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The Missing Macro Link

by

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ABSTRACT

This paper addresses the critique of the aggregational problem attached to the financial instability hypothesis of Hyman Minsky. The core of this critique is based on the Kaleckian analytical framework and, in very broad terms, states that the expenditure of firms for investment is at the same time a source of income for the firms producing capital goods. Hence, even if investments are debt financed, as in Minsky's analysis, the overall level of indebtedness of the firm sector remains unchanged, since the debts of investing firms are balanced by the income of capital goods–producing firms. According to the critics, Minsky incurs a fallacy of composition when he does not take this dynamic into account when applying his micro analysis of investment at the macro level. The aim of this paper is to clarify the consequences of debt-financed investments over the financial structure of an aggregate economy. Starting from the works of Michał Kalecki and Josef Steindl, we developed a stock-flow consistent analysis of a highly simplified economy under four different financial regimes: (1) debt-financed with no distributed profits, (2) debt-financed with distributed profits, (3) internally financed with no distributed profits, and (4) internally financed with distributed profits. The results of our investigation show that debt-financed investments do not lead to a worsening of the financial position of the firm sector only if specific assumptions are taken into account.

Keywords: Hyman Minsky; Financial Instability Hypothesis; Stock-flow Consistent; Financial Fragility; Debt Financing

JEL Classifications: B5, E12

1. INTRODUCTION

Hyman P. Minsky is one of the most influential authors in the (American) Post-Keynesian tradition. The financial crisis that started in 2007 led to a resurgence of his theories among economists, and the expression "Minsky moment" became a catchphrase even outside of the academic world. However, the financial instability hypothesis (FIH), Minsky's most notorious contribution, has not been immune to critiques. Probably the most famous critique is the one raised by Lavoie and Seccareccia (2001), recently renewed by several authors (see Toporowski 2008, Bellofiore and Halevi 2009, and Passarella 2011), which identifies an aggregational problem in the FIH. The core of this critique is based on the Kaleckian analytical framework and—in very broad terms—states that the expenditure of firms for investment is at the same time a source of income for the firms producing capital goods. Hence—even if investments are debt-financed as in the analysis of Minsky—the overall level of indebtedness of the firms sector remains unchanged since the debt of investing firms is balanced by the income of firms producing capital goods. According to the critics, Minsky falls into a fallacy of composition when he does not take into account this dynamic when applying his micro analysis of investment at the macro level. In the FIH, firms base their investment decisions (see Minsky 1975, pp. 91–115) on considerations of the expected future income obtainable from the investment on the one hand, and on the costs of financing on the other hand. Minsky assumes that the higher the level of investment, the more firms will have to rely on external finance—hence, the higher the level of investment, the higher the level of the debt. Indeed, as observed by Lavoie and Seccareccia (2001), if analyzed under a Kaleckian perspective, this conclusion casts some doubt. Kalecki (1954) shows that at aggregate level, in a closed simplified economy (the difference between public expenditure and taxes being negligible, and workers consuming all of their income), the level of profits is determined by investments and capitalists' consumption, and that, furthermore, investments determine the level of saving. Minsky seems to overlook this dynamic in his analysis of aggregate investments. The FIH appears, therefore, to be based on rather weak ground:

> Minsky is thus applying to the macroeconomic level results that ought only to apply at the microeconomic level. He has subjected himself to the fallacy of composition. The rest of his financial fragility hypothesis follows from this questionable presupposition. (Lavoie and Seccareccia 2001, p.83)

The aim of this paper is not to defend the FIH, contradicting in toto the analysis by Lavoie and Seccareccia, which we believe is still valid in its empirical part (the way in which firms finance investment has undoubtedly changed since Minsky developed his analysis). Nor is it our intention to claim that a procyclical leverage ratio in the private sector is a necessary outcome of a capitalist economy. We argue that, while the critique succeeds in revealing a lack of rigor by Minsky in the passage from micro to aggregate analysis, it does not undermine the logical consistency of the FIH. Indeed, Minsky applies results drawn by a micro analysis at the macro level. However, our opinion is that assuming an erosion in the financial position of the firms sector due to debt-financed investments only implies an aggregational problem if specific assumptions are taken into account.

To validate our position, we rely on the stock-flow consistent (SFC) modeling framework on the one hand, and on the analysis of savings by Michał Kalecki and Josef Steindl on the other. The outline of the paper is as follows. First, we briefly introduce SFC models, highlighting the aspects functional to our work. Then, we present the simplified economy we intend to model and recall some of the main insights of the works of Kalecki and Steindl. Finally, we set up an attempt to clarify at the macro level the consequences of debt-financed investment over the financial structure of an aggregate economy, developing an SFC analysis of our highly simplified economy under four different financial regimes: (1) debt-financed with no distributed profits, (2) debt-financed with distributed profits, (3) internally financed with no distributed profits, and (4) internally financed with distributed profits. The four cases analyzed do not cover all of firms' financing options, since neither equities nor mixed financing regimes are considered. However, this schematic representation is sufficient to defend the logical consistency of the FIH.

