 1996, 1999A, 1999B; Lavoie and Godley, 2001-02; Godley and Lavoie, 2007A, 2007B). For a complete overview of this kind of model, see Dos Santos (2005). On possible problems and limits of the current stock-flow consistent literature, see Michell (2010).

(6) The rationale is that investment (i.e. the purchase of capital goods) is an exchange that is 'internal' to this sector. This hypothesis is used also in a number of recent 'agent-based models' dealing with the bankruptcy diffusion (see, for instance, Delli Gatti et al., 2006).

(7) Notice that if one wants to set out a simulation model, this assumption must be dropped, because it could produce an excessive 'simultaneity'.

(8) See footnote 6.

(9) For the sake of simplicity, in the rest of the paper we will assume that households' savings can take the form of either bank deposits or equities. However, this framework can be easily improved in order to consider explicitly the possibility, for households, of holding other kinds of assets (e.g.

buildings, Treasury bills, and so on).

(10) In this sense, the SFC modeling is the best way to develop the Minskian notion of the 'firm' as a balance sheet of assets and liabilities (in a world marked by radical uncertainty), as opposed to the traditional notion of the firm as a (completely rational and foresighted) individual agent who 'merely' combines the factors of production.

(11) For the moment, the question of the repayment of interest (in monetary terms) on bank loans is left aside. Notice also that if households do not hoard deposits, then the entirety of the sums paid by firms as dividends on shares flows back to the firm sector. For a complete analytical description of the monetary circuit, see Graziani (2003).

(12) Notice that bank loans which fund households' 'autonomous' consumption turn into an equivalent amount of bank deposits received by the production sector. This amount of deposits (in excess of the funds needed to undertake the production and the investment) gives rise to a process of 'over-capitalization' and allows firms to invest in financial assets (see Toporowski, 2008; and Michell, 2010).

(13) The reasons why the single firm would decide to buy back its shares are: (i) to sustain the price of equities; (ii) to maintain a given level of its own internal liquidity; (iii) to realize capital gains; (iv) to implement a 'distributional' mechanism.

(14) For instance, with the intermediation of pension and investment funds. For the sake of simplicity, we will assume both in Table 1 and in the following equations that firms subscribe directly non-specific 'bank bonds'.

(15) Among the works suggesting an integration between the SFC Post Keynesian modeling and the theory of monetary circuit, see Godley (1999B), Godley and Lavoie (2007A), Lavoie (2004, 2006), Zezza (2004, 2011), Keen (2009) and Pilkington (2009). For an opposite opinion that, on the whole, is critical of the monetary circuit approach (which is regarded as a mere 'pedagogical' instrument), see Cavalieri (2003).

(16) According to Graziani, firms 'need finance in order to set up and carry on any kind of production'. Hence, a bank loan 'must cover the cost of total production and is not confined to financing specifically the production of capital goods' (Graziani, 2003, p. 69). However, Graziani himself admits that, insofar as we abandon the conception of the firm sector as one that is fully integrated and we consider a multiplicity of units, 'in order to buy finished [capital] goods, firms need finance as much they need finance for paying the wage-bill in the labour market' (Graziani, 2003, p. 99).

(17) Notice that L_w must be borrowed at the beginning of the period, whereas one should assume

that L_k is demanded when production (of capital goods) has been completed. For the sake of simplicity, we will leave aside this distinction hereafter, and we will keep on assuming that the whole bank loan is borrowed at the beginning of the period.

(18) For a detailed glossary of symbols, we refer the reader to Table 2.

(19) As Zezza has argued, if we model a single monetary circuit, 'the rationale for banks asking for interest payments is either to pay for their "cost of production" … or to distribute profits to bank owners, or to cumulate wealth, and since we can rule out that banks cumulate wealth in the form of their own deposits, we can safely assume that any level of undistributed profits obtained by the banking sector is used entirely to purchase equities' (Zezza, 2011, p. 6; see also Zezza, 2004). Notice that Zezza's hypothesis that the 'financial period' (which starts when the bank loan is created, and ends when the loan is paid back) is longer than the 'production period' (in which firms recover liquidity from sales and pay the interest to banks, which, in turn, spend this liquidity to purchase goods and/or equities from firms), allows us to treat interest payments consistently. On this disputed issue, known as the 'paradox of profits', see also Parguez (2003), Lavoie (2004), and Bellofiore and Passarella (2009).

