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Industrial Organization of Financial Systems and Strategic Use of Relationship Banking ⋆

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Abstract. Using standard Industrial Organization tools, we analyze the relation between competition in arm's length financial markets and the prevalence of close bank-firms ties. We show how the degree of competition between financial intermediaries affects the intensity of relationships between banks and client firms, and explore the idea that investment in bank-firm relationships can be used strategically by incumbent multi-product (universal) banks to limit competition in arm's length markets. The analysis implies that reforms designed to facilitate entry of new intermediaries may actually induce incumbent banks to increase investment in relationship banking, so that regulatory entry barriers are replaced by entry barriers created endogenously, namely, there is "path dependence" in the market structure of financial systems. This result suggests that increased (potential) competition in the financial services industry will not always destroy bank-firm relationships but, on the contrary, may actually strengthen them.

Keywords: relationship banking, competition in banking, universal banking, multi-product banking, entry deterrence

JEL classification numbers: G21, L1

1. Introduction

There is still no conventional wisdom regarding the optimal market structure of the banking industry or the desired nature of bank competition in a well-functioning financial system. These issues are of particular importance in view of the recent wave of bank mergers in the US, Japan and Europe and in light of the relaxation of restrictions on the scope of bank activities in both the US and Japan. Clearly,

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the determinants of competition among financial institutions should be of prime interest to regulators around the world.

Much of the literature in the 1980s and early 1990s focused on comparisons of market-based financial systems where a considerable amount of financing is allocated "at arm's length" (e.g., the US and the UK) and bank-based financial systems where arm's length markets are relatively thin (e.g., Germany and Japan).[1] Only few studies sought to analyze the mode of competition between financial intermediaries in the two environments. In this paper we attempt to shed more light on this issue, using standard analytical tools borrowed from the Industrial Organization literature. We show within a very simple framework how the degree of competition between financial intermediaries affects the intensity of relationships between banks and client firms. Our model is consistent with the casual observation that extensive bank-firm ties are often associated with a small and concentrated arm's length market ("Germany") while a highly competitive arm's length market is associated with fewer ties between banks and borrowing companies. We also show how bank-firm relationships themselves can be used strategically by incumbent banks to deter entry and restrict competition in the arm's length market so that a market structure with strong bank-firm ties and limited competition in the arm's length market will tend to perpetuate itself.

Our model focuses on a multi-product bank that allocates resources among two activities: formation of relationships with firms and provision of standard loans. We argue that an important determinant of this choice is the degree of competition in the market for standard (arm's length) loans. Unlike intermediaries that specialize in particular niches of the capital market, multi-product banks take into account the cross-effect of their activities in one segment of the market on the profitability in other segments of the market. Therefore, the amount of relationship lending should be affected by the degree of competition in the arm's length market, and may also be used strategically as a device to affect the degree of competition in that market. We study both of these phenomena in turn.

In the first part of the paper, we model competition between one multi-product bank, offering both arm's length and relationship finance, and other intermediaries that offer only arm's length loans. The multi-product bank exploits its advantage in relationship finance by devoting resources to the formation of bank-client ties, attracting firms from the arm's length market, where competition is relatively intense, to the relationship banking market where the bank enjoys market power.[2] We study the relation between the incentive to invest in bank-firm ties and the number of competitors that the bank faces in the arm's length market. We show

[1] For example, Cable (1985) studies differences across the two systems in corporate governance patterns, Hoshi, Kashyap and Scharfstein (1991) stress mechanisms for the allocation of funds, while Hoshi, Kashyap and Scharfstein (1990) as well as Bolton and Freixas (1994) focus on the likelihood of recovery from financial distress in the two kinds of financial systems.

[2] Conceptually, nothing changes if there are several multi-product banks, but the modeling would be considerably more complex.

that, if the market power of the multi-product bank in the arm's length market does not exceed some maximal level, then higher market power renders investing in relationship banking more profitable. This "complementarity" results in a financial system characterized by a small and concentrated arm's length market and common use of relationship banking, or by a relatively competitive arm's length market and little investment in relationship banking.