2. SFC MODELS

SFC models are a relatively new family of macro models that combine the national income and the flow of funds accounts. The models are thus bifocals, in that they include both the stocks and the flows of the economy. This causes SFC models to be *intrinsically dynamic* (see Dos Santos 2006), since the stock-flow relation is explicitly reproduced: initial stocks determine specific flows, which will end up in new stocks, which in turn will determine new flows, and so on. To correctly trace these dynamics, the models usually rely on a set of three matrices[1] depicting the economy divided by institutional sectors: (1) a stock matrix (*the balance sheet* in our paper), (2) a flow matrix (*current transactions*), and (3) a stocks revaluation matrix (*flow of funds*). The result is an accounting framework that guarantees that nothing is lost: "The fact that money stocks and flows must satisfy accounting identities in individual budgets and in an economy as a whole provides a

[1] Our paper follows most of the recent literature on SFC models, which relies on the framework developed by Wynne Godley (see Godley and Lavoie 2007). For a more detailed review on SFC, see Dos Santos (2006) and Caverzasi and Godin (2013).

fundamental law of macroeconomics analogous to the principle of conservation of energy in physics" (Godley and Cripps 1983). Next to the matrices, the second component of the SFC approach is a set of behavioral equations defining all the variables not directly determined by the accounting framework. These equations complete the model, and usually include its main theoretical assumptions. James Tobin—the author who, next to Wynne Godley, is considered the father of the SFC approach—explained the role of the behavioral equations, noticing that "the accounting framework comes to life as an economic model when the entries x_{ij}, at least some of them, become variables to be explained by the behavior of the sector" (Backus et al. 1980, p. 262).

This paper will exclusively rely on the first of these two components. This choice is based on two sets of considerations. On the one hand, this paper does not aim to reproduce the FIH through a model. On the other hand, the accounting framework serves the scope of our work perfectly. The analysis of the balance sheets of the aggregate sectors and the intrinsic dynamic of the stock-flow relations allow us to examine the financial stability of the firm sector and the changes due to debt-financed investments. To evaluate the financial position of the firms, we will take into account the *liquidity level* and the *leverage ratio*, respectively measured as liquid assets over total assets, and total debt over total assets.

3. FROM KALECKI TO STEINDL

Both Kalecki and Steindl develop their analyses of savings by manipulating the national accounting. The starting point of Kalecki (1954, Chapter 5) is the gross domestic product (GDP), which can be expressed in terms of expenditure or income. Hence, in a simplified economy—closed and with a balanced public sector—the GDP is equal either to investment plus consumption or to wages[2] plus profits. Kalecki separates the consumption of capitalists and workers, and with the addition of the simple assumption that workers consume all of their income, he shows that profits (P) are necessarily equal to investments plus capitalists' consumption. Algebraically:

$$Y = I + CC + CW = W + P \tag{1}$$

$$P = I + CC \tag{2}$$

Since capitalists can decide how much to invest and to consume but not how much to earn, he

[2] For the sake of simplicity, we net out the differentiation between salaries and wages, which was present in the original version.

reaches the conclusion that investment and consumption decisions determine profits. Then, abandoning the assumption that workers consume all of their income, he shows that the consumption of workers is equal to wages minus household saving. The latter, therefore, must be deducted from the previous expression for profits.

$$P = I + C_C - S_W \tag{3}$$

Then, subtracting capitalists' consumption from both sides, we obtain that total saving (capitalists' and workers' savings) is equal to investments.

$$S_W + S_C = I \tag{4}$$

Clearly, previous reasoning on the causal relationship is still valid, hence, he states, "In the present conception investment, once carried out, automatically provides the savings necessary to finance it" (Kalecki 1954, p. 50). The paragraph ends with a consideration of the sources of financing, and one of the conclusions he reaches is central to our analysis: "If additional investment is financed by bank credit, the spending of the amounts in question will cause equal amounts of saved profits to accumulate as bank deposits" (Ibid., p. 50). This statement by Kalecki summarizes the critique that almost half a century later has been raised against Minsky.

The national accounting is also at the core of Steindl's (1952; 1990a, b) reasoning; his analysis starts from an equation very similar to Equation 4. However, Steindl distinguishes between business and households, rather than between capitalists and workers, thus coming to conclusions that we believe are distinct from but not contrasting with those reached by Kalecki. The development of the analysis starts with an open economy with a public deficit and with households' real investment in dwelling houses.

$$I + H + G - T + X - M = S_B + S_H \tag{5}$$

Where I is investment, H households dwellings, $G-T$ public expenditure minus taxes, M import, and X exports. Savings are divided between households (S_H) and business (S_B). Trivial manipulations lead to "an identity of lendings and borrowings" (Steindl 1990b, p.210), showing the interdependencies between sectors.

$$(S_B - I) + (T - G) + (M - X) + (S_H - H) = 0 \tag{6}$$

Where "the terms in brackets are the borrowing (–) or lending (+) of the various sectors: business, government, households, and the rest of the world" (Ibid., p.185). That is, the need for funds (the borrowing) of a sector must necessarily find a counterpart in the excess of funds (the lending) of another sector. Reverting to a more simple economy—hence, assuming away the government, the foreign sector, and the investment in dwellings—allows us to see that the sum of household and business savings must equal investment, and that S_H is equal to the difference between investment and business:

$$I - S_B = S_H \tag{7}$$

Therefore, "...if we exclude...[the] cases of direct transformation [of household saving] into equity, then the proportion of household saving to business saving in the economy must correspond to the proportion in which business finances its real investments by borrowing and by saving out of profits" (Ibid., p. 209).

