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Credit Channel and Industrial Firms' Market Power

by

Marco Mazzoli

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Università degli Studi di Modena e Reggio Emilia
Dipartimento di Economia Politica
Via Berengario, 51
41100 Modena (Italia)
e-mail:me-ma@pt.tizeta.it

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Marco Mazzoli*
Department of Economics
University of Modena and Reggio Emilia
Via Berengario 51 - 27100 Modena - ITALY
Phone: (+)39 059 417833
e-mail (priv.) me-ma@pt.tizeta.it

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ABSTRACT

The theoretical model presented here describes the interactions between a concentrated industrial sector and a perfectly competitive financial system where industrial firms can issue bonds or borrow from money from the banks in order to finance their investments. It is shown that an exogenous modification in the degree of concentration in the industrial sector does not only affects the equilibrium level of investments and the price of the final good, but also the transmission mechanism of the monetary policy. This paper also presents a first simplified framework to study the interactions between market power of industrial firms on the credit market and endogeneity of the composition of their external finance (in this context, bank credit and bonds). For this reason one of the main assumptions of the model is the existence of the "credit channel". The endogeneity of the composition of industrial firms' external finance also allows to formalise (although in a very simplified one-period context) a situation of simultaneity between financial and investment decisions for the firms.

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1. Introduction

With the advent of the EMU the European economies have witnessed a number of mergers and acquisitions not only in financial and local banking markets (for instance, in Italy) but also in relevant transnational industries, such as telecommunications and high technology. A first point that will be made here is that these issues should not only be studied within and industrial economic perspective but also for the multiplicity of their macroeconomic implications.

While a very extended literature on the macroeconomic implications of market concentration in the industrial sector already exist, hardly any literature exists on the macroeconomic implications of market concentration and market power in the banking and financial sectors. The problem is far from being irrelevant since there is no reason to assume that industrial firms' market power should have implications for the goods market equilibrium and not for the banking and financial market equilibria, at least to the extent that bank credit and securities are imperfect substitutes as a source of finance for industrial firms. One of the purposes of the present analysis is therefore to provide a first simplified theoretical framework to analyse this sort of institutional and structural changes which involve the behaviour of the industrial firms not only in the goods markets, but also in the banking and financial sectors. In particular, the theoretical model introduced here shows how an exogenous modification in the degree of concentration in the industrial sector affects:

a) the equilibrium level of investments and the price of the good produced by the "concentrated" industrial sector;

b) the transmission mechanism of the monetary policy with composite effects that, in spite of their complexity, may be decomposed into precise elements with a specific economic interpretation.

Another purpose of this work is to study how all the above-mentioned phenomena interact with the firms' financial structure (in terms of recourse to bank credit or bonds). The only promising approach to analyse this issue, where imperfect substitution between bank credit and securities play such an important role seems to be provided by the "credit view". One of the main assumptions of the model is therefore the existence of the "credit channel" of monetary shocks transmission[1].

For these reasons this paper is close, at least in spirit to the "credit view", even though the assumption of a (limited) substitutability between bank credit and securities for the industrial firms allows us to identify here a more general framework where the exclusive recourse to bank credit or securities constitute two extreme benchmark cases. The endogeneity in the composition of external finance for industrial firms also allows to formalise (although in simple one-period context) a situation of simultaneity

[1] In this regard we employ here a more extended definition of monetary shock than the one commonly used by Bernanke and Blinder (1988, 1992) and closer to the one used by Friedman and Kuttner (1993), who consider not only the "monetary policy shocks", but any exogenous and/or unpredictable change that may take place in the monetary sector of the economy.

between financial and investment decisions for the firms.

In times of deep institutional changes, one might also observe that the industrial firms' market power with respect to financial intermediaries constitute one of the relevant features of a financial system, although the interactions between institutional configurations of a financial system and short-run behaviour of the relevant variables have been paid little attention by the literature, with a few exceptions (see, for instance, Schmidt, 1999[2] and Mazzoli, 1998, ch. 1,2,3,4). In particular, Mazzoli (1998) provides a number of theoretical and empirical analyses where institutional configurations of a financial system interact with industrial firms' market power and with the transmission mechanism of monetary policy. However this is certainly a field where a precise theoretical configuration is missing, apart from the generical background provided by the "creditist" models assuming the "specialness" of bank credit.

2. Does market power matter only in the goods market or also in the credit market?

The macroeconomic implications of credit market structure have been explicitly analysed only "on the deposits side" (VanHoose, 1983, 1985), while other partial equilibrium analyses, mainly based on an industrial organisation approach (like the oligopolistic version of Monti-Klein model, presented, for instance, in Freixas e Rochet, 1997) only focus on the credit supply side and do not raise the problem of the possible macroeconomic implications of changes in the market structure. Other industrial organisation contributions focusing on the interaction between banks and industrial firms (Brander and Lewis 1985, Poitervin, 1989a, 1989b, 1990) have proposed models of duopoly on the goods market where the banks' behaviour has the only consequence of introducing possible strategic advantages of industrial firms in installing excess production capacity or, in the case of Poitervin (1989b), where the existence of a unique monopolistic bank generates pro-collusive effects in the goods markets, since an aggressive policy implemented by either of the industrial firms in the goods market would make riskier the bank assets and reduce, ad a consequence, their value.