Casual observation suggests that these predictions about the industrial organization of financial markets are not implausible. Countries where relationship finance is common (e.g., Germany and other Continental European countries) tend to have a concentrated banking sector and fairly underdeveloped (arm's length) securities markets. By contrast, the US and the UK are prime examples of financial systems with relatively little relationship finance and a competitive market for arm's length debt and equity.[3]

While in the first part of the paper competition in the arm's length market is treated as exogenous, in the second part we explore the idea that an incumbent multi-product bank uses investment in relationships strategically to deter entry to the arm's length market by new intermediaries. As in the entry deterrence literature, we focus on the case where there is one incumbent bank, offering both relationship finance and arm's length loans, and one potential entrant to the arm's length market. We show that, as in models of entry deterrence in general, it is worthwhile to deter entry when the cost of entry is not too large, nor too small. This part of the analysis is relevant for financial market reforms designed to facilitate entry and competition. In response to reforms, incumbent banks may increase their investment in the formation of ties with client firms, and thus prevent entry. This claim is consistent with historical evidence on the suppression of the bond market which accompanied the development of German banks (Tilly, 1989). It is also in line with more recent evidence (discussed later) on the reluctance of foreign banks to enter countries where strong bank-firm relationships are common; see the survey by Degryse and Ongena (1999) and references therein.[4]

The paper is related to several theoretical studies of competition in financial markets, especially those that emphasize the special multi-product nature of bank activity. Boot and Thakor (1997, 1999) and Yosha (1995) base their analyses on the premise that multi-product banks internalize cross effects (between commercial and investment banking, and between commercial banking and mutual fund management, respectively), whereas functionally separate banks do not.[5] Another related feature of the Boot and Thakor (1997) model is that universal banking

[3] For example, stock market capitalization relative to GDP is about four times higher in the US than in Germany (see Blommestein, 1999, Frankel and Montgomery, 1991, and Steinherr and Huveneers, 1994).

[4] See also Steinherr and Huveneers (1994) who provide evidence suggesting that there is limited entry into financial systems where bank-firm relationships are common, and Buch and Golder (1999) who investigate empirically the hypothesis that German universal banks limit competition, reaching ambiguous conclusions.

[5] See also Cukierman (1979) and Loranth (2000).

impedes the development of financial innovation, a conclusion that is consistent with our analysis. Rajan (1998) argues that universal banks have a first mover advantage in the competition with non-bank underwriters, and are therefore able to limit competition in underwriting. Boot and Thakor (1999) investigate the relation between competition and investment in relationship banking, albeit in a very different framework from the one used here, and Aoki and Dinc (2000) discuss whether or not relationship banking may survive increased competition. The idea developed in Aghion and Bolton (1987) also bears relation to our paper: an incumbent monopolist splits its profits with consumers in exchange for a commitment on their part not to buy from a potential entrant in case of entry. In our model, the incumbent bank splits with its client firms the surplus generated through the relationship with them, thus ensuring that the demand faced by potential entrants to the arm's length market will shrink.[6]

An important question that our analysis helps shed light on is whether increased competition in the financial services industry will destroy bank-firm relationships. Related empirical literature, e.g., Mayer (1988) and Petersen and Rajan (1995), promotes the idea that market power is a necessary condition for financial intermediaries to invest in relationships with their client firms. Without market power, banks would not be able to extract rents generated by investment in ties with firms, and consequently there would be little or no relationship banking. Our model emphasizes the cross-effects between various segments of the financial system, an aspect that is overlooked in the Mayer and Petersen–Rajan studies. In contrast with these studies, we argue that, under certain circumstances, greater *potential* competition in the arm's length market may actually induce *more* relationship lending, not less. These issues are discussed in more detail towards the end of the paper.

The rest of the paper is organized as follows. In Section 2, we present the basic model, and analyze the relation between competition in the arm's length market and investment in relationship lending by a multi-product bank. In Section 3, we focus on strategic entry deterrence through investment in relationships. Implications for financial markets reform and the industrial organization of financial systems are discussed in Section 4. Section 5 concludes.