(20) See footnote 13.

(21) This happens to the extent that opportunities for profitable 'productive' investment by c-firms have been exhausted or, in general, to the extent that the rate of profit on further investment is less than the rate of return to be obtained from buying financial products.

(22) In this case, the reason for purchasing c-firms' equities is the wish to realize capital gains.

(23) So that we have: $i_B \Delta B = \alpha i_L \Delta L_h$.

(24) Herein lies another possible difference with respect to the traditional monetary circuit approach. While, in the eyes of Graziani (2003), interest paid on securities is never a real cost to firms (apart from a possible 'income effect'), he regards the interest paid on bank loans as representing a real subtraction from firms' profit. Notice also that if we assume that c-firms target their entrepreneurial profit, then 'any increase in interest costs will be carried into higher prices. In other words, increases in interest rates will not lead to a fall in the share of income going to entrepreneurial profit, but it will lead to a fall in the real wage rate and in the share of wages' (Godley and Lavoie, 2007, p. 265).

(25) In the medium run, this price should correspond, in turn, to the expected present value of the series of future 'quasi-rents' from a unit of the capital good – see equations (2.3) and (2.4).

(26) Unlike Minsky, who considered equities as 'one class of outside funds' (Minsky, 1976, p. 107; quoted in Lavoie, 1986-1987, p. 260), we regard equities as a source of *internal* funds.

(27) This assumption is not only adopted by Kalecki and by other Post-Keynesian authors, but also

by a number of mainstream economists (notably, by the so-called 'New Keynesians').

(28) Notice that if one considers n firms (or sectors) producing n different goods (with $n \geq 2$), then the usual 'circuitist' short-run hypothesis that states supplies are *given* in real terms becomes inconsistent with the hypothesis of profit equalization. From a medium-run (reproduction) perspective, the solution 'is found in dropping the condition of given supplies' (Lunghini and Bianchi, 2004, p. 155), so that prices spring from the methods of production. This is the perspective adopted by Sraffa (1960) and by the current surplus approach. On the possibility of inter-breeding the circulation approach with the surplus approach, see also Brancaccio (2008).

(29) Endogenous variables are: Y, ΔK, p_i, R, p_c, C, ΔL_h, ΔV_h, F_{ch}, N_c, N_i, N, I_k, P_c, P_i, ΔL_c, ΔL_i, q, ε, p_{Ec}, F_{cb}. Exogenous variables are: i_L, α, a_c, a_i, b, μ, w, θ_c, ΔE_{Nc}. Parameters are: c_1, c_2, k_1, k_2, k_3, k_4.

(30) Notice that this equation substitutes Minsky's demand price of capital goods.

(31) In other words, we assume – in the wake of Marx – that there is a 'reserve army' of unemployed workers, all eager to work at the going wage.

(32) This becomes clear once we relax the assumption that banks use the entirety of their income to purchase only equities issued by c-firms.

(33) We refer the reader to footnote 24.

(34) See, for instance, Lavoie and Godley (2001-02), and Dos Santos and Zezza (2008). We also refer the reader to Passarella (2011A, 2011B). A different 'closure' of the model is supplied by Ryoo (2010), who assumes that the residual variable is the proportion of investment that is equity-financed.

(35) This latter is equal to: $qe/\varepsilon = p_{Ec}\Delta E_{Nc}/p_i\Delta K$.

(36) Notice also that another cause of the financial fragility is the practice of 'stiffening' the temporal structure of liabilities during the ascending phase of the cycle. Besides, mergers and takeovers have the effect – insofar as they are financed by debt – of increasing firms' leverage ratio (see Passarella, 2010).

(37) On this point, see Toporowski (2000, 2010), and Bellofiore, Halevi and Passarella (2010).