Nevertheless the implications of these classes of models have been confined to the field of industrial organisation and, despite the relevance of their findings, they have not really been employed in macroeconomic analysis, nor have their results been incorporated into macroeconomic models, specially for what concerns the possible (exogenous) modifications in the credit market structure "on the demand side", an aspect almost entirely neglected by the literature (with the isolated exception of Mazzoli, 1998, ch. 4, where the problem is dealt with in a context of partial equilibrium), even though phenomena of important mergers and acquisitions in strategic industries (such as, for instance, telecommunications) are

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[2] I am very grateful to Giuseppe Marotta for pointing out this reference to me.

far form being irrelevant in these last years in Italy, in Europe and in the States. As we know it, recently in Italy many mergers have actually taken place in the banking sector, i.e. on the "supply side" rather than in the "demand side" of the credit market. Nevertheless, the data of the Italian Antitrust Authority (Autorità Garante della Concorrenza e del Mercato, 1999) show that in the non-financial services and manufacturing sectors the overall value of the mergers has been higher than in the banking sector in 1996 and 1997, while the opposite happens only in 1998 (also due to the acceleration in the processes integration in financial and banking sectors, determined by the introduction of EURO)[3]. Another (more indirect) piece of evidence showing, for Italy, the relevance of concentration processes in non-banking sectors is given by the constant and significant growth of cases raised by the Italian Antitrust Authority for episodes of concentration among independent firms: 292 in 1997, 344 in 1998 and already 104 in the first quarter of 1999. These brief pieces of evidence show that if, on the one hand, the EMU has created strong incentives for mergers and acquisitions in the banking sector, a similar process of concentration is taking place on the other hand among industrial firms in important industries (such as, for instance, telecommunications)

At the same time another relevant structural phenomenon is taking place in Europe: an increase in the degree of substitutability between bank credit and securities as a source of finance for industrial firms, due to the expansion of financial markets in the EMU. And, of course, both phenomena might be explained by the incentives and scale economies determined by the EMU. While the implications of increases in the degree of concentration on the "supply side" of the bank credit market can be analyses (at least in terms of partial equilibrium) within framework of the oligopsonistic version of Monti-Klein model, there is hardly any literature on the implications of a simultaneous increase of industrial firms' market power on the goods and credit markets: modelling this specific issue is one of the purposes of this paper. The model also contains a typical "stylized fact" of the "credit view": the composition of the industrial firms' external finance depends on the spread between interest rate on bank credit and bonds. It will be shown that the degree of substitutability between bank credit and securities deeply affect the way an increase in the degree of concentration in industry affects the transmission mechanism of monetary policy.

3. A "mesoeconomic" model with oligopoly on the goods market and oligopsony on the credit market

The model introduced here is meant to propose a first theoretical framework to analyse the

[3] In particular, both the manufacturing and the non-financial services sectors show operations of mergers and concentration within the EU for a value higher than 80 billions of dollars in 1997 and for approximately 60 billions of dollars in 1996, and only in 1998 has the financial services sector shown operations of merger and concentration for higher values than the other two above-mentioned sectors.

macroeconomic impact of exogenous changes in the degree of concentration (possibly caused by mergers and acquisitions) in industries of relevant macroeconomic magnitude. It describes a closed economy and could be defined "mesoeconomic", since it is constituted by macroeconomic equations and "microeconomic" conditions describing in detail a single industry of relevant size, composed by large firms enjoying market power both on the goods market and in the bank credit market. The banks are assumed to be much more numerous than the firms and compete among them under a perfectly competitive regime.

The attention is focused on the investments (which are assumed to last for one period only) of the industrial firms. For this reason, it is assumed that the wages and the level of employment are given and set at the beginning of the period under consideration, according to an efficiency wages mechanism: this could be interpreted as a *ceteris paribus* assumption, or, alternatively, as an assumption only valid in the short run.

The industrial firms' (henceforth "firms") investments determines the quantity and price of the final good produced by the industry. The demand for physical capital affects, on the one hand the credit and bonds markets equilibria, on the other hand the output produced by the firms[4].

3.1 General assumptions

One of the main "ingredients" of the model must be a convenient framework allowing, on the one hand to formalise the macroeconomic effects of a change in firms' market power in the industrial sector, and, on the other hand, to include as extreme cases both perfect competition and monopoly. The simplest and more direct way to do the trick is to assume - like in Mazzoli (1998, ch.4) - that there are n identical firms (each of them owing some of the given N production units) behaving as oligopsonists *à la Cournot* on the bank credit market. The investment k (lasting for one period only) may be financed either with bank credit (at the interest rate r_L) or by issuing bonds (at the interest rate r_B). The firms choose to finance a portion μ of investments by borrowing from the banking system and a portion $(1-\mu)$ by issuing bonds.

Since we have a constraint given by the equality between industrial investments and supply of funds by the financial sector of the economy, the optimal investment decision for the firms amounts to:

1) choosing the portion $(1-\mu)$ of investments to be financed by issuing bonds on the (competitive) bond market and the portion μ to be financed by borrowing on the (oligopsonistic) bank credit market[5];

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[4] The aumont of financial capital in this context determines the quantity of final good supplied in the goods market, although it does not really determines a «*quantity precommitment*» effect similar to the one described in Kreps and Scheinkmann (1983) and in Maggi (1996).