2. The Model

Consider a market with a large number of firms, each demanding a loan of size one for the purpose of carrying out an investment project. Besides repayment of this loan (principal and interest), firms do not incur any other costs. Firms can

[6] Dell'Ariccia, Friedman, and Marquez (1999) develop a model which, like ours, predicts that bank-firm relations may form a barrier to entry. Incumbent banks possess informational advantages with respect to potential entrants. In a screening equilibrium, the least efficient of these banks makes zero profits rendering entry non-profitable. In their model, banks do not deliberately deter entry, although one could think of a natural extension of their model where information acquisition by incumbent banks is determined endogenously as a response to a threat of entry.

raise the loan in a standard arm's length market or seek a relationship loan. They differ in the value they attribute to the project, due to impatience, liquidity needs, growth prospects, local demand conditions, or simply the "quality" of their current investment opportunity. We denote by ν the valuation of the loan (net of the principal), and assume that at the time firms choose whether to raise an arm's length or a relationship loan, they know only that ν is uniformly distributed on [0, 1].[7] After choosing where to borrow, a firm learns the realization of ν. This formulation describes a world where investment opportunities are random, so that it is impossible to predict whether relationship financing is used for (ex-ante) "high quality" or "low quality" projects.[8]

The banking industry consists of n banks that operate in the arm's length loan market. One of these banks is "multi-product" in the sense that in addition to extending arm's length loans, it engages in tailor-made relationship lending. This assumption captures the idea that banks often engage in several types of intermediation activities, taking into account the cost and revenue in various segments of the capital market.

The multi-product bank chooses x, the amount of resources (money) spent on setting up capacity allowing the formation of relationships with firms, e.g., hiring experts in particular activities such as import-export services or in specific market segments such as retailing or real estate. An investment of x allows the bank to form relations with some, but not all the firms. The higher is x, the more firms can benefit from the formation of ties with the bank: if the bank invests x then a fraction $\rho(x)$ of the firms can choose where to borrow, while the rest must borrow at arm's length. The function $\rho(\cdot)$ is strictly increasing, strictly concave, strictly smaller than unity for all x, and satisfies $\rho(0) = 0$, $\lim_{x\to\infty} \rho(x) = 1$, $\lim_{x\to 0} \rho'(x) = \infty$, and $\lim_{x\to\infty} \rho'(x) = 0$. When the bank invests x, and assuming that any firm that can use relationship banking will actually do so (as will be the case in equilibrium), the demand for loans in the arm's length market is $q = [1-\rho(x)](1-r)$, where r is the "price" of the loan. The demand for relationship loans will then be $q = \rho(x)(1-r)$. The cost of extending (relationship or arm's length) loans is normalized to zero.

The relationship between the multi-product bank and a firm generates a surplus of size s (in addition to the valuation ν), reflecting benefits such as easier access to funds (due to smaller information asymmetries), less managerial moral hazard (due to better monitoring), or easier recovery in periods of financial distress (due to bank assistance). The bank appropriates a fraction λ of this surplus, and the firm

[7] Letting ν be distributed uniformly on an arbitrary interval does not affect the results in any meaningful way.

[8] It is possible to relax the assumption that firms choose where to borrow before they learn ν. This slightly complicates the analysis but the results are not affected in a material way. We return to this issue below.

obtains the remaining fraction, $1 - \lambda$. The fraction λ is chosen by the bank and is determined endogenously in equilibrium.[9]

If a firm takes a relationship loan, the bank learns the firm's private valuation ν (this is a natural consequence of the formation of a relationship). For simplicity, we assume that the bank then charges (in addition to the fraction λ of the surplus s) the firm's entire willingness to pay, ν. Therefore, the revenue of the bank from relationship loans is $\rho(x)\left(\frac{1}{2} + \lambda s\right)$. The first term, $\frac{1}{2}\rho(x)$, is the area under the inverse demand curve for relationship loans, $r = 1 - \frac{q}{\rho(x)}$, and the second term, $\rho(x)\lambda s$, is the bank's share in the surplus generated through lending relationships.

The revenue of a firm that takes a relationship loan is $(1 - \lambda)s$ which is independent of ν since the bank appropriates all the willingness to pay (compensating the firm with a fraction $1 - \lambda$ of the surplus). Notice that a firm that has chosen to seek a relationship loan will take the loan and undertake the project regardless of the realization of ν.[10]