(38) Fig. 2 shows that, if the stock buyback is 'internal' to the c-firm sector, then households (as a whole) cannot draw from the financial markets the liquidity that they need to pay off their bank debt. However, they can easily keep on renewing their bank debt, as the price of their own financial assets keeps on increasing, because of the inflow of c-firms' savings (retained profits). The same goes for c-firms' purchase of derivatives (i.e. bank bonds) from banks and NBFI. By contrast, insofar as c-firms buy back their shares from households, these latter can pay off (part of) their bank debt, but only if they 'de-accumulate' (part of) their stock of assets. Data seem to indicate that the two cases describe

two different (subsequent) phases of the business cycle as well as describe the process of 'financialization' on the whole. In fact, on the one hand, the process of financialization of western economies (which started at the end of the 1970s and continued to take place during the 1980s) has been associated with a long-term fall in the proportion of (fixed) investment which is financed by new issues. On the other hand, the equities-to-investment ratio decreased during the upswings (mainly because of the buy-back of stock within the production sector) and increased after the crises, such as the Wall Street crashes of 1987, 2000 and 2007 (see Ryoo, 2010; see also Passarella, 2011A).

(39) In this case, households can resort to bank loans on the basis of their stock of assets. It is clear that this requires the central bank to pursue an 'easy' monetary policy.

(40) Notice that the question of whether this rise is either an outcome of the pressure of demand for credit on a non-infinitely elastic supply (as claimed by Minsky), or the result of an autonomous decision taken by the central bank in order to hold inflation down (as claimed by 'horizontalist' Post-Keynesians), does not change the basic issue. In both cases, the fragility of firms has been endogenously produced as the result of their 'rational' behavior in a world of radical uncertainty. On this point, we refer the reader also to Passarella (2010).

Figures and tables

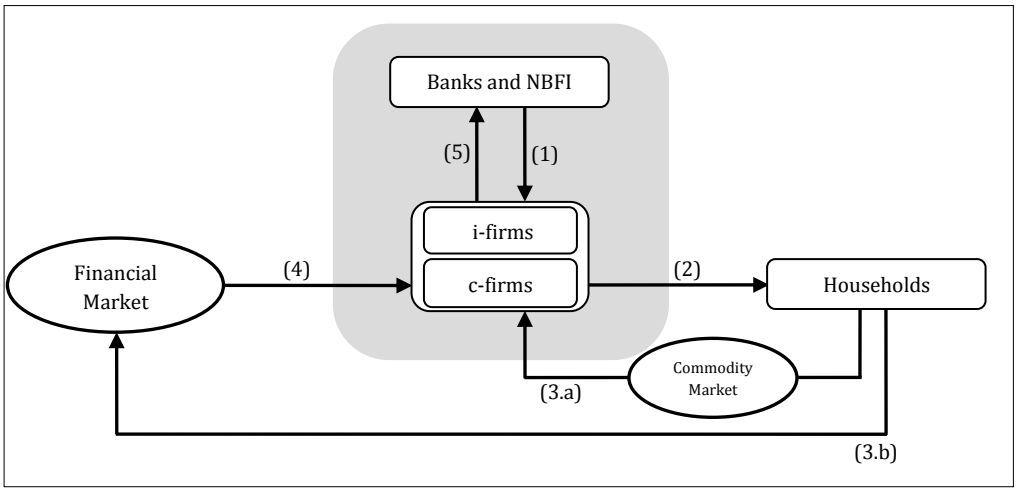

Fig. 1. The *logical* sequence of the monetary circuit. Government sector, foreign sector and central bank are assumed away. It is also assumed that households do not want to hoard bank deposits.

