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A discussion of joint bank and industry concentration

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Abstract: This article examines bank and industry concentration jointly within the static framework of Cournot competition. The general equilibrium is one in which banks form a multiplant monopoly and firm profit is zero. This is an unstable equilibrium because: (A) Firms have an incentive to (i) collude to "fight banks back" in the context of bilateral monopoly bargaining, and/or (ii) modernize their business towards financial independence; (B) Banks' best response is (i) innovation too, combined with (ii) disciplinary credit rationing.

JEL Classifications: D43, G21, L22, O31

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1. Introduction

Nowadays, most of bank lending is towards small and medium sized enterprises (SMEs), (Mullineux, 2013). It is a *konjunktur* which has also been witnessing expanding market power in the banking sector as, for instance, Table 1 reports concerning the course of the total assets of the five largest credit institutions in European Union between 2012 and 2016. Should one expect a corresponding restructuring of the borrowing SMEs towards companies of larger size, capable of negotiating with the lending banks better? And, what should one expect in terms of these firms' profitability if such a restructuring does not take place? These are the two main questions that motivate this article. SMEs are the backbone of modern social economies. According to the European Commission Executive Agency for Small and Medium-sized Enterprises, 99% of European businesses are SMEs and nine out of ten are firms with less than 10 employees. Consequently, any changes in the structure, conduct, and performance of SMEs induced by the monopolization of the bank sector, would have significant social and political repercussions as well.

Analytically, the issue under investigation is approached within the framework of Cournot competition. One convenient feature of this framework is that the continuum of market structures, from perfect competition to monopoly, is captured by the number of firms. This article investigates the market outcome of Cournot firms borrowing from Cournot banks. The main result of this competition is an equilibrium at which the banking system acts as a multiplant monopolist, zeroing firms profit unless firms collude and place the overall interaction in the context of bilateral monopoly. It is a result that can be made relevant to reality if assessed in terms of tendencies in banking and industry. For example, Phan (2015) reports that banks in emerging Asian countries try to increase their size. This article predicts that this is one reason why firms in the region should seek ways to become larger too, *ceteris paribus*. This is the principal result of the joint analysis of bank and

industry concentration in an elementary static framework. Nevertheless, even such a rudimentary discussion of the subject is absent from the literature despite its voluminous contribution to the matters of bank concentration and industry concentration by themselves.

TABLE 1. TOTAL ASSETS OF FIVE LARGEST CREDIT INSTITUTIONS IN EU

	2012	2013	2014	2015	2016
Belgium	66.3	64.0	65.8	65.5	66.2
Bulgaria	50.4	49.9	55.0	57.6	58.0
Czech Republic	61.5	62.8	61.3	63.3	64.7
Denmark	65.6	68.4	68.1	67.8	68.3
Germany	33.0	30.6	32.1	30.6	31.4
Estonia	89.6	89.7	89.9	88.6	88.0
Ireland	46.4	47.8	47.6	45.9	44.3
Greece	79.5	94.0	94.1	95.2	97.3
Croatia	73.9	72.9	72.3	72.7	73.0
Spain	51.4	54.4	58.3	60.2	61.8
France	44.6	46.7	47.6	47.2	46.0
Italy	39.7	39.6	41.0	41.0	43.0
Cyprus	62.6	64.1	63.4	67.5	65.7
Latvia	64.1	64.1	63.6	64.5	66.5
Lithuania	83.6	87.1	85.7	86.8	87.1
Luxembourg	33.1	33.7	32.0	31.3	27.6
Hungary	54.0	51.9	52.5	53.3	53.4
Malta	74.4	76.5	81.5	81.3	80.2
Netherlands	82.1	83.8	85.0	84.6	84.7
Austria	36.5	36.7	36.8	35.8	34.5
Poland	44.4	45.2	48.3	48.6	47.7
Portugal	69.9	70.3	69.2	72.3	71.2
Romania	54.7	54.4	54.2	57.4	59.1
Slovenia	58.4	57.1	55.6	59.2	61.0
Slovakia	70.7	70.3	70.7	72.3	72.7
Finland	79.0	84.1	79.8	75.0	66.5
Sweden	57.4	58.3	58.5	57.8	56.3
United Kingdom	42.8	43.7	38.9	37.0	35.5

Note: European Central Bank (2018).

One of the reasons for this lack of attention to the topic under examination might be the weakening of bank borrowing as a source of business finance. This is true. Table 2 reports the percentage of firms relying on bank lending worldwide in 2016. But, there is also a "shadow": "web of specialized financial institutions that conduct credit, maturity, and liquidity transformation... intertwined with the operations of core regulated institutions such as bank holding companies" (Adrian & Ashcraft, 2012). And, Table 2 says nothing about this "shadow" bank lending. Neither this article does, since adding in the calculations a coefficient reflecting the fact that a fraction only of business finance comes out of bank borrowing, does not change in the least the conclusion that banks individually and as a sector behave as an economic "hit man" (James, 2016). If left the system alone, its monopolization is innate in its operation.

