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The reflux phase in monetary circuit theory and stock–flow consistent models

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Stock–flow consistent (SFC) modelling and monetary circuit theory (MCT) have many similarities. However, an important difference concerns the reflux phase, during which the credits issued by banks are repaid. This phase is constitutive of MCT models, but does not generally appear explicitly in SFC models. The authors propose here to develop an SFC model in which the bank loans issued at the beginning of a period are explicitly repaid at the end of it. The repayment of long-term bank loans financing investments will then represent a leakage outside the monetary circuit and affect the level of aggregate demand and the dynamics of the model. The authors show that considering these repayments could have a lasting effect on corporate profits, corporate indebtedness, and growth of production. This result suggests that it could be interesting to focus more on the reflux phase within SFC models, taking inspiration from MCT.

Keywords: *monetary circuit, stock–flow consistency, reflux, bank loans*

JEL codes: *E11, E12, E17*

1 INTRODUCTION

Monetary circuit theory (MCT) originated in the work of Augusto Graziani (1990) in Italy, Alain Parguez (1980; 1986) in France, and was subsequently developed by Poulon (1982), Lavoie (1996), Seccareccia (1996) and Rochon (1999), among others (for a summary, see Cottin-Euziol/Rochon 2023). Monetary circuit models were among the first to integrate money's full endogeneity. Money is created by banks when they grant loans to creditworthy economic agents, mainly firms (although the model can easily incorporate household credit). This credit is necessary for the production process. The monetary emission is then based on the nature of debts – that, once borrowed, it must be repaid. Indeed, production takes time, and firms need access to funds to pay for their production costs, essentially wages and various other costs related to production. MCT then clearly highlights the fact that the existence of money, production and debt are intrinsically related (Rochon 1999) and allows us to approach Keynes's wish to build a complete theory of a monetary economy of production (Keynes 1936: 293). As Seccareccia (1988: 51) argued, production is a 'process of debt formation'.

In this sense, stock–flow consistent (SFC) models are in perfect continuity with the work of MCT: money is endogenous, created by the banking system, and serves as a

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medium for all economic exchanges. Besides, by systematically using transaction and stock matrices to trace the evolution or history of all monetary flows, SFC methodology 'provides coherence and formalism to the theory of the monetary circuit, espoused by Augusto Graziani' (Lavoie 2004: 146). 'There are no black holes' (Godley 1996: 7) in these models, as the sums of each row and column of the matrices must be equal to zero. The expenses of some make the revenues of others.

The difference between these two models, therefore, has more to do with the more sequential nature of the former than the latter. As Marc Lavoie (2004: 146) explains:

> Taken by itself, the transaction flow matrix tells us what results occur by the end of the period. The theory of the monetary circuit allows us to tell a causal story: it helps us to understand how economic activity arises, and how it is financed at the beginning of the period.

For example, in MCT models, firms will first borrow the funds necessary to finance their production expenditures, then spend them (mainly in the form of wages), collect revenues by selling their production, and repay the sums initially borrowed. In SFC models, however, only the two intermediate flows, from firms to households and vice versa, appear. The same thing happens with investments. Instead of considering distinctly new bank credits for investments and repayment of bank credits having financed past investments, only net investments are generally considered in SFC models.

We believe that this analysis in terms of net flows can sometimes be reductive in discussing net investments, because they cover two variables with very different dynamics: new investments and the repayment of bank loans that financed past investments. Indeed, from a Keynesian perspective, firms mostly determine their level of production and investment in relation to expectations of the level of anticipated demand (forward-looking) but repay past bank loans because of decisions taken previously (backward-looking). From this point of view, it seems interesting to us to go back to the traditional analyses of the monetary circuit to better understand the dynamics that lie behind the variable of net investments. Our objective is to show that distinguishing between new investments and the repayment of bank loans that financed past investments can modify sharply the dynamics of an SFC model.

To this end, we will return in Section 2 to the notions of flow and reflux within MCT. We will see in Section 3 why these flows do not appear explicitly any more in SFC models. We will then show that it may be relevant to distinguish in the traditional net investment function between new investments and the repayment of bank credits that financed past investments. In Section 4, we propose an SFC model in which this distinction is made. We show in Section 5 that the dynamics of an SFC model can then be significantly modified. We analyse the results obtained in Section 6 and conclude in Section 7.

2 THE DIFFERENT PHASES OF A PERIOD WITHIN AN MCT MODEL

While the monetary circuit extends to a succession of periods of production, a period of production is defined as the interval between the creation and the ultimate destruction of money. During this interval, money is circulating, and is foremost a means of payment, although it can also be a store of wealth, as consumers hoard money as savings. Within a period, there are different phases of the circuit.

The first phase of the circuit begins with the demand for bank credit. According to Parguez (1980) and Cottin-Euziol/Rochon (2013), credit is needed to cover both the costs associated with the production of goods, and also to purchase capital goods (investments). In this sense, credit is both short-term (production) and longer-term (investment).