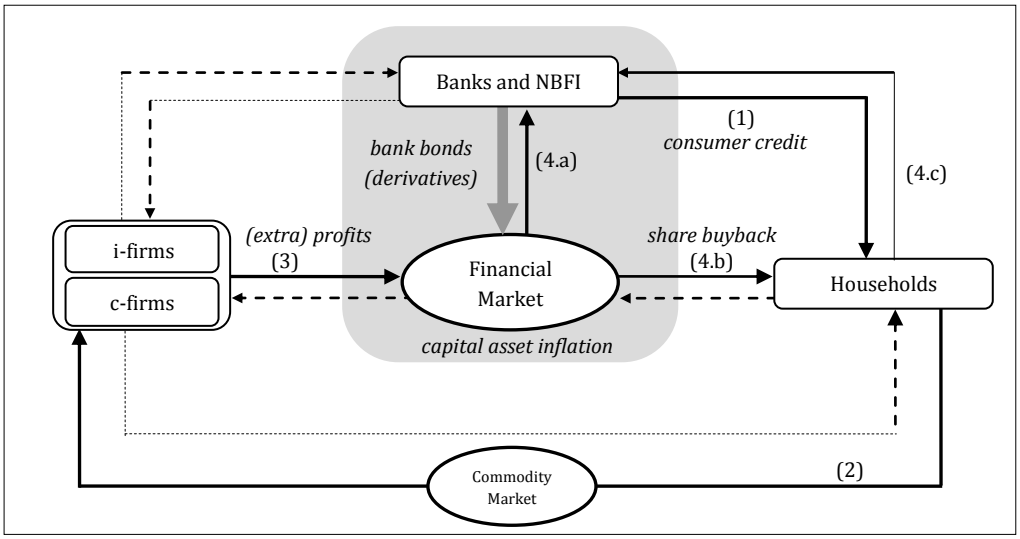

Fig. 2. The paradoxical form of the 'new' monetary circuit. The broken arrow-lines show the weakening of the traditional monetary link between firms, banks and households.

Table 1. The transactions flow matrix of an artificial, 'pure credit', closed economy with two 'productive' sectors

	Sectors: → / Entries: ↘	1. Households	2. Production sector		3. Banks and NBFI	Totals (*row*)
			c-firms	i-firms		
Income and expenditure matrix	1. Consumption	$-p_c \cdot C$	$+p_c \cdot C$			0
	2. Investment (capital goods)		$\{- p_i \cdot \Delta K\}$	$+p_i \cdot \Delta K$		0
	3. Wages	$+W$	$-W_c$	$-W_i$		0
	4. Interest on loans	$-i_L \cdot \Delta L_h$	$-i_L \cdot \Delta L_c$	$-i_L \cdot \Delta L_i$	$+i_L \cdot \Delta L$	0
	5. Interest on deposits	$+i_D \cdot \Delta D_{[h]}$	$[+i_D \cdot \Delta D_c]$	$[+i_D \cdot \Delta D_i]$	$-i_D \cdot \Delta D$	0
	6. Return on bank bonds		$+i_B \cdot \Delta B$		$-i_B \cdot \Delta B$	0
	7. Dividends	$+F_{ch} + F_b$	$-F_c$		$+F_{cb} - F_b$	0
	Current savings (acc. memo)	S_h	F_{uc}	F_{ui}	F_{ub}	S_{tot}
Flow of funds matrix	8. Δ Bank deposits	$-\Delta D_{[h]}$	$[-\Delta D_c]$	$[-\Delta D_i]$	$+\Delta D$	0
	9. Δ Bank loans	$+\Delta L_h$	$+\Delta L_c$	$+\Delta L_i$	$-\Delta L$	0
	10. Δ Bank bonds ('derivatives')		$+\Delta B$		$-\Delta B$	0
	11. Δ Equities	$- p_{Ec} \cdot \Delta E_{ch} - p_{Eb} \cdot \Delta E_b$	$+p_{Ec} \cdot \Delta E_{Nc}$		$- p_{Ec} \cdot \Delta E_{cb} + p_{Eb} \cdot \Delta E_b$	0
	Net capital trans. (acc. memo)	S_h	F_{uc}	F_{ui}	F_{ub}	S_{tot}
	Totals (*column*)	0	0	0	0	0
	Net worth (acc. memo)	$S_h + \Delta p_{Ec} \cdot E_{ch(-1)} + \Delta p_{Eb} \cdot E_{b(-1)}$	$F_{uc} - \Delta p_{Ec} \cdot E_{Nc(-1)} + \Delta p_i \cdot K_{(-1)}$	$F_{ui} - \Delta p_i \cdot K_{(-1)}$	$F_{ub} + \Delta p_{Ec} \cdot E_{cb(-1)} - \Delta p_{Eb} \cdot E_{b(-1)}$	$S_{tot} + \Delta p \cdot K_{t-1}$