Clearly, firms cannot control the level of household savings; hence, they must adapt their financing of investment to the saving decisions of households. This is linked to the concept of *enforced indebtedness*: if for example, saving propensity increases, since the level of investment has hitherto been decided, it "...will therefore have to be financed to a greater extent by borrowing than had been intended originally: there will be *enforced indebtedness*" (Ibid., p. 209).

To sum up, the conclusions of the two authors are the following: Kalecki postulates that investment financed by credit creates an equal amount of bank deposits via profits, while Steindl shows that firms need to adapt their draw on credits according to the saving decisions of households. The SFC analysis developed in the following paragraphs of this paper aims to show that if the profits created by investment decisions (as in Kalecki) are distributed, the indebtedness level of firms depends on the saving decisions of households (as in Steindl). In particular, we try to demonstrate that if firms finance their investments through debt, and households save a part of distributed profits, the indebtedness level of the firm sector will increase with capital accumulation, just as assumed in Minsky's FIH.

4. THE ECONOMY

In this section, we present a simplified economy, and we analyze the consequences of different means of financing investments. As anticipated, the analysis is developed using the SFC accounting framework. The three matrices we introduced earlier are reproduced for each of the financing regimes and are the tool to which we will refer in drawing the conclusion of this work. We want to stress that the models developed are purposefully kept at the highest level of simplification, since the purpose of this paper is not to depict any real economy, but to prove the logical consistency at the macro level of an erosion in the financial position of the firm sector due to debt-financed investments.

The economy we consider is composed of firms, households, banks, and government, and we assume that fiscal deficit equals trade deficit.[3] From the national accounting identity, differentiating between households' (S_h) and firms' savings (S_f) we know that:

$$S_f = I - S_h + (G - T) + (X - M) \tag{8}$$

With the aforementioned hypothesis[4], we obtain:

$$S_f + S_h = S = I \tag{9}$$

This starting point is the same simple accounting identity analyzed by Kalecki (see Equation 4), but expresses differentiating between households and firms, as in Steindl, since in our opinion, this latter distinction is more in line with Minsky's analysis and, therefore, with the scope of this paper.

4.1. Case 1: Debt-financed Investment with No Profits Distributed

First Period

In this first scenario, we consider the case in which firms finance investment through debt and no profits are distributed to the households, who consume all of their income (household savings is equal to zero). Furthermore, we start from an imaginary time[5] zero, where all net worths are null.

Table 1 Aggregate balance sheets

	Households	Firms	Banks	Gov.	Tot.
Bank Deposits	0		0		0
Bank Loans		0	0		0
Capital		0			0
Net worth	Vh	Vf	Vr	Vg	V

Note: A (+) sign before a variable denotes an asset, while a (–) sign denotes a liability

Table 1 shows the starting balance sheet. As we stated, all initial net worths are equal to zero.

$Vh = Vf = Vr = Vg = V = 0$

[3] Notice that this is the same as assuming a closed economy with a balanced budget.

[4] $(G - T) + (X - M) = 0$

[5] This will be the only case in which we will refer to two time periods, as it will not be necessary in the following steps of our analysis. For each period, we reproduce the three matrices.

Table 2 Current transactions

	Households	Firms		Banks	Gov.	Tot.
		current	capital			0
Consumption	-C	+C				0
Investment		+I	-I			0
Note: Final sales at market prices = pX = C + I = W + P						
Wages	+W	-W				0
Interests on L		0		0		0
Interests on CA	0			0		0
Dividends	0	0				0
Totals	SavH	Fu	-I	SavB	SavG	0

Note: (+) sign denotes receipt, (-) denotes a payment

From Table 2 (current transactions matrix), we can observe that: (1) households' savings are equal to zero ($SavH = -C + W = 0$), (2) all profits are retained (for assumption) and equal to the new fixed capital formation ($Fu = I$), (3) banks have no savings in this period ($SavB = 0$), and (4) government has no savings in this period ($SavG = 0$). The last row (totals) is fundamental since it gives the national account identity we recall at the beginning of this section. In this case:

$$SavH + Fu - I + SavB + SavG = 0 \tag{10}$$

From which, we know that $SavH = SavB = SavG = 0$ and that Fu is nothing but what we defined previously[6] as S_f, we obtain:

$$S_f = S = I \tag{11}$$

We want to remark that we did not make taxation and government expenditure explicit for the sake of simplicity. However, it would be trivial to embed them in our accounting scheme. We could, for example, assume that public expenditure takes place entirely in the form of a direct transfer to households to an extent equal to the taxes raised within the household sector itself—hence we would obtain a balanced public budget; this would represent exclusively a redistribution of wealth within the household sector.[7]

[6] Being that $S_h = 0$, we have that $S_f = S$. In practice, firms are the sector saving in this case.

[7] The equation for consumption would be:

$$C = W + R - T \tag{12}$$

where transfers equal taxes ($R = T$). Therefore, we obtain $C = W$.