In the arm's length market there is Cournot competition.[11] Every bank in the market takes as given the demand curve for arm's length loans, $q = [1 - \rho(x)](1 - r)$ (i.e., takes as given the investment x in relationship loans capacity by the multi-product bank) and maximizes profits by choosing the quantity of arm's length loans to be supplied (taking as given the quantities chosen by other banks). Then, the n-bank Cournot price in that market is $\frac{1}{n+1}$, the quantity of loans per bank is $\frac{1-\rho(x)}{n+1}$, and profits per bank are $\frac{1-\rho(x)}{(n+1)^2}$. A firm that has chosen to seek an arm's length loan will take the loan (and undertake the project) only if the realization of ν exceeds the price of the loan, $\frac{1}{n+1}$.[12]

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[9] Before proceeding, several remarks regarding the set-up are in order. The formulation assumes that the investment in relationship capacity affects the number of firms that populate each market, $\rho(x)$ and $1 - \rho(x)$. Instead, we can think of $\rho(x)$ as the amount of relationship loans per firm (e.g., the fraction of a firm's debt that is obtained as a relationship loan). A more fundamental assumption embedded in our set-up is that investment in relationships does not affect the amount of surplus generated by each relationship. It is certainly reasonable that s also depends on x. Technically, this is not a trivial extension but conceptually, we believe that our simple formulation captures well the essential tradeoffs.

[10] The "contract" between the bank and the firm is such that the bank is credibly committed to pay the firm its promised share of the generated surplus (either contractually or because of reputation considerations). As for the firm, once it decides to take a (relationship or arm's length) loan, it cannot switch to the other mode of financing even after discovering its valuation, ν. This assumption is extreme, but it is intended to capture a realistic feature of financial markets in the short run: firms cannot instantaneously convert from one form of financing to another. In a dynamic setting, such behavior must, of course, be allowed and studied.

[11] Other forms of imperfect competition can be assumed, e.g., competition along a "circle city" where products are imperfect substitutes. The effects we discuss are present in that framework as well, although the model is technically more complex. The major simplifying feature in a Cournot framework is that the price of loans in the arm's length market is independent of $\rho(x)$, unlike in a "circle city" model. We compare the results of the two models below.

[12] This price is the required repayment in addition to the principal (since the loan is of size one, $\frac{1}{n+1}$ is the interest *rate* on the loan.)

At the time a firm decides which type of loan to take, it compares the payoff from taking a relationship loan, $(1-\lambda)s$, to the expected payoff from borrowing at arm's length. *Ex-ante*, a firm will prefer a relationship loan if $(1-\lambda)s \geq \int_{\frac{1}{1+n}}^{1}\left(\nu - \frac{1}{1+n}\right)d\nu = \frac{1}{2}\left(\frac{n}{n+1}\right)^2$. Thus, the bank's optimization problem is:

$$\begin{aligned} &\max_{x,\lambda} \rho(x)\left(\frac{1}{2}+\lambda s\right) + \frac{1-\rho(x)}{(n+1)^2} - x \\ &\text{s.t.} \\ &(1-\lambda)s \geq \frac{1}{2}\left(\frac{n}{n+1}\right)^2 . \end{aligned} \tag{1}$$

The first term in the bank's objective function represents profits in the relationship loans market, the second term represents profits in the arm's length market, and the third term is the investment, x, in relationship loans capacity. The constraint is the ex-ante participation condition for borrowing firms derived above. It reflects the bank's inability to appropriate the entire surplus generated through the relationship, and the fact that greater competition in the arm's length market reduces the fraction that the bank can appropriate. In fact, in an interior solution ($x > 0$), the constraint must bind, so we have:

$$\lambda(n) = 1 - \frac{1}{2s}\left(\frac{n}{n+1}\right)^2 . \tag{2}$$

To ensure that $\lambda(n) \geq 0$ we assume that $s \geq \frac{1}{2}$, that is, the surplus generated through relationship lending is "substantial" (relative to the valuation ν which is at most 1, with an average of $\frac{1}{2}$).[13,14]

Returning to the solution of the bank's optimization problem (Equation 1), and using the constraint (Equation 2), we take a derivative with respect to x to obtain the first order condition:

$$\rho'(x)\left[\lambda(n)s + \frac{1}{2} - \frac{1}{(n+1)^2}\right] - 1 = 0 . \tag{3}$$

[13] For simplicity, we have allocated all the bargaining power to the bank, as is apparent from the constraint in the bank's optimization problem (Equation 1). Notice that in the solution, both the amount of relationship loans capacity, x, and the division of the surplus, λ, are determined endogenously.