Notes: In the top part of Table 1, a '+' before a magnitude denotes a receipt, whereas '–' denotes a payment; in the bottom part, a '+' denotes a source of funds, whereas '–' denotes a use of funds; it is assumed that there is neither a government sector nor a foreign sector; both capital depreciation and inventory stocks are assumed to be negligible.

Table 2. Glossary of symbols

a_c, a_i	Average output per worker of c-firms and i-firms, respectively
A_j	Internal funds of the j-th firm
b	Capital coefficient of c-firms
ΔB	Bank bonds ('derivatives') issued by banks and subscribed by c-firms
C	Quantity of consumer goods
c_1, c_2	Consumption parameters
c_h	Share of households' autonomous consumption on national income
$\Delta D_{[h]}$	Amount of new bank deposits (hoarded by households)
e	Quantity of shares per unit of real investment
$\Delta E_{[N]c}$	New equities issued by c-firms [net of share repurchase]
ΔE_b	New equities issued by banks and NBFI (and purchased by households)
ΔE_{cb}	New equities issued by c-firms and purchased by banks and NBFI
ΔE_{ch}	New equities issued by c-firms and purchased by households
F_b	Banks and NBFI's dividends (distributed to households)
F_c	c- firms' dividends (total)
F_{cb}	c- firms' dividends distributed to banks and NBFI
F_{ch}	c- firms' dividends distributed to households
F_{ub}	Retained earnings of banks and NFBI
F_{uc}	Retained earnings of c-firms ($\equiv \theta_c P_c$)
I_{0j}	Quantity of self-financed investment of j-th firm
i_B, i_D, i_L	Rate of return on derivatives, bank deposits and bank loans, respectively
$I_{r[j]}$, ΔK	Quantity of new capital goods
I_k	Quantity of debt-financed investment
k	Share of productive investment on national income
k_1	Accelerator coefficient
k_2	Securitization coefficient
L_{cw}, L_{iw}	Bank financing of the current production of c-firms and i-firms, respectively
$L_{k[j]}$	Bank financing of the investment

ΔL	New loans created by banks (total)
ΔL_c, ΔL_i	New loans to c-firms and i-firms, respectively
ΔL_f	New loans to productive sector
ΔL_h	New loans to households (consumer credit)
N_c, N_i, N	Employment of c-firms, i-firms and productive sector, respectively
p_c	Price of consumer goods
P_c, P_i, P_f	Monetary profits of c-firms, i-firms and productive sector, respectively
p_{Eb}	Price of equities issued by banks and other NBFI
p_{Ec}	Price of equities issued by c-firms
p_i	Supply price of capital goods
$p_{k[j]}$	Demand price of capital goods
$q_{[j]}$	Tobin 'q'
R, R_k	Borrower's risk function
R_i	Lender's risk function
r_j	Quasi-rent discount rate used by the j-th firm
v_i	Share of wages paid by i-firms on national income
ΔV_h, $V_{h\text{-}1}$	Net change in the worth of households and households' wealth at time $t-1$
w	Average wage paid to each worker
W	Total monetary wage-bill
W_c, W_i	Wage bill paid by c-firms and by i-firms, respectively
α	Percentage of securitization of households' debt
ε	Number of new shares per unit of *equity-financed* real investment
θ_b, θ_c	Percentage of retained earnings of banks and c-firms, respectively
λ_c, λ_f	Investment leverage ratio of c-firms and productive sector, respectively
λ_j	Investment leverage ratio of the j-th firm
μ	General mark-up
π_c	c-firms' profits to investment ratio
σ	Ratio of stock buyback to current issues