Table 3 Flow of funds

	Households	Firms	Banks	Gov.	Tot.
Current Sav	0	+Fu	0	0	SAV
Δ Bank Deposits		-ΔCA	+ΔCA		0
Δ Bank Loans		+ΔL	-ΔL		0
Δ Fixed K		-ΔK			-ΔK
Total	0	0	0	0	0
Net Worth	0	Fu	0	0	SAV

Note: (+) denotes sources of funds, (-) denotes uses of funds. The net worth of a sector is increased by its current savings during the period, plus capital gains.

Table 3 shows how each sector uses the flow of savings resulting from the transactions represented by previous matrix. As we said, households, banks, and government sectors in this first period have zero savings (represented by the zeros in the *Current Sav* row). A convenient way to look at the flow of funds of the firm sector is to consider it as an explanation on how investment (ΔK) is financed. We assume that the whole bulk of retained profits—corresponding to the total profits (which in turn, as we said, equals firms' expenditure in fixed capital)—are deposited by firms into their bank account (CA).

The defining aspect of this first case is that investments are entirely financed through debt. This is represented by ΔL, increase in bank loans. What we obtain, therefore, is that retained profits are deposited into the bank accounts of firms ($Fu = \Delta CA$), and investments are financed through loans ($\Delta L = \Delta K$). Since we are not considering changes in the level of prices of capital assets, total net worth is increased exclusively by current period savings.

At the end of this first period (which is equivalent to the beginning of the second period), we obtain that the financial situation of firms seems stable.

Liquidity (l), which we can easily measure as liquid assets over total assets, is (subscript referring to time):

$$l_1 = \frac{CA}{CA+K} \tag{13}$$

Knowing that $CA = K$, we get that the liquidity level is 50 percent.

Leverage ratio (lr)—measured as *financial gearing* (see Toporowski 2010)—is, as well, at 50 percent.

$$lr_1 = \frac{L}{CA+K} \tag{14}$$

We believe it is important to stress that there is no need to think about credit in a "monetarist" fashion[8], where banks use existing savings to finance investment. The *Banks* column can be read in a *circuitist* manner (see Graziani 2003). Money is created through loans and is then used by firms to pay production costs (W) and investment (ΔK). Since revenues from consumption (C) offset W, we obtain that growth in firms' bank accounts will equal their investment expenditure (which is nothing but the usual accounting identity between saving and investment). Consequently, the increase of firms' indebtedness to banks will keep pace with real capital growth.

Second Period

The reason to model a further period of the economy is twofold. On the one hand, it allows us to make the changes in the balance sheet of the economy explicit; on the other hand, it is a convenient way to clarify the role of the interest rate. Leverage and liquidity ratios are measured at the end of the first period (beginning of the second period) and at the end of the second period (beginning of third period) to make the dynamic of the model explicit.

Table 1.2 Aggregate balance sheets

	Households	Firms	Banks	Gov.	Tot.
Bank Deposits		+CA	-CA		0
Bank Loans		-L	+L		0
Capital		+K			+K
Net Worth	Vh	Vf	Vr	Vg	+K

Note: A (+) sign before a variable denotes and asset, while a (-) sign denotes a liability.

From Table 1.2, we can observe that the financial situation of the economy is the following: All the sectors—with the exception of firms—have net worth equal to zero ($Vh = Vr = Vg = V = 0$, while $Vf = K$). As we said in the conclusion of *Period 1*, both *liquidity (l)* and *leverage ratio (lr)* are at 50 percent. It is standard procedure in SFC modeling to take into account the flows determined by the stocks at the end of the previous period (i.e., interest rate on loans of period $t - 1$); in this case, interest payments are determined by the assets and liabilities held by sectors at the end of the first period.

At last, from Table 2.2 and Table 3.2, we can analyze the role of the interest rate.

[8] I.e., following a loanable funds approach as done by Minsky in his doctoral dissertation (see Lavoie 1997; Toporowski 2012).

Table 2.2 Current transactions

	Households	Firms		Banks	Gov.	Tot.
		current	capital			0
Consumption	-C	+C				0
Investment		+I	-I			0
Note: Final sales at market prices = pX = C + I = W + P						
Wages	+W	-W				0
Interests on L		$-rlL_{t-1}$		$+rlL_{t-1}$		0
Interests on CA		$+rcCA_{t-1}$		$-rcCA_{t-1}$		0
Dividends	0	0				0
Totals	SavH	Fu	-I	SavB	SavG	SAV

Note: A (+) sign denotes receipt, while a (-) sign denotes payment.

rl is the interest rate paid by firms on their stock of debt to banks, while *rc* is the interest rate received by firms on their bank deposit. It seems logical to consider the net interest payments of banks as being positive ($rl > rc$), since this allows for banks to earn a profit. Clearly, as interest payments are a percentage over stocks, with the increase of the latter, nominal flows rise while ratios are unaffected (i.e., net interest rate). As SFC accounting clearly makes explicit, current stocks determine current flows, which in turn are one of the determinants of next period's stocks, and so on.