In the simplified model, this is carried out mainly by firms. At this stage of the circuit, firms can evaluate quite accurately their investment needs and potential costs of production, essentially wages and various other costs related to production. Since the revenue from the sales of the product arises later in the circuit with the sale of their goods or services, firms must finance their production and investments by relying on bank credit.

This begins first with the decision of how much to produce and to invest, and how many workers to hire, which in turn will determine how much to borrow. The decision concerning how much to produce will depend mostly on the firm's expectations of aggregate demand arising within the period of production, whereas the decision to invest will depend on whether expectations of the growth of aggregate demand are deemed permanent. After all, there is no need to increase the capacity to produce if the growth in aggregate demand is expected to be short-lived or temporary.

Aggregate demand and expectations are thus at the heart of the production process and the monetary circuit. Once these expectations are made and firms decide on how much to produce and invest and how many workers to hire at a given wage, firms approach banks for financing. The need for credit applies to both consumption and investment-producing firms equally, as all firms must secure proper financing before beginning the production process (Rochon 1999).

The second phase then begins with the bank's decision on whether to agree to grant credit. Banks' decisions depend on their own expectations of aggregate demand. Cottin-Euziol/Rochon (2023) argue that 'the monetary circuit therefore pits the expectations of the firms against those of the banks'. If banks are less optimistic than firms, then credit won't be as forthcoming, and production can be frustrated.

This stage is also the initial financing of production, or simply what Graziani (2003) called 'initial finance', during which money is created *ex nihilo*. Banks do not necessarily meet all demands for credit and will refuse requests by firms that are not considered creditworthy. As Keynes said, there will always be a 'fringe of unsatisfied customers'. This said, banks will finance all firms that they deem creditworthy. In this sense, banks are only constrained by the lack of creditworthy customers, and not by deposits. In the banks' view, therefore, creditworthiness simply means the ability of firms to reimburse with interest the initial credit, and this definition will be influenced by the banks' own expectations of effective demand or growth. Banks will oscillate between being optimistic or pessimistic about future aggregate demand.

Once credit is given, a line of credit will be established enabling firms to draw from it in order to pay wages, which are deposited into workers' accounts, at which time money is created. As Graziani (1985: 164) writes, '[i]f a bank's finance, while guaranteed, has not yet been used, the corresponding liquidity has not yet been created, and it is not possible to talk of the existence of liquidity'.

If the second phase was about the creation of money, the third phase is about the circulation of money. Indeed, once wages have been paid, workers will then begin spending and purchasing goods and services, which means that money is now changing hands, or rather is flowing from one bank account (households) to another (firms), therefore returning to firms as they sell their products to consumers. Money still exists, but it is in different bank accounts. As Lavoie (1999: 106) points out, '[w]hen households disburse their money balances, the banking deposits revert to firms, all or most of which owe money to banks'. So, firms are able to recapture part of their initial outlays by selling goods and services to households. This is the final financing of production, or the 'final finance' (Graziani 1990).

But money can flow back to firms through another channel, the channel of financial saving, when firms sell financial assets or securities to households. In this sense, consumption and the purchase of securities play a similar role during this reflux phase of the circuit: transferring deposits from households to firms. According to Keynes (1937: 667–668), 'consumption is just as effective in liquidating the short-term finance as savings is'.

The last phase of the monetary circuit is the reimbursement of debt and the destruction of money, where once again debt and money are intrinsically linked. As money flows back to firms from consumption spending and financial savings, firms are able to reimburse their initial debt toward the banks. These repayments concern sums borrowed to finance production expenditures (wages) and investment. In doing so, debts are cancelled and money is destroyed, which ends the 'period' of the monetary circuit. We can note, nevertheless, that firms need to reimburse the credit for production at the end of the circuit, but sums borrowed for investment will typically be paid over several periods of production, as explained by Seccareccia (1996).

However, firms may not be able to reimburse all of their debt to banks due to the existence of hoarded savings, or what we can call liquidity preference on the part of households suggests that firms will be unable to fully reimburse their debt toward the banks. In this sense, and fully consistent with Keynes's work, hoarded savings is a drain of aggregate demand, and can easily frustrate the early expectations of firms and banks alike (for more details, see Bougrine/Seccareccia 2002).

In SFC models, these different phases do not appear, as transaction matrices represent the net monetary flows at the end of a period. In the next section, we incorporate the evolution concerning the phases of MCT into SFC models.

3 FROM MCT TO SFC MODELS

Let us consider, for now, a simple SFC model with three sectors (households, firms, banks). Households receive wages and dividends, consume part of their income, and save the rest. Firms produce and invest. In this simple example, firms' profits from the sale of their production are used to finance their own investments or are distributed in the form of dividends to households. Banks grant loans to firms, are assumed to be perfectly accommodating and make a profit through the interest rate they charge on the loans granted.

