Industrial Firms' Market Power and Credit Market Oligopsony in "Bank-Oriented" Financial Systems

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July, 2003

ABSTRACT

The theoretical model presented here describes the interaction between a concentrated industrial sector and a perfectly competitive and "bank-oriented" financial system. It is shown that an exogenous modification in the degree of concentration in the industrial sector (possibly caused by mergers) does not only affects the equilibrium level of investments and interest rates, but also the transmission mechanism of the monetary policy with composite effects that vary with the level of output and depend on the price demand elasticity and on the elasticity of the credit supply with respect to the lending rate.

Keywords: money supply; credit; money multipliers; industrial organization and macroeconomics; macroeconomic industrial structure.

JEL Classification: E51, L16.

* I am grateful to Alan Roe, Neil Rankin and Keith Cowling for helpful discussions. All mistakes are mine.

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1. Introduction

The increasing openness in financial markets has, in many cases, created incentives for mergers and acquisitions. The reasons for this are twofold: multinational corporations may implement acquisition policies of local companies in order to enter local markets and local companies might have incentives to merge in order to discourage potential entry and face competition by large international corporations. When this determines a situation of oligopoly on the goods market, industrial firms might use their market power even on the credit market, to the extent that in many "bank oriented" financial sectors (specially in developing countries) stock markets are not fully developed and their macroeconomic size is small compared to the one of the banking system. This kind of institutional configuration of the financial system has also characterized for a long time many Continental European financial systems, at least until the 1990's.[1]

The main purpose of this paper is to show that mergers and acquisitions have a macroeconomic impact not only for what concerns the goods market, but also the financial sectors: in particular, mergers do not only affect the equilibrium values of investments and interest rates, but also the transmission mechanism of monetary policy.

The strategic interaction between lenders and industrial firms has been studied within an industrial economics perspective (Brander and Lewis 1985, Poitervin, 1989a, 1989b, 1990), but not many contributions exist on the macroeconomic implications of industrial firms market power on the credit market. Non surprisingly, the results in the literature on lending market structure mainly depend on the specific assumptions concerning the strategic interactions among the various agents. In the simplest strategic configuration of the oligopolistic version of the Monti-Klein model (developed, for instance, in Freixas e Rochet, 1997) an increase in intensity of competition yields a lower response to monetary policy for what concerns the interest rate on loans and a higher response to monetary policy for what concerns the interest rate on deposits. Some contributions by Vanhoose (1983, 1985) analyse the macroeconomic implications of credit market structure, but these contributions are mainly concerned with the stability of monetary and credit aggregates rather than the interaction between the real and the financial side of the economy. In Mazzoli (2002) the impact of mergers and increases in the degree of market

concentration is analysed in a context where the substitutability between bank credit and securities plays an important role. It is shown there that the substitutability between bank credit and securities creates instability in the transmission mechanism of monetary policy, and that in the extreme benchmark case of an entirely market oriented financial system mergers and acquisitions reduce the short run impact of monetary policy because the firm's market power creates a sort of "filter" on the transmission of monetary shocks to the real sector of the economy.

In this paper we are looking at an entirely "bank oriented" financial system, where funds are only intermediated by the banking system. As we said, this assumption is meant to describe a bank-oriented financial system and its pecularities in the transmission mechanism of monetary policy. However it is shown that mergers (and, more in general, increases in the market power of the industrial firms) still have an impact on real investments and on the transmission mechanism of monetary policy, which depends on the relative degree of rigidity of the goods market and bank lending market. To the extent that the banking sector plays a relevant role for the transmission of monetary shocks, exogenous changes in the credit market structure affect the equilibrium level of investments and the transmission mechanism of monetary policy. In addition, it is argued here that, apart from the effects given by changes in banks' market power (analysed, for instance, in the above-mentioned oligopolistic version of the Monti-Klein model) there are potential effects given by changes in the market power on the "demand side" of bank credit. This paper analyses such "demand side" effects in a "bank oriented" financial system, where funds are intermediated by banks. The next section introduces a model with industrial firms oligopolistic in the goods market and oligopsonistic in the credit market. Section 3 contains some comparative statics and the main results. Section 4 contains some concluding remarks.