[5] Obviously in this context it is assumed that bonds and bank credit are imperfect substitutes for the firms as a source of external finance. This is a typical assumption of the "credit view", although in our case, by endogenizing the composition of the firms' liabilities, the assumption of imperfect substitutability between bank credit and bonds is weakened. for a more detailed survey and analysis of the "credit view" see Mazzoli (1998, ch. 1-2).

2) choosing (for what concerns the portion of capital μ financed by bank credit) an optimal point on the bank credit supply function, determining in this way the interest rate r_L on bank credit; this obviously also contributes to determine the level of the other interest rate, r_B, since, by implicitly defining the portion of investments financed on the other market - the bonds market - this affects its competitive equilibrium.

As mentioned before, it is assumed that the number N of production units owned by each of the n firms is fixed. Each of the n firms therefore raises external finance in order to provide with capital k each of its N/n production units. In this way - by keeping the number of production units in the economy constant - a change in the degree of concentration can be conceptually isolated form any other "entry and exit" effect that might affect the scale of the economy.

In addition, as mentioned before, it is assumed that the firms are oligopolistic in the goods market and produce a final consumption good at the price p.

The money base is assumed to be only constituted by the reserves held by the banks at the central bank: this implies that there is no currency and all payments are made with banks deposit.

Assuming that the monetary policy is non anticipated, the portion of investments that the firms decide to finance by bank credit is defined as follows:

$$\mu = arg\ min\ [1, m\, r_L^{-\lambda} r_B^{\lambda}]. \qquad (1)$$

where $0 < \mu \leq 1$, $m>0$ is a generic positive parameter. In the open interval (0,1), μ is a constant elasticity function (with elasticity equal to λ) with respect to r_L and r_B. In case we have $m\, r_L^{-\lambda} r_B^{\lambda} > 1$ the elasticity of μ with respect to r_L will not be $-\lambda$, but will be null[6]. For this reason we will define in a more general way the elasticity of μ with respect to r_L as $\varepsilon_{\mu,L}$. This definition allows us to discriminate

[6]The analytical form of (1) is not particularly restrictive, since it could be interpreted as a case of "unanticipated" monetary poicy in the following more general form:

$$\mu = arg\ min\ \{1, m\, r_L^{-\lambda} r_B^{\lambda} [1+E^*(\Delta BM)]^{\tau}\},$$

where $0 < m < 1$,
with
$E^*(\Delta BM) = \int E(\Delta BM) dF[E(\Delta BM)] = 0$

and $E^*(\Delta BM)=0$ *(i.e. unanticipated monetary policy)* ossia politica monetaria non anticipata). $E^*(\Delta BM)$ is the private sector expectation concerning the monetary policy intervention (defined as change in the money base) $F[E(\Delta BM)]$ is the probability distribution function of the expectations with respect to $E(\Delta BM)$, τ is a positive parameter describing the elasticity of the expectations with respect to ther monetary intervention $E^*(\Delta BM)$.

between the case where there is substitutability between the two sources of finance for the firms ($\varepsilon_{\mu,L}$ constant and equal to $-\lambda$) and the extreme case where the bank credit is so "special" that the elasticity $\varepsilon_{\mu,L}$ becomes null, although in the model the difference between the two cases is trigged by particular values assumed by the spread $(r_L - r_B)$ and not according to prior assumptions on the intrinsic nature of bank credit.

Having endogenized the composition of the firms' liabilities implies that effect of the firms' market power on the credit market depends on the value assumed by μ, and, of course, on the spread between the two interest rates (a crucial element of the *credit view*, at least in Bernanke and Blinder, s (1988) definition). This happens because the monetary policy, by having - in general - a different impact on the two interest rates r_L and r_B, may induce the firms to raise more capital on the market which turns out to be (in case of restrictive monetary policy) less affected by the monetary shocks or (in case of expansionary monetary policy) more affected by the monetary shocks.

The optimisation problem of the representative firm is the following:

$$\max \pi = (N/n)\ \{py - w^*l^* - (1 + r_L)\mu(\overset{-}{r_L}, \overset{+}{r_B})k\ - (1 + r_B)[1-\mu(\overset{-}{r_L}, \overset{+}{r_B})]k\} \qquad (2)$$

s.t.

$$\mu(r_L, r_B)[(N/n)\ k + K'] = S(\overset{+}{r_L}, \overset{-}{r_B}, \overset{+}{BM}) \qquad (3)$$

and

$$p = L(pY)^{\psi}\, r_B^{-\gamma} Y^{-\beta}, \qquad \psi, \gamma, \beta > 0,\ Y = Ny. \qquad (4)$$

where π are the firm's profits, y the output produced by each production unit, w^* the wages and l^* the labour employed (both fixed in the short run), k the investment for each production unit, $S(\cdot)$ is the bank credit supply function[7] (assumed to be a constant elasticity function with respect to r_L, and r_B), BM the money base (which - having assumed in our case that there is no currency - is equal to the private banks' outstanding reserves, figuring - in the central bank balance constraint - as a counterpart for the bonds held by the central bank), K' the investments made by all the other production units owned by all the other firms; equation (4) is the inverse demand function (assumed for simplicity to be a constant elasticity function with respect to the nominal output pY and the interest rate r_B) for the final consumption good produced by the industry under consideration, where ψ, γ, β are three generical positive parameters. In

[7] Equation (3) may be interpreted as a special case of the funtion $S(r_L, r_B, BM, E^*(\Delta BM))$, again under the assumption $E^*(\Delta BM)=0$, i.e. unanticipated monetary policy.

particular L is a function (assumed to be homogeneous in pY) that "capture" the causal link existing between the determination of the industry output pY and that part of the households' disposable income spent on the industry final consumption good[8].