In an SFC model, these different flows will be represented as follows in a transaction matrix (Table 1), with the '+' sign indicating 'receipt' while the '–' sign indicates 'disbursement'. Within each period, households earn wages (W) and receive dividends from firms (DP) and banks (BP). They consume part of their income (C) and save the rest, modifying their bank deposits (ΔD). On their current account, firms receive revenues from the sales of consumption (C) and investment goods. They pay wages (W) and the difference between their sales and production costs make their profits (TP). These profits are either used to self-finance (RP) or to pay out dividends to households (DP). On their capital account, firms decide how much they want to invest in net (I^{net}), depending on the expected aggregate demand, their profit rate, and a financial borrower risk. If they cannot self-finance all their investments, they then resort to bank credits (ΔL^{Inet}). The variation of bank loans is the result of the difference between the new loans issued by banks and the repayment of past bank loans by firms. As for banks, part of their revenue depends on the difference between the interest they charge on the loans granted ($i_L.L^I$)[1] and the

1. There is considerable literature on how M becomes M' thereby allowing firms to reimburse their loans with interest. We will not discuss this here, as it would require considerable space and is beyond the immediate scope of this paper. However, for a debate, see Renaud (2000), Rochon (2009) and Zezza (2012).

Table 1 Transaction matrix of a simple three-sector SFC model

	Firms		Households	Banks		Σ
	Current	Capital		Current	Capital	
Consumption	$+C$		$-C$			0
Investment	$+I^{net}$	$-I^{net}$				0
Wage payment	$-W$		$+W$			0
Firms' profits	$-TP$	$+RP$	$+DP$			0
Interest on loans	$-i_L.L^I$			$+i_L.L^I$		0
Interest on deposits			$+i^D.D$	$-i^D.D$		0
Banks' profits			$+BP$	$-BP$		0
Change in loans		$+\Delta L^{Inet}$			$-\Delta L^{Inet}$	0
Change in deposits			$-\Delta D$		$+\Delta D$	0
Σ	0	0	0	0	0	0

interest they pay to their depositors ($i^D.D$). Their profits (BP) are fully distributed to households. On their capital account, we find the loans granted and still not repaid, and the deposits from households.

We can now build upon this simple example to account more directly for the initial finance of production. To achieve this, it is necessary to add new lines to this matrix, which account for the financing by banks of firms' production expenditures (here summarized as the payment of wages alone) and investments.

Row 1 of Table 2 deals with the advances made by banks to firms to finance their production expenditures; this is the initial finance. Row 10 concerns the repayment by firms of these advances to the banks at the end of the period (reflux phase). As for investments, SFC models usually only consider net investments; this means the difference between new investments and the repayment of bank credits having financed past investments. In MCT, firms will first borrow the sums necessary for the financing of their non-self-financed investments (row 2), and then, during the reflux phase, using their profits, they repay part of the loans having financed past investments (row 11). The transaction matrix of an SFC model that explicitly takes into account the flow and reflux phases would thus be as shown in Table 2, with four new rows (indicated in italics). We then obtain a matrix depicting explicitly the different phases of MCT.

From this matrix, it is understandable why it does not seem necessary to explicitly show the flow and reflux phases in an SFC model, since rows 1 and 10 of Table 2 cancel each other out completely. The net flows induced by these production expenses can therefore be reduced to row 5, which is the only one retained in SFC models. The same is true for the financing of investments. By calling ΔL^{net} the difference between new loans taken out by firms to finance their investments and the repayment of past bank loans, rows 2 and 11 in Table 2 can be summarized by a row showing the net change in bank loans, with: $\Delta L^{Inet} = \Delta L^I - R$. This formulation is usually retained in SFC models, as we can see in Table 1.

However, if this simplification makes sense for production expenditures, we believe that this analysis in terms of net flows can sometimes be reductive with respect to net investments. Indeed, net investments cover two variables with very different dynamics: new investments and the repayment of bank loans that financed past investments. This difference is firstly temporal. The repayment of bank loans is often based on due dates

Table 2 Transaction matrix with explicit flux and reflux phases

	Firms		Households	Banks		Σ
	Current	Capital		Current	Capital	
1. Financing of wages (initial finance)		$+L^W$			$-L^W$	0
2. Financing of investment (initial finance)		$+\Delta L^I$			$-\Delta L^I$	0
3. Consumption	$+C$		$-C$			0
4. Investment	$+I$	$-I$				0
5. Payment of wages	$-W$		$+W$			0
6. Firms' profits	$-TP$	$+RP$	$+DP$			0
7. Interest on loans	$-i_L.L^I$			$+i_L.L^I$		0
8. Interest on deposits			$+i^D.D$	$-i^D.D$		0
9. Banks' profits			$+BP$	$-BP$		0
10. Repayment of bank loans having financed wages		$-L^W$			$+L^W$	0
11. Repayment of bank loans having financed investments		$-R$			$+R$	0
12. Change in deposits			$-\Delta D$		$+\Delta D$	0
Σ	0	0	0	0	0	0

set in loan contracts signed sometime in the past, while new investments will mainly depend on the current economic activity. It is also spatial. At any given time, companies are deleveraging by repaying past loans, while other companies are taking on new debt. It is therefore not obvious to capture through a single variable two sub-variables with very different dynamics.