[14] If firms know ν before they choose in which market to borrow then, for each ν, the bank (who learns ν if the firm seeks a relationship loan) will set λ as a function of ν so as to render a firm with valuation ν just indifferent regarding where to borrow. The remaining analysis, and in particular, the forces that determine the desirability of investment in relationships, are not materially affected. In this setup, if $s < 1$ and n is large, the multi-product bank will offer relationship loans only to "bad" (low valuation) companies whose "outside option" is poor, while "good" (high valuation) firms will raise arm's length funding. This is not implausible: for example, Hoshi and Kashyap (2000) argue that this is what happened in Japan in the 1980s when "good" firms severed their main bank ties.

Denote the solution of this equation $x(n)$. The assumptions regarding $\rho(x)$ ensure an interior solution (where the bank engages in both arm's length and relationship lending), and the strict concavity of $\rho(\cdot)$ ensures that the second order conditions for an interior maximum are satisfied at $x(n)$.[15]

2.1. COMPETITION IN THE ARM'S LENGTH MARKET AND BANK-FIRM RELATIONSHIPS

To see the link between the number of competitors in the arm's length market and investment in relationships, differentiate the first-order-condition (Equation 3) with respect to n, the number of Cournot competitors in the arm's length market. Using Equation (2), this yields

$$x'(n) = -\frac{\rho'[x(n)]^2}{\rho''[(x(n)]} \frac{2-n}{(n+1)^3}. \tag{4}$$

Thus, when competition in the arm's length market is low ($n < 2$), a marginal increase in competition entails higher investment in relationships, whereas when competition in the arm's length market is sufficiently intense ($n > 2$), a marginal increase in competition entails lower investment in relationships.

The case $n < 2$ in fact means $n = 1$, namely, the universal bank is a monopolist in both markets. The result, however, does not literally apply to a monopolist since the particular cut-off value $n = 2$ is an artifact of our assumption that the valuations of firms for a loan are distributed uniformly on [0, 1]. (If, for example, valuations were distributed uniformly on $[0, \bar{v}]$, the cutoff value of n would be $2\bar{v}$.) The meaning of $x'(n) > 0$ for low n is that when profits in the arm's length market are large, increased competition in that market *raises* the amount of relationship lending, unlike the logic in Petersen and Rajan (1995) where monopoly power is necessary for investment in relationships.[16]

We turn to a discussion of the intuition for Equation (4). If λ were constant (not a function of n), that is, if the bank did not adjust the share of the surplus that it appropriates in response to lower prices in the arm's length market, the derivative of x with respect to n would be strictly positive (for any n). In that event, lower

[15] Notice that since firms are indifferent where to seek a loan, the ex-ante average valuation, v, is the same in both markets. But ex-post, the average valuation of firms that actually undertake the project is higher in the arm's length market, where only firms such that $v \geq \frac{1}{n+1}$ take a loan, whereas all the firms that seek a relationship loan actually do so. Since the price of the loan in the arm's length market decreases with n, approaching zero, the fraction of firms in this market that undertake the project increases with n, approaching unity.

[16] There is no contradiction, however, between our result and the logic of Petersen and Rajan (1995). They explicitly model the inter-temporal aspect of the problem (today's investment will be sunk tomorrow so more intense competition tomorrow reduces the incentive to invest today) whereas our model focuses on intra-temporal competition across markets of substitute goods (arm's length versus relationship loans).

profitability in the arm's length market would induce the multi-product bank to substitute into relationship lending by increasing x.[17] When λ is set optimally by the bank as a function of n, an additional, opposite, effect arises. Increased competition in the arm's length market forces the bank to raise the share of the surplus that goes to firms seeking relationship loans. As a consequence, the bank finds investment in forming relationships less profitable. This effect dominates if n is large enough, namely, if competition in the arm's length market is high enough. The reason can be understood by noting that a firm's "surplus" (its expected valuation of the loan minus the cost of the loan) in the arm's length market is $\frac{1}{2}\left(\frac{n}{n+1}\right)^2$. The incremental compensation, as n increases, that the bank must offer a firm in order to induce it to choose relationship loans behaves as the derivative of this expression, $\frac{n}{(n+1)^3}$, which is precisely the incremental reduction in the bank's profits in the relationship segment of the market. The incremental reduction in its profits in the arm's length market, as n increases, behaves as the derivative of $\left(\frac{1}{n+1}\right)^2$ which is $\frac{-2}{(n+1)^3}$. For $n > 2$, the latter is smaller in absolute value. Therefore, when n is large enough, further increases in n induce the bank, on net, to reduce relationship lending.[18]