This means that the higher the macroeconomic relevance of the industry under consideration, the higher will be the value $\partial L(\cdot)/\partial Y$. In other words, the industry output affect its demand in two opposite senses: on the one hand (through the term $Y^{-\beta}$) it reflects the usual negative relation between the price and the demanded quantity of the good, on the other hand (through the term $L(pY)^{\psi}$) it positively affects the demand for the good. Since this is a partial equilibrium model, and since the industry output only affects the households disposable income to the extent that our industry is relevant on a macroeconomic point of view, we assume that in (4) the main impact of Y on p be negative.

Constraint (3) explains that the (symmetrical) firms only finance a portion μ of their investments by borrowing from the banking system[9].

Having assumed that the firms behave as *Cournot* oligopolists on the goods market and *Cournot* oligopsonists on the credit market, and having assumed that the S.O.C. are satisfied, the F.O.C. are the following:

$$p(\partial y/\partial k)[1 + 1/n\varepsilon_{DP}] = 1 + \mu r_L + (1-\mu)\, r_B + \{\mu[r_L - \varepsilon_{\mu,L}(r_L - r_B)]\} \,/\, \{n(\varepsilon_{SL}-\varepsilon_{\mu,L})\}, \qquad (5)$$

where ε_{DP} is the demand price elasticity of the final good, ε_{SL} is the bank credit supply elasticity with respect to r_L and $\varepsilon_{\mu,L}$ is the elasticity of μ with respect to r_L. This means that we have three potential sources of rigidity in the model, and two of them in the credit market. In particular, in the credit market, the presence of rigidity in the credit supply (captured by a low value of ε_{SL}) is mitigated by $\varepsilon_{\mu,L}$, which (being negative and having a negative sign) contributes to increase the value of the denominator in the last

[8] The presence of $L(\cdot)$ in the demand function derives from the fact that this is a "one-period" model. In a hypothetical dynamic extention of the model one could introduce a time lag between the moment when the industry output is produced and the moment when the households actually spend that part ot their disposable income (generated directly or indirectly by the industry output) on the industry final consumption good.

[9] Reminding that (3) may be assumed to be a special case with $E^*(\Delta BM)=0$ of the more general caso of equilibrium between the function $S(r_L, r_B, BM, E^*(\Delta BM))$ and the investments financed with bank credit, even when $E^*(\Delta BM)=0$, the probability attributed by the banking system to the case where $E(\Delta BM)\neq 0$ will not be null. In other words, talking about expectations formulated by the banking stytem, we could say that, given that we have a large number of banks, at least one bank will attach a non-zero probability to the event $E(\Delta BM)>0$ and at least one bank will attach a non-zero probability to the opposit event. Introducing an explicit formalization ot uncertainty in the behaviour function of the banking system would not have practical consequences for the analytical form of the model, since, by assuming an unanticipated monetary policy we would have $E^*(\Delta BM)=0$). In this way one would explicitly show that the aggregate banking system is diversifying its portfolio, and therefore one would justify the existence of a positive (although very small) credit supply even when the spread between r_L and r_B is negative. However all that would significantly complicate the formal notation of the model

addend on the right-hand side of (5). In the extreme case where the firm only finance its investments with bonds (i.e. μ tends to zero), the only potential source of rigidity in the economy would be on the goods market. In this context, μ determines the extent of the firms' oligopolistic power on the financial sector of the economy and, by increasing or reducing its value according to the possible changes in the interest rates spread, it contributes to increase or reduce the degree of rigidity in the financial sector of the economy[10].

We can re-write equation (5) as an implicit function:

$$f_1(p, k, r_L, r_B, n) = 0 \,. \qquad (6)$$

The rest of the model is composed by the following equations

- Equilibrium on the market for bank credit to the firms:

$$\mu(\overset{-}{r_L}, \overset{+}{r_B})N k - S(\overset{+}{r_L}, \overset{-}{r_B}, \overset{+}{BM}) = f_2(r_L, r_B, k, BM) = 0. \qquad (7)$$

- Equilibrium on the bonds market:

$$B^b(\overset{+}{r_B}, \overset{-}{r_L}) + B^H(\overset{+}{r_B}, \overset{-}{pY}) + L^{b\text{-}H}(\overset{+}{r_B}, \overset{-}{r_L}) + BM - BT - (1 - \mu(\overset{-}{r_L}, \overset{+}{r_B}))N k = f_3(p, k, r_L, r_B, BM) = 0.$$
(8)