Moreover, within the framework of the SFC model (Le Héron 2009; 2011; 2012; 2013; 2015; Cottin-Euziol/Piluso 2021) and MCT (Rochon 2009; Cottin-Euziol/Rochon 2013), various authors have shown that taking into account the repayment of bank loans that financed past investments could have a lasting effect on the dynamics of an economy. We can imagine, for example, a situation where banks become so pessimistic about future levels of aggregate demand that they refuse to refinance firms or grant new loans – or react similarly but to a lesser degree. Obviously, this would have important consequences. For instance, these repayments represent a spending for firms, as shown in Table 2, but the repayment of the bank loan principal does not generate any income, since it leads to the disappearance of the corresponding credit line. The repayment of a bank loan principal is therefore a non-revenue-generating cost (Barrère 1990). The increase in repayment volumes by firms then tends to raise their production spendings without increasing the level of income in the economy. This can create a mismatch between the value at which firms wish to sell their production and the level of aggregate demand, thus affecting the dynamics of economies.

Therefore, we believe that it may be relevant to build an SFC model that explicitly distinguishes between loans that finance new investments, on the one hand, and the repayment of loans that financed past investments, on the other. In the following section, we show that considering the repayment of firms' debt can significantly modify the dynamics of an SFC model.

4 A SIMPLE SFC MODEL WITH REPAYMENT OF PAST BANK LOANS

In this section, we present a simple three-sector SFC model (firms, households, banks) in which firms finance part of their investments with bank loans that must be repaid over several periods. The model is similar to Le Héron/Cottin-Euziol (2021). The main difference is that, within each period, firms will repay a part of their debt out of their profits.

4.1 Firms

Within each period of production, firms determine their level of output (Y), based on expected household consumption spending (C) and households' planned investment decisions (equation (1)).

The production capacity of firms is limited by the amount of capital they own (K) and the product per unit of fixed capital (v), assumed to be fixed (equation (2)).

Firms' investment decisions during a period (equation (3)) rely on the rate of capital utilization (equation (4)), the profit rate net of repayments of the last period (equation (5)) and the borrower financial risk (RE), which depends on the debt leverage and long-term interest rates (equation (6)). These investments will increase the stock of capital (equation (7)).

Corporate profits (TP) are the difference between corporate revenues and corporate costs (equation (8)). These costs are composed of the wages paid to households (W) and the interest paid on the debt they have contracted to finance their investments ($i_L.L^I_{-1}$). To obtain corporate profits net of the repayment of firms' debt, it is then necessary to subtract from these profits the expenses corresponding to the repayment of bank loans in that period, which financed past investments (R). The equation of these new profits net of repayments can therefore be written as follows (equation (9)).

Profit then has two uses: part is distributed to households in the form of dividends (equation (10)) and the rest is used to finance investments (equation (11)). The change in firms' debt towards banks is the difference between non-self-financed investments and the repayment of bank loans made during the period under review (equation (12)). We suppose, as in Rochon (2009), that firms repay within each period a given part, θ, of their debt (equation (13)).

$$\text{Output: } Y = C + I \tag{1}$$

$$\text{Productive capacity: } Y^* = vK \tag{2}$$

$$\text{Investments: } I = (\gamma_0 + \gamma_1 \,.\, u_{-1} + \gamma_2 \,.\, r^f_{-1} + \gamma_3 \,.\, RE_{-1}) \,.\, K_{-1} \tag{3}$$

$$\text{Rate of capital utilization: } u_{-1} = \frac{Y}{Y^*} \tag{4}$$

$$\text{Profit rate net of repayments: } r^f = \frac{TP - R}{Y} \tag{5}$$

$$\text{Borrower financial risk: } RE = i_L \,.\, \frac{L^I}{Y} \tag{6}$$

$$\text{Capital accumulation: } K = K_{-1} + I \tag{7}$$

$$\text{Corporate profits: } TP = Y - W - i_L L^I_{-1} \tag{8}$$

$$\text{Corporate profits net of repayments: } TP - R = Y - W - i_L L^I_{-1} - R \quad (9)$$