First, it is important to notice that the national accounting identity holds. Once again, from the *Totals* row we have

$$SavH + Fu - I + SavB + SavG = 0 \tag{15}$$

In this case, $SavH = SavG = 0$, and substituting *Fu* and *SavB* with their components[9], we obtain:

$$I + rcCA_{t-1} - rlL_{t-1} - I - rcCA_{t-1} + rlL_{t-1} = 0 \tag{16}$$

Hence, including banks' savings in what we labeled S_f —a standard procedure in the national income and product accounts (NIPA)—we obtain:

$$S_f = S = I \tag{17}$$

The second and most important observation we can derive from Table 2.2 is that in this period, retained earnings by firms (*Fu*) are not equal to investment. Indeed, retained profits in this (as in any) period are given by:

[9] With retained profits being $Fu_t = +I + rcCA_{t-1} - rlL_{t-1}$, since $C = W$; and banks' saving $SavB = -rcCA_{t-1} + rlL_{t-1}$.

$$Fu_t = +I + rcCA_{t-1} - rlL_{t-1} \tag{18}$$

Up to this period, the value of stocks of (1) bank deposits, (2) debt, and (3) capital has been equal. We assumed $nr = rl - rc > 0$ (with nr indicating the net interest rate payment); we now define $NR_t = +rlL_{t-1} - rcCA_{t-1}$ the net financial flow. Therefore, the new level of profits (for assumption, entirely retained by the firms) is:

$$Fu_t = +I_t + NR_t \tag{19}$$

Since NR is negative, we obtain that retained profits—which are nothing but the savings of firms—are increasing at a slower rate than real capital and, hence, at a slower rate than debt (in this example, real capital accumulation is entirely debt-financed). The different rates of growth (depending on the net interest rate) will determine negative savings when $I < NR$.

Referring to a numerical example could help to clarify the matter. If we suppose that in any period $I = 100$, $rc = 2\%$ and $rl = 4\%$, in the second period ($t = 2$) we get:

$$Fu_2 = 100 - 0.04 * L_1 + 0.02 * CA_1 = 100 - 0.04 * 100 + 0.02 * 100 \tag{20}$$

Therefore, we obtain: $Fu_2 = 98 < I = 100 = Fu_1$. Ceteris paribus, this after 37 periods will lead to a net loss by firms ($Fu < 0$).

One of the cardinal principles of the accounting framework of SFC modeling is that one person's asset is another person's liability, so to any inflow there must be a corresponding outflow. The net interest rate payment by firms represents an inflow for banks, which start to make profits (becoming savings in this simplified economy). Hence, $SavB = 2$. So, the investment of 100 generated an inflow of an equal amount. However, it partially leaks and goes to banks (2).

Table 3.2 Flow of funds

	Households	Firms	Banks	Gov.	Tot.
Current Sav	0	$Fu = 98$	SavB	0	SAV
Δ Bank Deposits		$-\Delta CA = 98$	$+\Delta CA$		0
Δ Bank Loans		$+\Delta L = 100$	$-\Delta L$		0
Δ Fixed K		$-\Delta K = 100$			$-\Delta K$
Total	0	0	0	0	0
Net Worth	0	$Fu = 98$	Vb = 2		SAV

Note: A (+) sign denotes sources of funds, while (-) denotes uses of funds. The net worth of a sector is increased by its current savings during the period, plus capital gains.

From Table 3.2, we can observe that the bank accounts of firms are increasing to a lesser degree than are both their debt to banks and their fixed capital. This directly affects the liquidity (and leverage), which ceases to be at 50 percent and—starting to decrease (increase)—signals a decline in the financial structure of the sector. *Liquidity ratio* is now:

$$l_2 = \frac{CA_2}{CA_2 + K_2} \tag{21}$$

Leverage ratio (lr):

$$lr_2 = \frac{L_2}{CA_2 + K_2} \tag{22}$$

Since with our assumptions, $K_2 = L_2 > CA_2$, we obtain that the two ratios are no longer 50 percent, but $l_2 < l_1$ and $lr_2 > lr_1$. Furthermore, as is self-evident through the SFC accounting framework since stocks determine flows, with a growing debt, the nominal level of flows determined by the interest rate will tend to increase in a cumulative process. Hence, there is no need for the interest rate to increase in order to determine higher financial commitments for the firm sector.

Sylos Labini (1948), in a brilliant paper that included (albeit in the embryonic stages) an analysis of aggregate money flows, economic circuits, and profit determinants, shows how firms do not face problems in the payment of interest as long as the rate of growth of the economy is higher than the due interest rate. Sylos Labini refers his analysis to the long period; whereas in our discrete time SFC models it fits into a single period, since it does not include the stock-flows relation. What our simple model reveals is that in a cumulative process, profits in each period need to exceed the outflows of money not only due as interest on the debt necessary for current production, but also on interest on the stock of outstanding debt.