We assume, for simplicity, that the interest rate on deposits is null and the households are also the owners of the banking system[11]. B^b and B^H represent the demand for bonds by the banks and households respectively, BT the (given) aumont of public debt, $L^{b\text{-}H}$ is an excess demand function of households' liabilities with banks. Even in this case $B^H(\cdot)$ is affected by the industry output, through the impact that the latter has in the determination of the households' disposable income, which, in its turn, can be invested in bonds[12]. $L^{b\text{-}H}$ is defined according to the following assumptions: since we admit that banks lend money to the households, we assume that the sector of bank credit to the households be perfectly competitive and that its interest rate be defined as $r_H = r_B + h$, where h is a constant[13]. Introducing this assumption amounts to aggregating the bonds market and the market for bank credit to the households (both of them perfectly competitive) and does not have particular consequences for our analysis, nor does it causes any loss of generality. Let us introduce now the equilibrium condition between money demand and supply (9) and the equilibrium condition on the market for the final consumption good (10).

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[10] With $m\, r_L^{-\lambda} r_B^{\lambda} > 1$, we get $\mu=1$, i.e. the firm is financing its investments only with bank credit, then we have $\varepsilon_{\mu,L} = 0$, and (5) becomes the following:
$p(\partial y/\partial k)[1 + 1/n\varepsilon_{DP}] = 1 + r_L[1 + 1/(n\varepsilon_{SL})]$.

[11] According to this consideration, there should be also a contribution of the industry output to the income of the public sector, through the interest rate on the state bonds. Since the interest rate on the bonds is endogenous, there shoud be a

$$D^H(\overset{+}{pY},\ \overset{-}{r_B})\ - BM/q(\overset{-}{r_L},\ \overset{-}{r_B}) = 0\ \ = f_5\,(r_L,\ r_B,\ BM). \tag{9}$$

$$C(\cdot)p^{-1/\beta}\ r_B{}^{-\gamma/\beta} - Nak^{\alpha}\ l^{*1-\alpha} = 0 = f_4\,(p,\ k,\ r_B\,), \tag{10}$$

$D^H(\cdot)$ is the households' demand for deposits, $q(\cdot)$ the reserves e reserve (i.e. the sum of reserve requirements and free reserves) of the banking system, $C = [L(\cdot)^{\psi}]^{\ 1/\beta}$ is obtained by a simple algebraic manipulation of (4), $Y = Nak^{\alpha}l^{*1-\alpha}$ is the output produced by all the existing production units (being fixed in the short run the quantity of labour l). Since the equilibrium conditions on the money and bond markets are linearly dependent, we only consider equation (8).

3.2 A comparative statics analysis of the implications of a change in the degree of concentration in the industrial sector

Let us assume, as usual in financial sector models, that in the excess demand functions for financial assets the partial derivatives with respect to the own interest rates are larger (in absolute value) than the derivatives with respect to alternative interest rates. We get the following system, where F is the matrix at the left-hand side of the equality:

$$\begin{bmatrix} \frac{\partial f_1}{\partial p} & \frac{\partial f_1}{\partial k} & \frac{\partial f_1}{\partial r_L} & \frac{\partial f_1}{\partial r_B} \\ 0 & \frac{\partial f_2}{\partial k} & \frac{\partial f_2}{\partial r_L} & \frac{\partial f_2}{\partial r_B} \\ \frac{\partial f_3}{\partial p} & \frac{\partial f_3}{\partial k} & \frac{\partial f_3}{\partial r_L} & \frac{\partial f_3}{\partial r_B} \\ \frac{\partial f_4}{\partial p} & \frac{\partial f_4}{\partial k} & 0 & \frac{\partial f_4}{\partial r_B} \end{bmatrix} \begin{bmatrix} dp \\ dk \\ dr_L \\ dr_B \end{bmatrix} = \begin{bmatrix} 0 & -\frac{\partial f_1}{\partial n} \\ \frac{\partial S}{\partial BM} & 0 \\ -1 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} dBM \\ dn \end{bmatrix} \tag{11}$$

On the basis of the above-mentioned assumptions we get the following sign pattern:

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monetary feedback of the interest rates on the households disposable income and on the firms' profits. We assume here that this moetary feedback is negligible.

[12] In particular, by defining $\varsigma(pY)$ that part of households' disposable income generated by the industry output, saved and then invested in bonds, we may assume, without loss of generality, the following relation:

$B^H(.) = W^* + \varsigma(pY) - D^H(r_B, (pY))$.

Even here there is a causal link between the output produced by the industry the disposable income and its allocation. In particular, pY affects $B^H(.)$ both negatively (through the transactional motivation in the demand for money) and positively (through its influence on the aggregate level of savings). We assume (consistently with the earlier mentioned assumptions on the demand for the final consumption good) that the former effect prevails on the latter.