$$\text{Distributed profits: } DP = (1 - sf).(TP - R) \quad (10)$$

$$\text{Retained profits: } RP = TP - R - DP \quad (11)$$

$$\text{Bank loans: } \Delta L^I = I - RP - R \quad (12)$$

$$R = \theta L^I_{-1} \quad (13)$$

4.2 Households

Households receive wages (W), which represent a fixed share (ρ) of firms' revenues (equation (14)). They also receive financial income, which consists of the profits distributed by firms (DP), banks (BP), and interest paid on their deposits (equation (15)). Households consume in each period a fixed share (c_1) of their expected wages, a fixed but smaller share (c_2) of their expected financial income, and an even smaller share (c_3) of their bank deposits previously accumulated (D_{-1}) (equation (16)), as in Le Héron (2008; 2009; 2011; 2012; 2013). Consumption depends on expected wages (equation (17)) and expected financial income (equation (18)) because households can only know their whole revenues at the end of the period. Their expected revenues will then depend on their revenues in the last period and on a corrective coefficient applied to the difference between their expected and actual revenues in the last period. The share of households' unconsumed income is added to their bank deposits (equation (19)), since we suppose for simplicity that the financial sector is only made up of banks. They receive all the households' savings and grant credits to firms.

$$\text{Wages: } W = \rho Y \quad (14)$$

$$\text{Household financial income: } FI = DP + BP + i_D D_{-1} \quad (15)$$

$$\text{Consumption: } C = c_1 W^e + c_2 FI^e + c_3 D_{-1} \quad (16)$$

$$\text{Expected wages: } W^e = W_{-1} + \Omega_W (W_{-1} - W^e_{-1}) \quad (17)$$

$$\text{Expected financial income: } FI^e = FI_{-1} + \Omega_{FI} (FI_{-1} - FI^e_{-1}) \quad (18)$$

$$\text{Deposits: } \Delta D = W + FI - C \quad (19)$$

4.3 Banks

The banking sector plays a purely accommodative role in this model in the sense that it systematically grants creditworthy firms the requested credits. Firms repay all their debt incurred for production at the end of the period but repay the debt incurred for the purchase of capital at a given rate, θ. Banks are also responsible for collecting bank deposits from households. We assume that the rate of return (iD) on household bank deposits (D) is fixed. The loans granted by banks to firms are also granted at a given fixed rate (i_L), which is a mark-up over rates on deposits. We assume here that all firms receive the same rate of interest, which we realize is not reflective of reality. The banks' profits are therefore the difference between the interest earned on loans granted and the interest paid on household deposits (equation (20)). These profits are entirely given out as dividends to households.

$$\text{Bank profits: } BP = i_L L^I_{-1} - i_D D_{-1} \tag{20}$$

Since the model is stock–flow consistent, the variation of bank deposits should be equal in each period to the variation of credits granted by the banks (equation (21)). This identity is explained by the fact that bank credit is the origin of all money in this model and that the deposits of the various economic agents are the final destination of this money, after payment of wages, profits, consumption, and repayment of past bank credits. Once created, money just circulates, but the total amount of money remains the same, with just changes in bank accounts until the repayment of debt in the reflux phase.

$$\text{Control equation: } \Delta D = \Delta L^I \tag{21}$$

5 RESULTS

The simulations we carried out with this model allow us to study the impact of the repayment of corporate debt on the dynamics of an SFC model. To do this, we first run the model without considering these corporate repayments, until period 100. The growth rate of the different variables of the model are then stable. We then assume that firms will start repaying only the new loans taken out from period 100 onwards. This means that they will continue to pay interest on their debt accumulated until period 100, without trying to repay this debt. However, after period 100 they will repay a part of their debt accumulated from period 100 onwards. We fixed the repayment rate at 5 per cent. This means that firms will repay, within every period, 5 per cent of the debt taken out since period 100. These repayments will then decrease firms' profit and so firms' distributed and non-distributed profits, as explained in the previous section. We present the results below. For each variable, we display its variations from period 90 to period 300. The dynamics of these variables is modified from period 100, when the repayment of past bank credits is taken into account.

We can first see that the growth rate of production decreases sharply after period 100, when firms start repaying their debt (Figure 1). This growth rate decreases progressively