TABLE 2. PERCENT OF FIRMS USING BANKS TO FINANCE INVESTMENT AND WORKING CAPITAL IN 2016

	Investment	Working Capital
Middle East & North Africa	25.4	24.7
Sub-Saharan Africa	21.3	23.7
Latin America & Caribbean	32.9	42.1
Least developed countries: UN classification	17.8	22.2
European Union	26.7	32.4
World	25.3	30.4

Source: World Bank (2018).

In a dynamic context, cost-reducing innovation on the part of firms instead of collusion, innovation enabling self-financing, is another means of defense against bank aggression. The bank has a similar innovation motive to neutralize the move of firms towards financial independence. Biform game theory informs us that the bank should also be using the threat of undersupply of credit credibly if it wants to have the upper hand in its deals with its borrowers. Such credibility translates to credit rationing practices that are otherwise unjustifiable. The result is instability triggered by the financial sector a la Hyman with a Schumpeterian flavor (Knell, 2015). It is a conclusion corroborated by this article too, though indirectly since the analysis is static. This analysis is undertaken in the next section and suffices to do justice to all those negative epithets ascribed to banking. The paper concludes with still another section expanding on policy considerations.

2. Formal theoretical considerations

Suppose that firms compete in terms of quantity produced, q, which is financed through bank loans, L, so that $q = \varphi(L)$ as in Freixas & Rochet (2008). Let the marginal revenue of the nth borrowing firm be:

$$p + q_n \frac{dp}{dq_n} = p + f_n Q \frac{dp}{dQ} \tag{1}$$

where $n = 1,2, \dots, N$, p is the price of the product, Q is its total quantity in the market, and

$$f_n \equiv \frac{dQ/Q}{dq_n/q_n}$$

is the response of Q to a change in the output of the nth firm, q_n, as perceived by this firm (Toolsema, 2003). That is, $f_n \in [0,1]$ is the conjectural variation elasticity, taking on the value 0 under perfect competition and the value 1 in the case of monopoly. Assuming for simplicity that $Q = \theta L^e$, where θ is some positive constant and where the coefficient e is less than 1, and postulating a total output demand curve, $p = A - \vartheta Q^{\varepsilon}$, (1) becomes

$$A - \vartheta Q^{\varepsilon} + f_n(\theta L^e)(-\varepsilon \vartheta Q^{\varepsilon-1}) = A - \vartheta(\theta L^e)^{\varepsilon} - f_n \varepsilon \vartheta \theta^{\varepsilon} L^{e\varepsilon} \qquad (1')$$
$$= A - \vartheta \theta^{\varepsilon} L^{e\varepsilon}\,(1 + \varepsilon f_n)$$

where $L = \sum_1^N L_n$. Industry production is subject to diminishing marginal returns while the demand curve is more or less a general one from the point of view that its negative slope may be increasing, constant, or decreasing absolutely depending on whether the exponent $\varepsilon > 1, \varepsilon = 1,$ or $\varepsilon < 1$, respectively. A is presumably some positive constant, which is at least as great as the marginal cost that applies, of course, to borrowing. Since total cost is $(1 + r_L)L_n$, marginal and average cost will be $(1 + r_L)$, where r_L is the lending interest rate. It follows that letting $L = L_n + L_{-n}$, individual profit is maximized when

$$A - \vartheta \theta^{\varepsilon}(L_n + L_{-n})^{e\varepsilon}\,(1 + \varepsilon f_n) - (1 + r_L) = 0 \qquad (2)$$

Solving it for L_n yields the loan demand curve,

$$L_n = \left[\frac{A - (1 + r_L)}{\vartheta \theta^{\varepsilon}(1 + \varepsilon f_n)}\right]^{\frac{1}{e\varepsilon}} - L_{-n} \qquad (3)$$

or, in inverse form,

$$r_L = A - 1 - \vartheta \theta^{\varepsilon} L^{e\varepsilon}\,(1 + \varepsilon f_n) \qquad (4)$$

The individual demand for loans depends inversely on the individual conjectural variation elasticity. This is reasonable at the firm-specific level but note that the industry-wide demand for loans, L, which is equal to the bracketed term in (3), depends on f_n, too: Each firm sees what is "good" for the whole sector from its own point of view, which, of course, is reasonable when the industry is not at its Cournot-Nash equilibrium.