What this first case shows is that at the macro level, debt-financed investments with all profits retained do not negatively affect the balance sheets of the firm sector, only given the assumption that the net interest rate payment is considered negligible in size.[10] This implies that the difference between the interest paid on debt (*rl*, in our accounting scheme) and received on deposits (*rc*) is close to zero. However, as is clearly shown by Zezza (2004), the analysis concluded at this stage could be considered unsatisfactory. Indeed, nothing is said about how banks use the profits

[10] Nothing is said about the effects of interest rate decisions of central banks, nor of investing decisions, because we want to keep the economy unchanged to focus exclusively on debt-financed investments.

they make out of net interest rate. Zezza identifies three possible uses of banks' profits: (1) to cover costs of production (wages), (2) to distribute profits, and (3) to cumulate wealth. Cases (1) and (2) are equivalent in our model and they would be represented by an increase in the level of consumption (since, in this case, we did not consider the possibility of households' savings). This could be seen as capitalists' consumption in the analysis by Kalecki that we recall above. Hence, firms' profits (entirely retained by assumption) would increase by an amount equal to the profits of banks (entirely distributed to households). Therefore, firms' retained profits and debt would be equal at the end of the day.

To sum up, in this first case, where households are assumed to consume all of their income and firms finance investment only through debt, the critique of the aggregational problem holds only if we add a further assumption: that either the interest rate differential is zero or banks distribute all[11] of their profits.

4.2. Case 2: Debt-financed Investment with Distributed Profits

To appreciate the peculiarities of this case there is no need to refer to different time periods. We therefore consider a generic unspecified time *t*. The structure of the economy depicted by the balance sheet (Table 1.b) does not differ from the previous case's. Firms' net worth is given by the difference between their assets—namely bank deposits (*CA*) and real capital (*K*)—and their liabilities: debts to banks (-*L*). This, in turn, represents the assets banks hold against their liabilities, namely, firms' deposits.

Table 1b Aggregate balance sheets

	Households	Firms	Banks	Gov.	Tot
Bank Deposits		+CA	-CA		0
Bank Loans		+L	+L		0
Capital		+K			+K
Net worth	Vh	Vf	Vr	Vg	V

Note: A (+) sign before a variable denotes an asset, while a (-) sign denotes a liability.

[11] The cumulative process described above would just slow down if we consider banks distributing a part of their profits.

Table 2.b Current transactions

	Households	Firms		Banks	Gov.	Tot.
		current	capital			0
Consumption	-C	+C				0
Investment		+I	-I			0
Note: Final Sales at market prices = pX = C + I = W + P						
Wages	+W	-W				0
Interests on L		$-rlL_{t-1}$		$+rlL_{t-1}$		0
Interests on CA		$+rcCA_{t-1}$		$-rcCA_{t-1}$		0
Dividends	+Ff	-Ff				0
Totals	SavH	Fu	-I	SavB	SavG	SAV

Note: A (+) sign denotes receipt, while a (-) sign denotes a payment.

Table 3.b Flow of funds

	Households	Firms	Banks	Gov.	Tot.
Current Sav	Sav H	*Fu*	SavB	0	SAV
Δ Bank Deposits		−ΔCA	+ΔCA		0
Δ Bank Loans		+ΔL	-ΔL		0
Δ Fixed K		-ΔK			-ΔK
Total	0	0	0	0	0
Net Worth	SAVH	Fu	Vb	0	SAV

Note: A (+) sign denotes sources of funds, while a (-) denotes uses of funds. The net worth of a sector is increased by its current savings during the period, plus capital gains.

For assumption, firms decide to distribute profits—hence, retained profits are greater or equal to zero ($dF = Fu \geq 0$). Two main decisions characterize the model. In the first place, firms decide what percentage of profits[12] to distribute. In the second place, households decide how much of their financial income (represented by the profits that firms distribute as dividends) to consume—a fraction (1-s) or the whole of it—whereas wage income is entirely consumed by assumption.

The distinction between the two kinds of income can be considered to represent two different classes of households (e.g., workers and rentiers), which are aggregated in a unique sector since, in this case, making the presence of the two classes explicit would not add any useful information. From the accounting in Table 2.b, we can see that entrepreneurial profit (F) is given by revenues ($C + I$) minus costs, both wages and net financial outflows ($-rlL_{t-1} + rcCA_{t-1}$).

$$F = C + I - W - rlL_{t-1} + rcCA_{t-1} \tag{23}$$

[12] Profits are here intended as entrepreneurial profits (see Godley and Lavoie 2007, p. 256), which unlike gross profits, include interest paid.

The pace that the economy follows at this point depends on the behavioral assumptions of the savings decision of households on the one hand (s) and the fraction of profits distributed by firms (d) on the other hand. Different combinations of these variables determine three[13] possible scenarios: (1) firms distribute all their entrepreneurial profits and households save a fraction of it ($Fu = 0$; $s > 0$), (2) firms distribute a fraction of their entrepreneurial profits and households' saving propensity is null ($Fu > 0$; $s = 0$), or (3) firms distribute a fraction of their entrepreneurial profits and households save a part of it ($Fu > 0$; $s > 0$). In the following part of the paper, through very trivial algebraic passages, we show the characteristics of each of the three scenarios, highlighting in each how the identity between saving and investment is still valid. In an attempt of simplify and to emphasize the main features of the accounting scheme, we did not take into account net financial flows. Therefore, the savings of the two sectors taken into account represent the whole bulk of saving of the economy.