2.2. EMPIRICAL IMPLICATIONS

Casual observation (e.g., Germany and Israel versus the US and the UK), as well as the evidence provided by Steinherr and Huveneers (1994), suggests that a competitive arm's length market is associated with little relationship lending, which is consistent with the decreasing portion of $x(n)$. The developments in the Japanese financial system since the early 1980s are also very much in line with the spirit of the model. Weinstein and Yafeh (1998) show that liberalization of Japanese arm's length markets starting around 1980 led to a decline in the monopoly power of banks. This was followed by a decline in bank-firm relations, as many firms severed their main bank ties (see Hoshi and Kashyap, 2000). The explanation we propose for these phenomena is that when competition in the arm's length market is intense, multi-product banks find it less profitable to lure customer firms to form long-term relationships since firms must be promised a large fraction of the surplus generated through the relationship.

[17] Such a positive relation between competition in the arm's length market and the extent of relationship lending is also present in Boot and Thakor's (1999) model.

[18] This "surplus sharing" effect is not present in Boot and Thakor (1999) although, as pointed out to us by Arnoud Boot, an extension of their model also produces a non-monotonic relation between competition in banking and the amount of relationship lending. In their model, banks first decide how much to invest in total (arm's length and relationship) lending capacity, and later allocate the installed capacity to various uses.

2.3. SOCIAL EFFICIENCY

Another interesting implication of the model is that multi-product banks invest "too much" in the creation of relationships. To see this, compare the bank's maximization problem (Equation 1) with that of a social planner who picks x to maximize social welfare subject to the participation constraint for borrowing firms.[19] First, a social planner would take into account the effect of investment in relationships on total profits (of *all* banks) in the arm's length market, whereas the multi-product bank cares only about its own profits. Second, a planner would take into account the entire surplus generated by a bank-firm relationship, whereas the bank takes into account only its own share. Third, in choosing the socially optimal x, the planner takes into account the forgone "surplus" of firms that borrow in the arm's length market, an effect that is ignored by the profit-maximizing multi-product bank. Note, however, that because of the firms' ex-ante participation constraint (Equation 2), the fraction of relationship surplus not appropriated by the bank, $(1 - \lambda)s$, is exactly equal to the firm's (foregone) "surplus" in the arm's length market, and therefore these two terms cancel out in the social planner's objective function. The only remaining difference between the bank's maximization problem and that of a social planner is that the bank ignores the negative impact of its investment in relationships on the profits of all the other banks in the arm's length market and therefore invests "too much" in relationship capacity.

2.4. ROBUSTNESS: A "CIRCLE CITY" MODEL

We briefly sketch the results of an analogous model where banks in the arm's length market are modeled as sellers of differentiated products, and are distributed uniformly on a circle with circumference $1 - \rho(x)$. As in the Cournot model, investment in relationship capacity, $\rho(x)$, reduces the demand in the arm's length market. Suppose that there are n banks distributed along the circle and denote the prices charged by two neighboring banks by p_1 and p_2. The distance between these banks is $\frac{1-\rho(x)}{n}$ so a customer situated at a distance d from bank 1 is indifferent between purchasing from either bank (assuming a marginal transport cost of 1) if $d = \frac{1}{2}\left[(p_2 - p_1) + \frac{1-\rho(x)}{n}\right]$. Bank 1 maximizes $p_1 d$ taking p_2 as given, and similarly for bank 2. Symmetry then implies that $p = \frac{1-\rho(x)}{n}$ with per bank profits of $\frac{1}{2}\left[\frac{1-\rho(x)}{n}\right]^2$.