[13] In order to have the signs indicated in equation (8), on the basis of the definition of wealth (and reminding tha wealth is given in the model) $W^* + \varsigma(pY) = D(.) + B^H(.) - L^{b-H}(.)$, the following conditions are assumed to apply:

$\partial r_H / \partial r_B = 1;\ \ |\partial D(.)/\partial r_B| > |\partial L^{b-H}/\partial r_B|$

$$\begin{bmatrix} + & - & - & ? \\ 0 & + & - & + \\ - & - & - & + \\ - & - & 0 & - \end{bmatrix}$$

The element $\partial f_1/\partial r_B$ in matrix F has an uncertain sign. It is positive for high values of μ, (i.e. for values of r_B sufficiently higher than r_L): in particular, the smaller is μ, the larger must be the difference r_B - r_L in order the inequality $\partial f_1/\partial r_B$ >0 is satisfied. Two benchmark cases seem to appear here, i.e. when $\partial f_1/\partial r_B$ is positive (μ high) and negative (μ low), which will be defined respectively **"case A"** and **"case B"**. To these two we should actually add one more particular case, where the firms entirely finance their investments through bank credit and the elasticity of μ with respect to bank credit is null.

In order to study the implications of an exogenous change in the industrial sector market structure we will focus our attention on the case where the monetary policy does not show any perverse effect, i.e. when *dk/dBM>0* (an expansionary operation does not cause a reduction in the investments).

Endogenizing the composition of the firms' liabilities makes the model rather complex and requires some restrictions (shown and discussed in the Appendix). The intuitive meaning of these restrictions is the following: since the industrial firms are able to switch from very high to very low values of μ as a reaction (for instance) to a monetary negative shock, they will tend to avoid the effects of monetary policy by borrowing on the market (and at the interest rate) less reactive to the monetary shock. This generates a monetary feedback of opposite sign with respect to the initial monetary policy operation, and the restrictions only requires that this particular monetary feedback be smaller (in absolute value) than the initial monetary policy operation that generates it. The restrictions are therefore rather general. When the monetary policy multiplier is positive (i.e. when inequalities (16) to (19), shown and discussed in the appendix, are satisfied), we get the following results:

$dk/dn>0;$ (12)

$dp/dn<0,$ (13)

i.e. a reduction in the degree of concentration in the industrial sector increases, *ceteris paribus*, the equilibrium level of investments and reduces the price of the goods, while the effect on the interest rates is more ambiguous[14], and so is the effect on the monetary policy multiplier *dk/dBM*. Formally we have:

$$d(dk/dBM)/dn = [(1/det(F)] \cdot [(dD_1/dn) - (d(det(F)/dn) \cdot dk/dBM] = QD + Q\Delta . \qquad (14)$$

[14] In particular, dr_L/dn is composed by 3 positive terms and 1 negative term, while dr_B/dn is composed by 2 negative terms and 1 positive term.

where $QD = [(1/det(F)] \cdot (dD_I/dn)$; and $Q\Delta = [(1/det(F)] [- (d(det(F)/dn) \cdot dk/dBM]$.

QD may be interpreted as the impact that changes in the money base have on the modified conditions of competition; the latter "spread" their effects not only through the goods market, but also through the financial markets. In other words, QD may be interpreted as the "direct" impact that an exogenous increase in n has primarily on the "sensitiveness" of the firm's first order conditions with respect to the interest rate r_L (i.e. on the "curvature" of f_1), and secondarily (through a monetary feedback involving the partial derivatives with respect to the interest rates in both the credit market, described by f_2, and the security market, described by f_3), on the goods market.

The term $Q\Delta$ may be interpreted as the effect determined by an exogenous modification in n, "*for a given value of the multiplier dk/dBM*, through all the variables (k, r_L, r_B) appearing in the bank credit market.

While $det(F)$ and dk/dBM are positive in the case of monetary policy without perverse effects, the terms dD_I/dn and $d(det(F))/dn$ show ambiguous signs. However it is possible to make a few points on the various effects that contribute to determine (14). In particular, QD (composed by 4 negative elements and 3 positive elements when μ elasticity with respect to the bank loans interest rate is equal to $-\lambda$) is positive when $\mu = 1$ (investments entirely financed by banks). This means that QD is positive in the extreme case of "non- substitutability" of bank credit for industrial firms (which might be interpreted as an "*extreme credit view case*" where $\mu=1$ and $\varepsilon_{\mu L}=0$).

Furthermore, dD_I/dn (and, as a consequence, QD) will be larger (and more likely to be positive) the smaller is the demand elasticity ε_{DP} and will be smaller (and more likely to be negative) the smaller is the sum "$\varepsilon_{SL} - \varepsilon_{\mu L}$" (positive since it is composed by two positive addends in absolute value), i.e. the more anelastic is the goods market with respect to the bank credit market (having defined the rigidity of the latter as the sum of ε_{SL} and $\varepsilon_{\mu L}$).

When μ changes, on the other hand $(d(det(F))/dn)$ is constant while (dk/dBM) (always composed by 5 positive elements and 1 negative element) may show modifications of relatively small magnitude[15].

[15] In particular, when μ changes, the two terms containing the derivative $\partial f_1/\partial r_B$ change sign in opposite directions.

4. Concluding remarks

These last years have witnessed a significant increase in the number and relevance of mergers and acquisitions in relevant sectors (such as telecommunications and high technology) of many EMU countries.