First Scenario

Firms distribute all of their entrepreneurial profits and households save ($Fu = 0$; $s > 0$).

$$F = C + I - W \tag{24}$$

$$C = W + (1 - s)Ff \tag{25}$$

$$F = W + (1 - s)Ff + I - W \tag{26}$$

Being that all profits are distributed, we have that $Ff = F$ (distributed profits equals total profits) and $Fu = 0$ (retained profits are zero). Hence, since $SavB = SavG = Fu = 0$

$$F = \frac{I}{s} \tag{27}$$

$$SavH = sF = S = I \tag{28}$$

The first observation we can make is that the higher the saving propensity (s), the lower the profits, and as a direct consequence, the lower consumption, hence GDP.

For the sake of our analysis, it important to bear in mind that in this case, retained profits are

[13] The scenario in which all profits are distributed and the saving propensity of households is equal to zero is not taken into account since the circuit, consumption, profits, dividends, and consumption profit would be endless, and hence useless for our analysis.

equal to zero ($Fu = 0$)

Second Scenario

Firms distribute a fraction of their entrepreneurial profits and households do not save ($Fu > 0$; $s = 0$).

$$F = C + I - W \tag{29}$$

$$C = W + Ff \tag{30}$$

$$Ff = d * F \tag{31}$$

$$Fu = (1 - d) * F \tag{32}$$

$$F = W + Ff + I - W = Ff + I \tag{33}$$

$$F\ (I - d) = I \tag{34}$$

$$Fu = I \tag{35}$$

In this case, the level of GDP is ultimately determined by the fraction firms decide to distribute (d); the higher its level, the higher its profits, consumption, and hence GDP.

Once again, for our analysis, it is important to bear in mind the value of retained profits, which in this case is equal to investment ($Fu = I$).

Third Scenario

Firms distribute a fraction of their entrepreneurial profits and households save a part of it (Fu > 0; s > 0).

$$F = C + I - W \tag{36}$$

$$Ff = d\ *\ F \tag{37}$$

$$Fu = (1 - d)\ *\ F \tag{38}$$

$$C = W + (1 - s)dF \tag{39}$$

$$F = W + (1 - s)dF + I - W \tag{40}$$

$$F = \frac{I}{1-d+ds} \tag{41}$$

$$Fu = \frac{(1-d)}{1-d+ds} I \tag{42}$$

$$SavH = sd\frac{I}{1-d+ds} \tag{43}$$

$$S = \frac{I}{1-d+ds}(1 - d) + sd\frac{I}{1-d+ds} \tag{44}$$

$$S = I \tag{45}$$

It is immediately clear that the GDP increases with the fraction of distributed profits, but it diminishes when saving propensity increases. Finally, in this case, retained profits are smaller than investment ($Fu > I$)

To sum up, in an economy where profits are distributed, the saving propensity of households becomes the fundamental variable. The only scenario in which the retained profits are equal to investments is indeed the one in which households' saving propensity is zero.

The dynamic underlying this case is made evident in Table 3.b. We remind the reader that we assumed that investments are entirely financed through debt, and that the only financial assets firms can obtain are bank deposits. Therefore, in any period, bank deposits will increase of an amount equal to the profits that are retained within the firm sector ($Fu = \Delta CA$).

The increasing stocks in this situation are bank deposits, the outstanding debt of firms to banks, and the fixed capital. With respect to the financial situation of the firm sector, we can observe that the second scenario (where $s = 0$ and $Fu > 0$) is equivalent to Case 1 (with no profits being distributed). The liquidity ratio $(l = \frac{CA}{CA+CK})$ and the leverage ratio $(lr = \frac{L}{CA+K})$ are constant only given the assumption that the net interest rate payment is negligible in size. Case 1 and the second scenario differ, however, with respect to GDP, which—with the hypothesis of distributed profits—is higher since, as shown previously, the level of consumption is higher, while investments are the same for assumption (we remind the reader that in our simplified economy $Y = C + I$).

Taking into account the other two scenarios—the first and the third—the worsening of the financial position of firms is self-evident, since retained profits, which determine the change in the

CA stock, are lower than the increase in fixed capital and in indebtedness level. Therefore, liquidity tends to decrease while leverage tends to rise.[14]

Furthermore, as in the previous case, the interest rate differential between loans (*rl*) and bank deposits (*rc*) determines a further worsening in financial position (if not considered negligible in size).

Next to the worsening in the financial condition of firms (signaled by both indicators—leverage and liquidity), the main impact of the distribution of profits to households in this (ultra-simplified) debt-financed regime is on the GDP. Maintaining the validity of the assumption of households' zero saving propensity out of wages, one obtains that consumption is no longer determined exclusively by wages ($C = W$), but it increases, as well, of an amount equal to the distributed profits, which are now used—totally or partially—to purchase consumption goods ($C = W + (1 - s)Ff$), determining a higher level of GDP.

4.3. Case 3: Internally financed Investment with No Distributed Profit

In this case, firms are assumed to finance investment through retained profits. Table 1.c differs from the aggregate balance sheet of the previous period because it includes government bills, which represent the assets banks hold against their liabilities (the deposits of firms). This additional assumption is needed since banks do not lend money to the private sector due to firms financing investment only through retained profits. It might be possible to imagine that banks were making no use of the money deposited, but we feel this would be an overly unrealistic assumption, hence we assumed the addition of government bills.