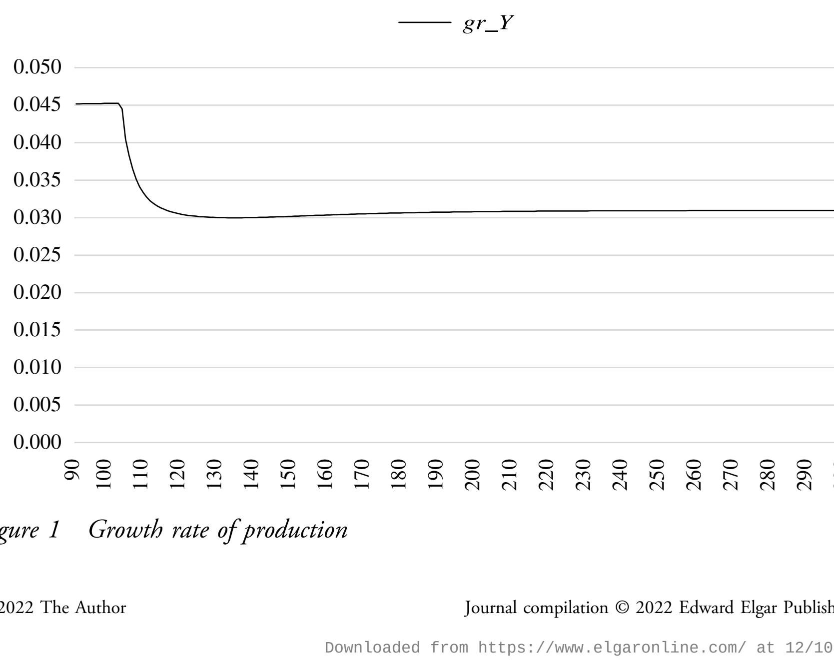

Figure 1 Growth rate of production

from about 4.5 per cent to 3 per cent. The diminution of the growth rate can be explained by the decrease of both the consumption growth rate and the investment growth rate (Figure 2). The consumption growth rate decreases because of the diminution of distributed profits by firms. Indeed, before period 100, firms use their profits either to pay out dividends or to self-finance investments. Then, from period 100 onwards, they also need to repay, out of their profits, part of their debt. These repayments will decrease the amount of distributed profits – and so the level of consumption – and non-distributed profits. In our model, these repayments will drain about 30 per cent of corporate profits (Figure 3). They will represent an outflow outside the economic circuit, as the repayment of a bank credit leads to the cancellation of the corresponding credit line. Households' revenues and consumption will therefore be lower after considering the repayment of corporate debt.

The investment growth rate will also decrease (Figure 2). In our model, investment depends on the rate of capital utilization, firms' profits, and the leverage ratio (equation (3)). As we can

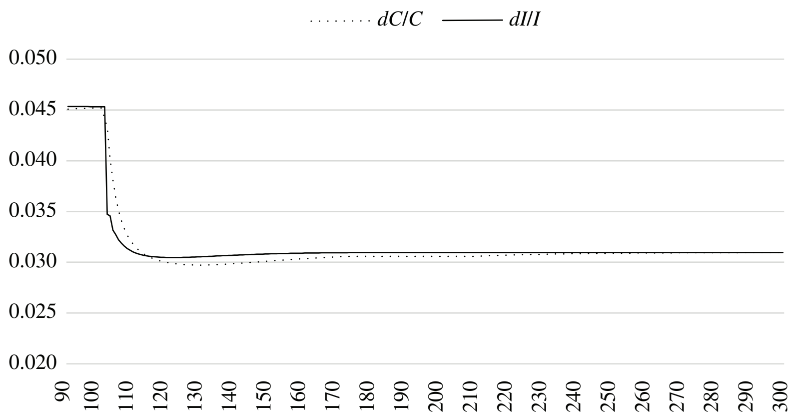

Figure 2 Consumption and investment growth rate

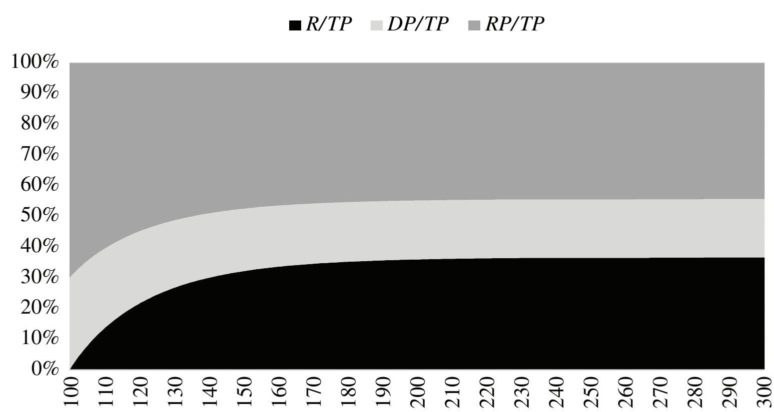

Figure 3 Share of corporate profits use

see, these three parameters are negatively impacted by the repayment of corporate debt. First, the profit rate of firms was about 33 per cent before considering the repayment of corporate debt (Figure 4). After considering these repayments, the corporate profit net of repayments represents about 20 per cent of the production value. As the level of firms' indebtedness (L^f/Y) represents about 2.5 times the value of production in our model, this means that repaying 5 per cent of this debt within every period represents about 12.5 per cent of firms' revenues. This explains why, after considering the repayment of firms' debt, their profits net of debt repayments decrease by about 12 percentage points.