2. The model

We introduce here a short run "mesoeconomic"model: it deals with the first impact of monetary policy, and 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 more numerous than the firms and compete between themselves 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 fixed: this could be interpreted as a *ceteris paribus* assumption, or,

[1] In this regard see, for instance, Allen and Gale (2000)

alternatively, we can think of a short run description of the labour market, characterized by long run contracts.[2]

The industrial firms' (henceforth "firms") investments determine the output produced by the industry. In addition, we assume that the model describes an economy with a "banking.-oriented" financial system, as usual in developing countries. One of the main "ingredients" of the model must be a convenient framework allowing us, 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. For this purpose we assume that there are *n* identical firms (each of them owing some of the given N production units, or factories) behaving as oligopsonists *à la Cournot* on the bank credit market. The individual factory's 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). As mentioned before, it is assumed that the overall number *N* of production units 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, and each production unit is a generic Cobb-Douglas. 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 order to let *N/n* vary with continuity, we allow the possibility for the firms to own a portion of a production unit. 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. Each of the factories, or production units, owned by the firms may be represented by a Cobb-Douglas in the following way:

$$y_i = NAk_i^{\alpha}\boldsymbol{\Phi}$$

where the subscript "*i*", which identifies the i-th production unit (or factory), will be ignored in the rest of the paper. For what concerns labour, captured by $\boldsymbol{\Phi}$, for simplicity, as we said, we have introduced here a "*ceteris paribus*" assumption. Introducing labour would not have qualitatively changed the result of the paper, but would have considerably complicated its algebra. The optimisation problem of the representative firm may be described as follows:

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

[2] We might also justify this "*ceteris paribus*" assumption by postulating some form of contract which makes constant the level of employment in the industry in the short run, together with an efficiency wages mechanism which introduces wages rigidity in the short run, like in Greenwald and Stiglitz (1988)

s.t.

$$(N/n)\, k + K' = S(r_L, r_B, BM) \qquad (3)$$

and

$$p = L(pY)^{\psi} Y^{-\beta}, \qquad \text{where } \psi, \beta > 0 \text{ and } Y = Ny = Nak^{\alpha} l^{*1-\alpha}. \qquad (4)$$

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[3] (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) for the final consumption good produced by the industry under consideration, where ψ and β are generic positive parameters. In particular L is a function (assumed to be homogeneous in pY) that captures the causal link existing between the determination of the industry output pY and that part of the households' disposable income spent on the industry's final consumption good. This means that the higher the macroeconomic relevance of the industry under consideration, and the higher the contribution of the industry output in determining the overall disposable income of the economy, the higher will be the value $\partial L(\cdot)/\partial Y$. In other words, the industry output affects 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 through the households' disposable income. The former captures movements along the demand curve, the latter captures shifts of the demand curve, determined by changes in the aggregate households' disposable income and determined by an increase in the industry output. Since this is a short run partial equilibrium model, we assume that in (4) the main impact of Y on p be negative. Constraint (3) represents the macroeconomic equality between credit supply and firms' investments. Having assumed that the firms behave as *Cournot*

[3] Equation (3) may be interpreted as a special case of the function $S(r_L, r_B, BM, E^*(\Delta BM))$, with
$E^*(\Delta BM) = \int E(\Delta BM) dF[E(\Delta BM)] = 0$
and $E^*(\Delta BM) = 0$ *(i.e. unanticipated monetary policy)*. $E^*(\Delta BM)$ 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 the monetary intervention $E^*(\Delta BM)$. Therefore, equation (3) reflects a situation of unanticipated monetary policy.

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:

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

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. This means that we have two potential sources of rigidity in the model, one in the goods market and one in the credit market[4]. It is important to point out that credit market rigidity may act in an opposite direction with respect to the goods market rigidity.