The theoretical model introduced here shows how an exogenous modification in the degree of concentration in the industrial sector affects:

a) the equilibrium level of investments and the price of the good produced by the "concentrated" industrial sector;

b) the transmission mechanism of the monetary policy with composite effects that, in spite of their complexity, may be decomposed into precise elements with a specific economic interpretation.

Another purpose of the present analysis was to present a first simplified framework to study the interactions between market power of industrial firms on the credit market and endogeneity of their financial structure in terms of recourse to bank credit or securities. For this reason one of the main assumptions of the model is the existence of the "credit channel" of monetary shocks transmission[16]. In this regard, this work is close, at least in spirit to the "credit view", even though the assumption of substitutability between bank credit and securities for the industrial firms allows us to identify here a more general framework where the exclusive recourse to bank credit or securities constitute two extreme benchmark cases. The endogeneity in the composition of external finance for industrial firms also allows to formalise (although in simple one-period context) a situation of simultaneity between financial and investment decisions for the firms.

Appendix

Model restrictions

In the model it is assumed that monetary policy has no perverse effects, i.e. the monetary policy multiplier is positive. Formally we have:

$$dk/dBM = [(1/det(F)]\cdot\{(\partial S(\cdot)/\partial BM)\cdot[(\partial f_1/\partial p)\cdot(\partial f_3/\partial r_L)\cdot(\partial f_4/\partial r_B) + (\partial f_1/\partial r_L)\cdot(\partial f_3/\partial r_B)\cdot$$
$$\cdot(\partial f_4/\partial p)] +-(\partial f_1/\partial r_B)\cdot(\partial f_3/\partial r_L)\cdot(\partial f_4/\partial p) - (\partial f_1/\partial r_L)\cdot(\partial f_3/\partial p)\cdot(\partial f_4/\partial r_B) +$$
$$+ [(\partial f_1/\partial p)\cdot(\partial f_2/\partial r_L)\cdot(\partial f_4/\partial r_B) + (\partial f_1/\partial r_L)\cdot(\partial f_2/\partial r_B)\cdot(\partial f_4/\partial p) - (\partial f_1/\partial r_L)\cdot(\partial f_2/\partial r_B)\cdot$$
$$\cdot(\partial f_4/\partial p)]\} = [(1/det(F)]\cdot D_1 > 0 \qquad (15)$$

where

[16] In this regard we employ here a more extended definition of monetary shock than the one commonly used by Bernanke and Blinder (1988, 1992) and closer to the one used by Friedman and Kuttner (1993), who consider not only the "monetary policy shocks", but any exogenous and/or unpredictable change that may take place in the monetary sector of the economy.

$$D_1 = \{(\partial S(\cdot)/\partial BM) \cdot [(\partial f_1/\partial p) \cdot (\partial f_3/\partial r_L) \cdot (\partial f_4/\partial r_B) + (\partial f_1/\partial r_L) \cdot (\partial f_3/\partial r_B) \cdot (\partial f_4/\partial p)] +$$
$$-(\partial f_1/\partial r_B) \cdot (\partial f_3/\partial r_L) \cdot (\partial f_4/\partial p) - (\partial f_1/\partial r_L) \cdot (\partial f_3/\partial p) \cdot (\partial f_4/\partial r_B) +$$
$$+ [(\partial f_1/\partial p) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_4/\partial r_B) + (\partial f_1/\partial r_L) \cdot (\partial f_2/\partial r_B) \cdot (\partial f_4/\partial p) - (\partial f_1/\partial r_L) \cdot (\partial f_2/\partial r_B) \cdot$$
$$\cdot (\partial f_4/\partial p)]\}$$

The conditions that satisfy (15) are rather general in terms of relative magnitude of the elements composing $det(F)$ and D_1 .

D_1 is composed (both in case "A" and in case "B") by 5 positive elements and one negative element only. In particular we will have $D_1 > 0$ when when the following conditions (16) (for "case A" with μ high) and (17) (for "case B" with μ low)

$$\{(\partial S(\cdot)/\partial BM) \cdot [(\partial f_1/\partial p) \cdot (\partial f_3/\partial r_L) \cdot (\partial f_4/\partial r_B) + (\partial f_1/\partial r_L) \cdot (\partial f_3/\partial r_B) \cdot (\partial f_4/\partial p)] +$$
$$-(\partial f_1/\partial r_B) \cdot (\partial f_3/\partial r_L) \cdot (\partial f_4/\partial p) - (\partial f_1/\partial r_L) \cdot (\partial f_3/\partial p) \cdot (\partial f_4/\partial r_B) +$$
$$+ [(\partial f_1/\partial p) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_4/\partial r_B)]\} > | (\partial S(\cdot)/\partial BM) (\partial f_1/\partial r_L) \cdot (\partial f_2/\partial r_B) \cdot (\partial f_4/\partial p) | \qquad (16)$$

$$\{(\partial S(\cdot)/\partial BM) \cdot [(\partial f_1/\partial p) \cdot (\partial f_3/\partial r_L) \cdot (\partial f_4/\partial r_B) + (\partial f_1/\partial r_L) \cdot (\partial f_3/\partial r_B) \cdot (\partial f_4/\partial p)] +$$
$$-(\partial f_1/\partial r_L) \cdot (\partial f_3/\partial p) \cdot (\partial f_4/\partial r_B) + [(\partial f_1/\partial p) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_4/\partial r_B) + (\partial f_1/\partial r_L) \cdot (\partial f_2/\partial r_B) \cdot (\partial f_4/\partial p)]\} >$$
$$| (\partial S(\cdot)/\partial BM) (\partial f_1/\partial r_B) \cdot (\partial f_3/\partial r_L) \cdot (\partial f_4/\partial p) | \qquad (17)$$