Next, consider the ith bank's marginal revenue,

$$r_L + L_i \frac{dr_L}{dL_i} = r_L + b_i L \frac{dr_L}{dL} \tag{5}$$

where $b_i \in [0,1]$ is the conjectural variation elasticity, and $i = 1,2,\dots,I$. Differentiating (4) with respect to L and inserting the result in (5), the marginal revenue becomes,

$$\begin{aligned} & r_L - b_i L[\vartheta\theta^{\varepsilon}(1+\varepsilon f_n)e\varepsilon L^{e\varepsilon-1}] \\ & = A - 1 - \vartheta\theta^{\varepsilon}L^{e\varepsilon}\,(1+\varepsilon f_n)(1+e\varepsilon b_i) \end{aligned} \tag{5'}$$

given that r_L is as in (4). Assuming a constant marginal cost γ_i, profit is maximized when

$$A - 1 - \vartheta\theta^{\varepsilon}L^{e\varepsilon}\,(1+\varepsilon f_n)(1+e\varepsilon b_i) - \gamma_i = 0 \tag{6}$$

which in turn implies that the total loan demand that the ith bank considers optimal for the banking sector when this sector is not at its Cournot-Nash equilibrium, is

$$L = \left[\frac{A - 1 - \gamma_i}{\vartheta\theta^{\varepsilon}(1+\varepsilon f_n)(1+e\varepsilon b_i)}\right]^{\frac{1}{e\varepsilon}} \tag{7}$$

and, of course, is as subjective as (3) is on the part of firms. Equating the bracketed term of (3) with (8), one obtains the equilibrium lending rate,

$$r_L^* = \frac{\gamma_i}{(1+e\varepsilon b_i)} \tag{8}$$

which since it has to be equal to

$$r_L^* = \frac{\gamma_j}{(1+e\varepsilon b_j)}$$

too, leads to the condition that at equilibrium,

$$\frac{\gamma_i}{\gamma_j} = \frac{1 + e\varepsilon b_i}{1 + e\varepsilon b_j} \tag{9}$$

where $j \neq i, j = 1,2, \ldots, M$. Setting (8) in (3) yields that

$$L^* = \left[\frac{(A-1)(1+e\varepsilon b_i) - \gamma_i}{\vartheta\theta^{\varepsilon}(1+\varepsilon f_n)(1+e\varepsilon b_i)}\right]^{\frac{1}{e\varepsilon}} \tag{10}$$

Equating (10) with (7), one obtains that,

$$(A-1)e\varepsilon b_i = 0$$

which is true since at equilibrium $b_i = 0$. Therefore, condition (10) becomes, $\gamma_i = \gamma_j$, which prompts the first major conclusion of this paper that profit maximization in the banking sector occurs if this sector operates as a multiplant monopoly. Also, (8) and (10) become,

$$r_L^* = \gamma_i \tag{8'}$$

and

$$L^* = \left[\frac{A - 1 - \gamma_i}{\vartheta\theta^{\varepsilon}(1+\varepsilon f_n)}\right]^{\frac{1}{e\varepsilon}} \tag{10'}$$

Now, integrating the left-hand side of (2) with respect to L_n, the following profit function is obtained:

$$\Pi_n = AL_n - \vartheta\theta^{\varepsilon}\,(1+\varepsilon f_n)\frac{(L_n + L_{-n})^{1+e\varepsilon}}{1+e\varepsilon} - (1+r_L)L_n + ct_n \tag{11}$$

where ct is the constant of the integration. Ignoring for simplicity this constant, inserting (8') and (10') in (11), and noting that at equilibrium, $q_n = Q/N$ and hence, $L_n = L/N$, yields

$$\Pi_n = \frac{(A-1-\gamma_i)^{\frac{1+e\varepsilon}{e\varepsilon}}}{[\vartheta\theta^{\varepsilon}(1+\varepsilon f_n)]^{\frac{1}{e\varepsilon}}}\left[\frac{1+e\varepsilon-N}{N(1+e\varepsilon)}\right] \tag{11'}$$

Since the values of e and ε are such that $1+e\varepsilon-N<0$ for $N>1$, since $A-1-\gamma_i \geq 0$ by assumption, and since profit cannot be negative, its only sensible value is zero under such bank pricing that $A=1+\gamma_i$: That is, if the firm is not a monopolist, the maximum profit the borrowing firm can reach is zero independently of market structure, which is the second major conclusion of this paper. Put the two conclusions together, the overall picture is one predicted by standard microeconomic theory. Regardless the market structure of the banking system, what is optimal for it is to collude and act as a multiplant monopoly targeting the appropriation of the profits of the borrowing firms and of all the surplus of bank clients as consumers of its product when they cannot collude too, to form a monopsony and bargain lending terms in a bilateral monopoly fashion.