In general, there is no reason to assume that only one of these sources of rigidity should be taken into account since there is no reason to assume that the firms only use their market power in real transactions, and not in the credit market. We can re-write equation (5) as an implicit function:

$$p(\partial y/\partial k)[1 + 1/ n\varepsilon_{DP}] - 1 - r_L [1 + (1 / n\varepsilon_{SL})] = f_1(p, k, r_L, n) = 0 \qquad (6)$$

The rest of the model is composed of the equilibrium conditions in the various asset markets. Since the focus here is on the transmission mechanism of monetary policy, the functions describing demands or supplies for financial assets are indicated without assuming *a priori* a specific analytical form (which, in some cases, might even implicitly introduce a particular propagation patterns for monetary shocks). We believe that this is the most general assumption one can make, since the choice of some analytical form for a utility function of a representative firm or individual (like, for instance, the CRRA), would have entailed a loss of generality in terms of aggregation of potentially heterogeneous agents[5].

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

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[4] Obviously it is also assumed that the marginal revenue is positive, i.e. $(1+ 1/ n\varepsilon_{DP}) \geq 0$, with $n \geq 1$.

[5] A very criticism to the use of a representative agent to model the whole economy is the following: is the utility function of a representative agent a sort of "aggegate utility function", and if so, does it really provide a microfoundation, or does it not rather constitutes a macroeconomic function, indirectly derived from integrating the aggregate consumption function? One could answer that even an "aggregate utility function" allows us to build the aggregate behaviour on some rigorous and consistent axioms of preference, but, in this case, the analytical features of a standard "nicely behaved" utility function, like the CRRA utility function, not only are completely arbitrary, but they are also strongly rejected by a very extended empirical evidence (Benartzi and Thaler, 1995, Kahneman, 1994, Shafir, Diamond and Tversky, 1997) that prooves the existence of the so-called "endowment effect" (stating that once a person comes to possess a good, she immediately values it more than before she possessed it) and "loss aversion" (stating that losses weight more than gains in the utility function), and yield a "kinked utility function" with an analytical form like the following one:

$$v(x) = \begin{cases} x^{\alpha} & \text{if } x \geq 0 \\ -\lambda(-x)^{\beta} & \text{otherwise} \end{cases}$$

where λ is the coefficient of loss aversion, and Kahneman and Tversky (1979) have estimated α and β to be 0.88 and λ to be 2.25.

$$N\,k - S(r_L, r_B, BM) = f_2(r_L, r_B, k, BM) = 0 \qquad (7)$$

(+ on r_L, − on r_B, + on BM)

- Equilibrium on the bonds market:

$$B^b(r_B, r_L) + B^H(r_B) + L^{b\text{-}H}(r_B, r_L) + BM - BT = f_3(r_L, r_B, BM) = 0. \qquad (8)$$

(+ on r_B, − on r_L; + on r_B; + on r_B, − on r_L)

We assume, for simplicity, that the interest rate on deposits is null and the households are also the owners of the banking system[6]. B^b and B^H represent the demand for bonds by the banks and households respectively, BT the (given) amount of public debt[7], $L^{b\text{-}H}$ is an excess demand function of households' liabilities with banks. Given the nature of our short-run "first-impact" model, we assume that there is no feedback from the output produced by the industry to the demand of bonds by the households $B^H(\cdot)$, which amounts to saying that the feedback does exist, but simply does not takes place in the short run[8]. $L^{b\text{-}H}$ 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 risk premium on lending to households, assumed to be constant in the short run[9]. This assumption consists of aggregating the bonds market and the market for bank credit to the households (both of them perfectly competitive) and considerably simplifies the algebra of the model and does not qualitatively change the conclusions.

The balance sheet constraint of the banking sector is:

$$L^b + R + B^b = D$$

where L^b are the total bank loans supply (to firms and households), R the bank reserves, equal to the bonds held by the Central Bank. For the sake of simplicity, the money base BM is equal to the bonds held by the Central Bank, which means that monetary policy is carried out

[6] According to this consideration, there should also be 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 should be a monetary feedback of the interest rates on the households disposable income and on the firms' profits. We assume here that this monetary feedback is negligible.

[7] Industry output in principle contributes to the Public Sector income through the interest rates on state bonds. In addition, since the interest rate on state bonds is endogenous, in principle there could be a monetary feedback of the interest rates on the households disposable income and on the firms' profits. For the sake of simplicity we assume that all these effects and feedbacks are negligible.