A firm's participation constraint is $(1 - \lambda)s \geq \int_{\frac{1-\rho(x)}{n}}^{1} \left(\nu - \frac{1-\rho(x)}{n}\right) d\nu$ which must bind, and can be solved for λ as a function of n, $\rho(x)$, and s. Notice that, unlike the Cournot model, the price and profits in the arm's length market, as well as the equilibrium value of λ, *all* depend on x. In particular, λ (which was inde-

[19] In a social optimum, this constraint binds (otherwise there is excessive investment in x) so an equivalent interpretation is that the planner chooses x while the multi-product bank chooses λ.

pendent of x in the Cournot model, see Equation 2), decreases with x in this model, reflecting the need to compensate relationship loan borrowers for the reduction in price in the arm's length market resulting from the higher $\rho(x)$.

The profit function of the multi-product bank (similar to that in Equation 1) can now be calculated and, using the firms' participation constraint, a first order condition with respect to x can be derived. The resulting condition is somewhat more complex but very similar to the first order condition in the Cournot model described in Equation (3). Differentiation of this first-order-condition with respect to n is quite tedious, but the two essential forces that are present in the Cournot case are also present here. On the one hand, as the arm's length market becomes more competitive and profits fall, the multi-product bank would like to shift more client firms to relationship finance. On the other hand, the firms' bargaining position vis-a-vis the bank is improved the more competitive is the arm's length market (because their "surplus" there increases with the decline in price). Therefore the bank has to offer a "better deal" (i.e., a larger fraction of the relationship surplus) to make firms willing to "move" to the relationship banking segment. Unlike the Cournot case, the function $x(n)$ is not necessarily hump-shaped here, but we can demonstrate (under technical assumptions on the function $\rho(\cdot)$ and the parameter s) that there is a cut-off value n^* such that for n larger than n^* the function $x(n)$ is decreasing in n, as in the Cournot case.[20] Thus, the general flavor and the basic economic forces discussed before are not specific to Cournot competition and are present also when competition in the arm's length market is modeled as a circle city Bertrand game.

3. Strategic Use of Bank-Firm Relationships

So far, competition in the financial system has been assumed to be exogenous. We now explore the idea that an incumbent (multi-product) bank can use investment in relationship lending capacity as a strategic device to deter entry to the arm's length market and restrict competition.[21] We believe that entry, if it occurs, is more likely to take place in the arm's length market where loans are standard and less information-intensive. Entry to the relationship lending segment of the market requires considerably more time, learning, and reputation building on the part of foreign banks or non-bank intermediaries, and may happen only at a later stage (in the next section we provide anecdotal evidence that this is indeed the case). We therefore focus on potential entry to the arm's length market only. As in the entry deterrence literature, we study the special case where there is one incumbent bank, offering both relationship and arm's length loans, and one potential entrant to the

[20] Further details can be obtained from the authors upon request.

[21] It is possible to interpret this part of the model as an alternative description of the sequence of events. Whereas before, competition (or entry) into the arm's length market occurred first, and the amount of relationship lending was determined later, now we assume that the multi-product bank determines its investment in relationship capacity so as to soften competition in subsequent periods.

arm's length market. First, the incumbent chooses x, the investment in relationship lending capacity. The potential entrant observes x, and thus knows the demand function in the arm's length market. He then decides whether to enter or not. After observing the entry decision, the incumbent sets λ to maximize profits, given x (according to the borrowing firms' participation constraint). If entry occurs, the two banks engage in Cournot competition in the arm's length market. The entrant correctly anticipates the value of λ that will be chosen by the incumbent. The cost of entry to the arm's length market is k, reflecting setup costs, administrative costs imposed by regulators, as well as perceived costs associated with operation in a new market.

For any x, the monopoly price and the Cournot duopoly price in the arm's length market are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. These numbers are a consequence of our simplifying assumption that v is uniformly distributed on [0, 1]. The central message does not change with a more general specification. Since duopoly profits in the arm's length market are $\frac{1}{9}[1 - \rho(x)]$, entry will occur if $k \leq \frac{1}{9}[1 - \rho(x)]$. We study the equilibrium for different values of k. The analysis of this simple entry game is standard, and boils down to the following cases.

3.1. BLOCKADED ENTRY

If entry costs are high, $k > \frac{1}{9}$, there is no entry regardless of the level of x (duopoly profits in the arm's length market are smaller than k even when $x = 0$). The level of relationship capacity, x, invested by the incumbent bank will be optimal for a bank that is a monopolist in the arm's length market and faces no threat of entry; we denote it $x(1)$ and will use it in the discussion that follows.