Under these circumstances, what should the independent firm do in a dynamic context? The answer appears to be, borrowing today enough to adjust in the market towards shelf-financing tomorrow. There will be market adjustment if the supply of and/or demand for the firm's product are handled differently next period. This, in turn, will be the case only if the forces addressed by the technology-push and/or demand-pull approaches in fostering and shaping innovation, are addressed by the firm as well (Dawid, Pellegrino, & Vivarelli, 2017). The defense of a borrowing firm from the bank lending it, involves the reallocation of borrowed funds towards research and development, marketing, and all those factors influencing the market of the firm's product. The best response of the lending bank will be (i) to lower the current lending rate and ration credit towards the least promising firms in terms of innovation capabilities, (ii) advancing at the same time risky financial innovations to recover the profit lost from credit rationing, and avoid rationing next period under the constant threat of credit rationing.

A new term has to be introduced to describe the resulting equilibrium in game theory; a term, which in practice, translates to that in the post-WWII era "the financial system grew rapidly relative to the nonfinancial sector, rising from about 10 percent of value added and a 10 percent share of corporate profits to 20 percent of value added and 40 percent of corporate profits in the United States" (Mazzucato & Wray, 2015, p. 1). It is an equilibrium under which banks finance themselves instead of the capital development of the economy, because it emphasizes customer screening and hence, bilateral bargaining with each borrower under credible undersupply threat as in biform games (Stuart, 2007). Only occasionally the outcome of such a game can be socially beneficial, rendering the equilibrium unstable in a Schumpeter-Hyman fashion (Knell, 2015). As far as this paper is concerned, the overall conclusion from these complex dynamic considerations boils down to the one reached within the simple static framework developed earlier, and this is the novelty of this article methodologically.

3. Concluding remarks

Would additional competition introduced by the non-bank financial system make any difference? None, at all, because as the emergence of the so-called shadow banking activities of official banking signifies, non-bank financial operations are increasingly integrated into the banking system indirectly (Adrian & Ashcraft, 2012). It is certainly a form of collusion as our theory here would predict. Also, without a central clearinghouse for share loans, which would reduce search costs between share borrowers and lenders, the equity lending market is not in a position to compete effectively with banking (Kolasinski, Reed, & Ringgenberg, 2013). As a matter of fact, our modeling predicts a collusion of the two markets; all would be better off especially in view of the prospect of short equity sales in response to demand shocks. Shadow banking includes such activities as well, rendering immaterial pro-borrower institutional developments like investments indirectly through fund managers (Woolley, 2010). This is one reason the Bernanke-Blinder bank credit channel hypothesis cannot be rejected empirically (Brissimis, Garganas, & Hall, 2014). Neither the option of borrowing from the stock market can challenge the market power associated with bank lending, since the finding is that bank-based financial development and stock market development go hand in hand (Odhiambo, 2010).

The tendency in the financial sector in general is increasing market concentration as an equilibrium phenomenon by itself and as part of a broader general equilibrium with increased industry concentration too, to be balancing the distribution of welfare between the two sectors. Financial development and technological advancement is an indispensable feature of this general equilibrium Nevertheless, it is also an equilibrium with complete disregard to the welfare of the general public whose interests are better served under as much competition as possible. Diallo & Koch (2017) document extensively the negative relation between bank concentration and growth while for OECD (2009, p. 7) "more competitive market structures can promote stability". Also, Ciarli & Valente (2016) conclude that industrial concentration can benefit growth only under sufficiently large demand. And, Arrow would add that even the cause of technical change is served better under more competition (Baker, 2007). Anti-trust in industry and full-reserve banking or the same, zero-profit *quasi*-perfectly-competitive banking is thus what one is inclined to propose policy-wise.

At the other end, we have Schumpeter (1942) himself who maintains that it is concentration rather than competition that favors technical change; competition is good only for static resource allocation. Cohen & Levin (1989, p. 1061) point out that it all depends on "the structure of demand, the nature and abundance of technological opportunity, and the conditions governing appropriability of the returns from innovation". In so far as banking is concerned, Cetorelli (2001) emphasizes that competition among banks can have negative effects too, while according to Allen & Gale (2004) there appears to be a trade-off between competition and financial stability. Therefore, one is inclined to suggest as a rule of thumb, that industrial policy should not be upsetting the optimal mix of efficiency and stability in the financial sector and should be encouraging at the same time research and development on the part of firms. In any case, industry concentration may be stemming from reasons unrelated to the financial sector and it does not necessarily follow that if some optimal bank competition is attained, competition in industry will also be optimal. Sensitivity to the matter of SMEs is expected, anyway.

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