[8] In particular, the following balance constraint holds:
$B^H(.) = W^* - D^H(r_B)$.
Where $D^H(r_B)$ are the deposits held by the households

[9] For what concerns equation (8), on the basis of the definition of wealth (note that wealth is given in the model) $W^* = D(.) + B^H(.) - L^{b\text{-}H}(.)$, the following conditions hold:
$\partial r_H / \partial r_B = 1$, which is trivial, since by assumption the two interest rates only differ by the constant h, and
$|\partial D(.)/\partial r_B| > |\partial L^{b\text{-}H}/\partial r_B|$

through open market operations.

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).

$$D^H(\bar{r}_B) - BM/q(\bar{r}_L, \bar{r}_B) = 0 \quad = f_5(r_L, r_B, BM). \tag{9}$$

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

$D^H(\cdot)$ is the households' demand for deposits, $q(\cdot)$ the total reserves (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), and $Y = Nak^{\alpha}l^{*1-\alpha}$ is the output produced by all the existing production units (the quantity of labour l being fixed in the short run). Since the equilibrium conditions on the money and bond markets are linearly dependent, we only consider equation (8).

3. Comparative statics and main results

Let us assume, as is 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:

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

Since this is a short-run model, for what concerns monetary policy, we get, as expected:

$dk/dBM>0;\ dr_L/dBM<0;\ dr_B/dBM<0.$

For what concerns the effects of an exogenous change in market structure, we get:

$dk/dn>0;\quad dr_L/dn>0;\quad dr_B/dn>0.$

In other words, an increase in the degree of competition (reduction in the degree of concentration) in the industrial sector increases, *ceteris paribus*, the demand for capital and, as a consequence, the equilibrium level of investments and interest rates. This means that mergers negatively affect economic activity. This result (not particularly surprising) recalls some of the typical arguments in the debate on competition policies and antitrust regulation. However, it might be interesting to note that mergers impact on economic activity also for a fixed number of production units and without information asymmetries between banks and firms. In this regard, it would be rather straightforward to show that stochastic fluctuations in the economic activity could simply be generated by assuming that the number of owners "*n*" of the given production units be stochastic instead of being exogenous.

Let us focus our attention on the monetary policy multiplier

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

$$= [(1/det(F)] \cdot D_1 \qquad (15)$$

where

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

The question is now whether and how exogenous changes in the market structure affect the transmission mechanism of monetary policy. To answer this, we can simply take the derivative of (15) with respect to "*n*", which yields the following:

$$d(dk/dBM)/dn = [(1/det(F)] \cdot [(dD_1/dn) - (d(det(F)/dn) \cdot dk/dBM] = QD + Q\Delta \quad (16)$$

where $QD = [(1/det(F)] \cdot (dD_1/dn)$; and $Q\Delta = [(1/det(F)] [- (d(det(F)/dn) \cdot dk/dBM]$.

QD may be interpreted as the impact that an exogenous change in the market structure induces *on the money multiplier,* and is always negative. This means, for what concerns *QD*, that an increase in the degree of competition makes our (short run) model closer to the perfect competition case with money neutrality. *Q*Δ may be interpreted as the effect determined by an exogenous modification in *n*, "*for a given value of the multiplier dk/dBM*, and its sign is ambiguous. However, its negative terms will be larger in absolute value the larger $|\varepsilon_{SL}|$ is compared to $|\varepsilon_{DP}|$, the higher the marginal productivity of physical capital is and the more concave is the firms' production function is.

4. Concluding remarks

The theoretical model introduced here shows that in a "bank oriented" financial system an

exogenous increase in the degree of competition (reduction in the degree of concentration) in the industrial sector affects:

a) positively the equilibrium level of investments in the "concentrated" industrial sector;

b) the transmission mechanism of the monetary policy with composite effects wich depend on the price elasticity of the demand for the good produced in the industry under consideration and on the credit supply elasticity with respect to the lending rate. In other words, since the rigidities on the goods market and on the credit market act in different directions, when the rigidity on the goods market prevails, an increase in the degree of competition approaches a situation of higher competition, which would yield less effective monetary policy within a general equilibrium context. Mergers and acquisitions tend to reduce the level of economic activity and are to be considered among the factors conditioning the transmission mechanism of monetary policy in bank-oriented financial systems.

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