Secondly, due to the decrease of global demand, the rate of firms' capital utilization will also decrease (Figure 5). This will in return impact negatively the desired rate of corporate capital accumulation, leading to fewer investments and less global demand in the future. Considering corporate repayments thus negatively affects firms' capital utilization. As

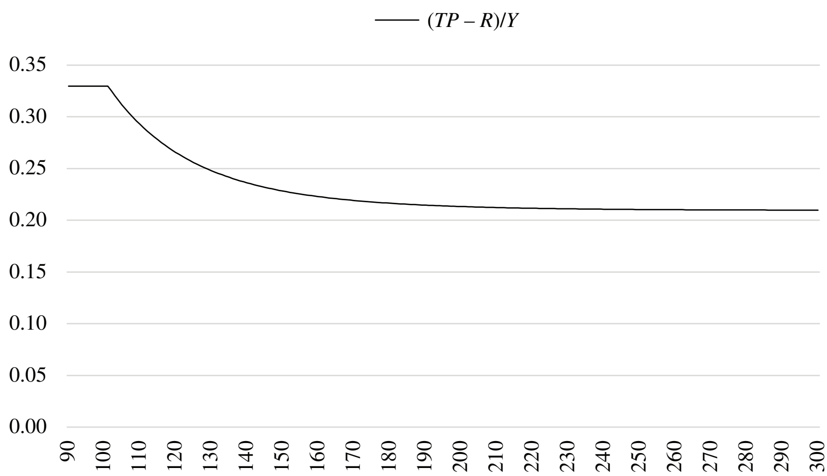

Figure 4 Firms' profit rate net of debt repayments

Figure 5 Rate of capital utilization

regards the last parameter in the investment function – the borrower risk – the impact of corporate repayments at first seems paradoxical. Indeed, despite these repayments, we can observe a slight increase of firms' leverage ratio (Figure 6). This ratio will remain higher than the one obtained before considering the repayments. This is because the repayment of corporate debt has a twofold effect. It decreases firms' indebtedness, but the negative impact of these repayments on consumption and investment also decreases the growth rate of production. This explains why firms' indebtedness does not decrease despite the repayment of their debt. This mechanism reminds us of Fisher's (1933) debt-deflation theory. The big difference here is that there is no deflation in our model, just slower corporate debt growth and slower economic growth. The increase of the leverage ratio will also slightly increase the share of banks' profits, as it leads to an increase in the level of interest payments in relation to the volume of production (Figure 7).

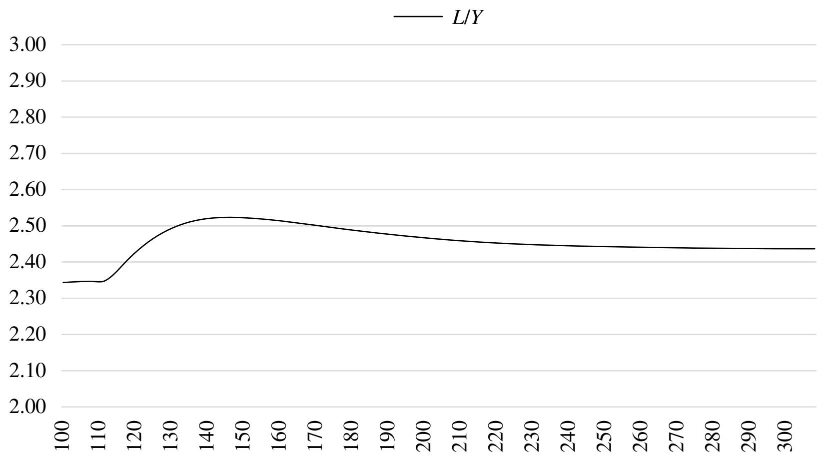

Figure 6 Firms' leverage ratio

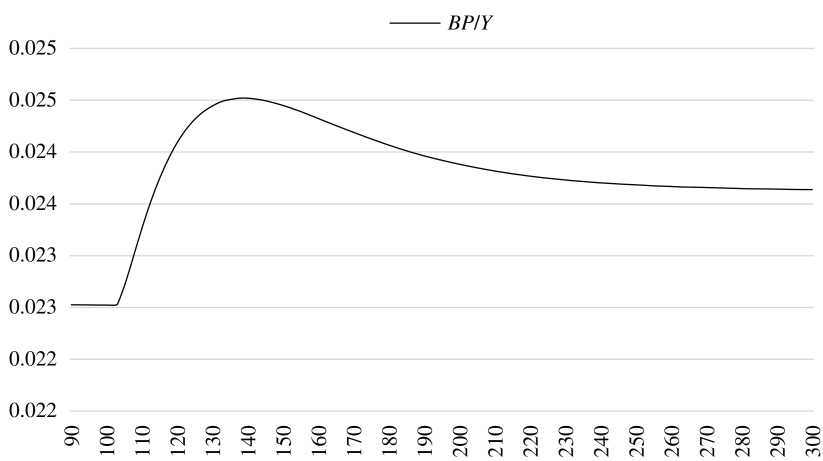

Figure 7 Banks' profit rate

The diminution of corporate profits and capital utilization as well as the slight increase of leverage ratio will then significantly impact the desired rate of corporate capital accumulation, and thus global demand and the growth rate of the economy. These different results allow us to highlight the importance of the repayment of bank loans taken out by firms on the dynamics of an SFC model. The repayment of these loans represents an outflow outside the economic circuit, which can decelerate sharply the growth rate of the economy.