(16) is not a very restrictive condition, since one can easily show that $(\partial f_1/\partial r_L)$ tends to zero when μ is very large and close to one.. Even (17), is not a very restrictive condition, unless one assumes an abnormously large magnitude of $(\partial f_1/\partial r_B)$ with respect to $(\partial f_1/\partial p)$ and, more in general, with respect to the other partial derivatives that compose the five positive terms on the left-hand side of (17).

For the sake of the model discussion, $det(F)$ is composed, when μ is big (in "case A"), by 9 positive elements and 5 negative elements, and, when μ is low (i.e. in "case B"), by 10 positive elements and 4 negative elements. In particular, $det(F)$ will be positive when the two following conditions are satisfied (for "case A" and "case B" respectively)

$$(\partial f_4/\partial p)[(\partial f_1/\partial k) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial r_B) + (\partial f_1/\partial r_L) \cdot (\partial f_2/\partial r_B) \cdot (\partial f_3/\partial k) +$$
$$- (\partial f_1/\partial r_L) \cdot (\partial f_2/\partial k) \cdot (\partial f_3 \partial r_B)] + (\partial f_4/\partial k)[(\partial f_1/\partial p) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial r_B) + - (\partial f_1/\partial r_B) \cdot$$
$$\cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial p)] + (\partial f_4/\partial r_B) [(\partial f_1/\partial p) \cdot (\partial f_2/\partial k) \cdot (\partial f_3/\partial r_L) + (\partial f_1/\partial k) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial p) +$$
$$- (\partial f_1/\partial r_L) \cdot (\partial f_2/\partial k) \cdot (\partial f_3/\partial p) - (\partial f_1/\partial p) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial k)] >$$

$$> | (\partial f_4/\partial k) | \cdot [|(\partial f_1/\partial p) \cdot (\partial f_2/\partial r_B) \cdot (\partial f_3/\partial r_L)| + | (\partial f_1/\partial r_L) \cdot (\partial f_2/\partial r_B) \cdot (\partial f_3/\partial p)| +$$
$$|(\partial f_4/\partial p)| [| (\partial f_1/\partial r_B) \cdot (\partial f_2/\partial k) \cdot (\partial f_3/\partial r_L)| + |(\partial f_1/\partial r_B) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial k)| + | (\partial f_1/\partial k) \cdot$$
$$\cdot (\partial f_2/\partial r_B) \cdot (\partial f_3/\partial r_L)]. \qquad (18)$$

$$(\partial f_4/\partial p)[(\partial f_1/\partial k) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial r_B) + (\partial f_1/\partial r_L) \cdot (\partial f_2/\partial r_B) \cdot (\partial f_3/\partial k) +$$
$$+ (\partial f_1/\partial r_B) \cdot (\partial f_2/\partial k) \cdot (\partial f_3/\partial r_L) - (\partial f_1/\partial r_B) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial k) +$$
$$- (\partial f_1/\partial r_L) \cdot (\partial f_2/\partial k) \cdot (\partial f_3 \partial r_B)] + (\partial f_4/\partial k)[(\partial f_1/\partial p) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial r_B)] + (\partial f_4/\partial r_B) [(\partial f_1/\partial p) \cdot$$
$$\cdot (\partial f_2/\partial k) \cdot (\partial f_3/\partial r_L) + (\partial f_1/\partial k) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial p) - (\partial f_1/\partial r_L) \cdot$$
$$\cdot (\partial f_2/\partial k) \cdot (\partial f_3/\partial p) - (\partial f_1/\partial p) \cdot (\partial f_2/\partial r_L) \cdot (\partial f_3/\partial k)] >$$

$$> |\,(\partial f_4/\partial k)\,| \cdot [\,|(\partial f_1/\partial p)\cdot(\partial f_2/\partial r_B)\cdot(\partial f_3/\partial r_L)| + |\,(\partial f_1/\partial r_L)\cdot(\partial f_2/\partial r_B)\cdot(\partial f_3/\partial p)| + |-(\partial f_1/\partial r_B)\cdot$$
$$\cdot(\partial f_2/\partial r_L)\cdot(\partial f_3/\partial p)\,| + |(\partial f_4/\partial p)| \cdot |\,(\partial f_1/\partial k)\cdot(\partial f_2/\partial r_B)\cdot(\partial f_3/\partial r_L)]. \qquad (19)$$

The case where $det(F)<0$ and $D_1<0$ would correspond to a positive monetary policy multiplier dk/dBM, but with abnormal values and magnitudes for the partial derivatives of the implicit functions that constitute the negative terms in $det(F)$ and D_1. This case has not been taken into consideration because it would have been associated to the paradoxical situation where the nominal monetary policy multiplier does not show any perverse effects, due to the composite effects of two perverse effects.

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