Table 1.c Aggregate balance sheets

	Households	Firms	Banks	Gov.	Tot.
Bank Deposits		+CA	-CA		0
Gov. Bills			+B	-B	0
Capital		+K			+K
Net worth	Vh	Vf	Vr	Vg	V

Note: A (+) sign before a variable denotes an asset, while a (-) denotes a liability.

The current transaction matrix (Table 2.c) shows how, in this case, firms' savings are equal to profits coming from investments plus interest on the previous period's bank deposits.

$$Fu = I + rcCA_{t-1} \tag{46}$$

[14] Liquidity $\left(l = \frac{CA}{CA+CK}\right)$ decreases, since *K* grows more than *CA*. Leverage $\left(lr = \frac{L}{CA+K}\right)$ increases, since *L* and *K* increase at the same rate, higher than the rate of increase of *CA*.

The dynamic of the model in this case is the following: Firms cover the costs of production and investment with retained profits. In each period, therefore, firms see the outflow of their deposits compensated by the inflow derived from profits determined by investment decisions. Therefore, deposits are augmenting only via interest rate, while fixed capital increases in any period according to investment decisions (in practice, referring to Table 3.c, ΔCA = $+\mathrm{r}cCA_{t-1}$).

Table 2.c Current transactions

	Households	Firms		Banks	Gov.	Tot.
		current	capital			0
Consumption	-C	+C				0
Investment		+I	-I			0
Note: Final Sales at market prices = pX = C + I = W + P						
Wages	+W	-W				0
Interests on Bills				$+rbBt-1$	$-rbBt-1$	0
Interests on CA		$+rcCAt-1$		$-rcCAt-1$		0
Dividends	0	0				0
Totals	SavH	Fu	-I	SavB	SavG	SAV

Note: A (+) sign denotes receipt, while a (-) sign denotes a payment.

Table3.c Flow of funds

	Households	Firms	Banks	Gov.	Tot.
Current Sav	0	F u	SavB	SavG	SAV
Δ Bank Deposits		-ΔCA	+ΔCA		0
Δ Gov. Bills			-ΔB	+ΔB	0
Δ Fixed K		-ΔK			-ΔK
Total	0	0	0	0	0
Net Worth	0	Fu	Vb	0	SAV

Note: A (+) sign denotes sources of funds, while a (-) denotes uses of funds. The net worth of a sector is increased by its current savings during the period, plus capital gains.

Liquidity

In this extreme case, the liquidity level diminishes in any period according to the difference between inflows derived from interest rate on bank deposits and investment decisions. This does not represent a problem, however, since the other ratio (which we considered an indicator of financial fragility), leverage, is equal to zero in any moment, since no indebtedness is taken into account.

4.4. Case 4: Internally financed with Distributed Profits

It is easy to notice that adding the assumption of distribution of all profits would imply a decrease in the bank accounts of firms, equal to their investing decisions. Since retained profits (*Fu*) in this case is zero, the only means of financing investment would be through the use of money from the firms' bank accounts ($-\Delta CA$). This would clearly determine an unsustainable path.

Table 2 Current transactions

	Households	Firms		Banks	Gov.	Tot.
		current	capital			0
Consumption	-C	+C				0
Investment		+I	-I			0
Note: Final Sales at market prices = pX = C + I = W + P						
Wages	+W	-W				0
Interests on Bills				$+rbBt-1$	$-$rbBt$-$1	0
Interests on CA		$+rcCAt-1$		$-rcCAt-1$		0
Dividends	+Ff	-Ff				0
Totals	SavH	0	-I	SavB	SavG	SAV

Note: A (+) sign denotes receipt, while a (-) sign denotes a payment. The net worth of a sector is increased by its current savings during the period, plus capital gains.

Table 3 Flow of funds

	Households	Firms	Banks	Gov.	Tot.
Current Sav	0	0	SavB	SavG	SAV
Δ Bank Deposits		-ΔCA	+ΔCA		0
Δ Gov. Bills			-ΔB	+ΔB	0
Δ Fixed K		-ΔK			-ΔK
Total	0	0	0	0	0
Net Worth	0	0	Vb	0	SAV

Note: A (+) sign denotes sources of funds, while a (-) denotes uses of funds.

These two last cases lie outside of the strict scope of this paper since they do not refer to debt-financed investment. However, we chose to include them for the sake of completeness of exposition and analysis.

CONCLUSIONS

The aim of this paper was to find the "missing macro link" needed to prove the logical consistency of Hyman Minsky's financial instability hypothesis. We tried to prove that the idea of an increase in the indebtedness level of the firms sector, due to debt-financed investment, does not necessarily rely on a fallacy of composition. To do so, we relied on the analysis of Kalecki and Steindl, as well as on the accounting framework of SFC models. Analyzing a simplified economy under different financing regimes, we show that debt-financed investments do not lead to a worsening in the financial position of the firm sector only assuming that firms do not distribute profits or, if they do, that households have a saving propensity equal to zero, and in both cases assuming that the net interest rate paid to banks is negligible in size. On the contrary, if profits are distributed and households save a part of them, debt-financed investments lead to a higher indebtedness level of firms.

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