6 FINDINGS

The model presented above enables us to draw a link between firms' indebtedness and the dynamics of an SFC model. This effect of indebtedness on the dynamics of economies is well recognized and empirically documented (Kim 2016). The literature generally distinguishes two relationships between debt and output: one positive in the short run and the other negative in the long run. Two explanations are offered:

1. The first explanation refers to Minsky's financial instability hypothesis (Minsky 1974; 1986; Keen 1995). According to Minsky, the euphoria accompanying a period of expansion increases debt ratios because firms' indebtedness gets larger to finance their investments. At the same time, creditors are confident in the capacity of their debtors to repay their debts because of economic tranquillity and thrilling business spirits. This is the phase of optimism. This will at first allow growth and prosperity, and profits increase. Eventually, however, this makes the economy more fragile. The ensuing downturn is the result of a change in the expectations of creditors who become fearful (pessimistic) and restrict financing conditions because of the weakness of the more exposed economic units. The result is a lower level of investment that reduces aggregate demand and exacerbates the crisis.
2. The second explanation refers to the distributional effect of debt (Palley 1994; 1997). In these studies, household debt increases consumption in the short term, strengthening aggregate demand and the growth process, but due to the repayment of the loan and interest, it will finally lead to a transfer of revenues from debtor households with a high propensity to consume to creditor households with a lower one. This implies a reduction of the consumption level, causing an economic downturn.

In our simulations, we also link economic activity with variations in the indebtedness of economic agents by highlighting a third link. We show, using the SFC model described above, that the debt repayment process can greatly modify the dynamics of an economy. Corporate indebtedness then has a twofold impact. It first results in an increase in money creation, income, and aggregate demand. This increase can fuel growth, as an increase in aggregate demand will result in new investments and thus a further increase in aggregate demand (the accelerator principle). However, the loans taken out to finance the investments must be repaid. These repayments will represent a leakage outside the economic circuit, as they constitute a non-income-generating expense (Cottin-Euziol/Rochon 2013). Firms will then have less profits to pay out as dividends or to retain to self-finance their investments. This is the reason why, when we consider these repayments, we attain a reduction of economic growth. So, corporate debt can at the same time boost the economy in the short run and slow it down in the long run when credits are repaid.

7 CONCLUSION

The objective of this article was to explicitly consider the reflux of bank credits in SFC models, inspired by the models of MCT. The model presented in this paper allowed us to highlight the significant impact of the repayment of past bank credits on a simple SFC model. In our model, the growth rate of the economy, consumption, and investment growth rates and profit rates are all negatively impacted by these repayments. The main explanation suggested here is that the repayment of a bank credit represents an outflow outside the economic circuit, since it is an expenditure generating no revenues, the corresponding credit line being destroyed.

This article may then pave the way for future studies. If issuing bank credits to finance investments can accelerate growth (Kalecki 1943) and the repayment of these credits decelerate it, then it may be possible to model economic cycles based on the relation between these two variables. During a growth phase, companies take on debt to finance their investments. This indebtedness to banks results in an increase in money creation, income, and aggregate demand. This increase fuels growth, as explained previously. However, the loans taken out to finance the investments must be repaid and will represent a leakage outside the economic circuit, as they constitute a non-income-generating expense. As the indebtedness of economic agents increases, these repayments also increase, and thus so does the leakage from the economic circuit. This increasing leakage due to repayments will then slow down the growth of the economy. A vicious circle is thus set up: the increase in repayments slows down the growth of aggregate demand, and therefore investment rates, and the drop in investment will in turn reduce economic growth. This chain of events could eventually lead to a downturn in the economy. However, this economic downturn could in turn be halted, by the decrease in repayments of past bank loans after several years of crisis. This decrease is explained by the fact that companies continue to repay their past debts during the crisis phase, but no longer take out new bank loans because they no longer invest. After several periods of crisis, the indebtedness of firms then falls.

It would also be interesting to study in which way corporate repayments impact the sharing between distributed and non-distributed profits. In our model, we assumed that these repayments do not alter this sharing. Firms first repay a part of their debt on their profits, and then share their profits between distributed and non-distributed ones. However, empirical studies should be carried out to determine whether firms facing higher repayments choose to decrease their distributed (preferably) or their non-distributed profits.

We can conclude by asserting that the dynamics proposed here is directly related to the banking nature of money. By granting credit, banks create money and increase the level of aggregate demand. The repayment of these credits, associated with the destruction of money, causes the opposite effect. This suggests that it could be interesting to focus more on the reflux phase within the SFC model, taking inspiration from MCT.

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