3.2. INVOLUNTARY ENTRY DETERRENCE

Let $\frac{1}{9}[1 - \rho(x(1))] < k < \frac{1}{9}$, where $x(1)$ is the optimal investment in relationships when $n = 1$ as defined above. In this case, entry would have occurred if x were zero but does not occur when $x = x(1)$. This is not, however, deliberate (strategic) entry deterrence since $x(1)$ is the level of x that would have been chosen had there been no threat of entry. Nevertheless, the fact that the higher is $x(1)$ the more firms seek relationship loans and the more difficult is entry to the arm's length market, has interesting implications. When the surplus generated from relationship loans, s, is high, also $x(1)$ will be high (see the bank's first order condition, Equation 3). This, together with the notion that arm's length finance is more appropriate for innovative industries while relationship finance is more appropriate for firms in traditional sectors, suggests that there may be a connection between a country's industrial structure and the extent of competition in its financial system.[22] In coun-

[22] Allen (1993) provides a theoretical justification for the view that arm's length finance is better suited to finance innovation. Carlin and Mayer (1999), Blass and Yafeh (1999), and Pagano et al. (1999) provide empirical support.

tries where the industrial structure is more "traditional" (i.e., the surplus generated from relationship loans, s, is high) bank-firm ties will be relatively common and, *as a result,* competition in the financial system less intense, while the opposite should be true in countries with a dominant high-tech sector. This characterization seems consistent with the (admittedly stylized) descriptions of Germany versus the US.

3.3. STRATEGIC ENTRY DETERRENCE

There is a constant $k^* > 0$ such that if $k^* < k < \frac{1}{9}[1 - \rho(x(1))]$, the incumbent bank invests more in relationship capacity than when there is no threat of entry, and as a result of this extra investment in relationship capacity, entry is deterred. The incumbent bank remains a monopoly in both segments of the financial system.

The intuition is simple. Naturally, the profits of the incumbent bank are higher when there is no entry ($n = 1$) than when there is entry ($n = 2$). Now, suppose that k is just slightly smaller than $\frac{1}{9}[1 - \rho(x(1))]$. In this case, it may be worthwhile for the incumbent bank to choose a level of x that is slightly larger than $x(1)$, reducing the demand and profits in the arm's length market so that k just exceeds $\frac{1}{9}[1-\rho(x)]$, deterring entry.

We believe that this is a good description of the response of local banks in countries with bank-based financial systems to increased globalization and financial market liberalization. Some firms no doubt take advantage of new financing opportunities (mainly abroad), but those who do not, often end up with strengthened relationships with local banks (we elaborate on this point in the next section).

3.4. ACCOMMODATED ENTRY

If $0 < k < k^*$, the incumbent bank accommodates entry. The level of x that would be chosen by the incumbent if it anticipates entry is determined by the first order condition for $n = 2$ (see Equation 3). The intuition is that as the entry cost, k, decreases it takes an increasingly larger investment in x to deter entry. Since the bank's objective function is strictly concave in x, and is maximized at $x(1)$, and because of the larger investment in x which is needed to deter entry, the incumbent bank's profits fall as k decreases. For k sufficiently small it pays the incumbent bank to accommodate entry.

4. Implications for Financial Markets Reform

Financial markets reform varies considerably across countries. In the US, there has been gradual relaxation of the Glass–Steagall restrictions on the scope of activities that banks may undertake, until its final abolition with the 1999 Gramm–Leach–Bliley Financial Modernization Act. In Japan too, some of the restrictions on bank dealing in securities have been recently relaxed. In Israel, unlike the US, there have been several unsuccessful attempts to impose restrictions on scope of activities of

(universal) multi-product banks. Overall, the tendency in many countries to impose fewer restrictions on bank activities, combined with the recent bank merger wave, render our model quite relevant: the banking industry in most countries is well described as constituting of a few large multi-product banks that behave as imperfect competitors.[23]

The Israeli example is rather interesting. In the past, there have been restrictions on the ability of foreign companies (including banks) to convert profits into foreign currency and repatriate them. Today, after a series of liberalization measures, the cost of entry to the Israeli banking sector appears to be rather low. Entry of foreign banks, however, has not occurred. It is not very likely that political and regulatory risks in Israel (and in other emerging markets in a similar situation) are still perceived as too high for entry to occur, since non-bank foreign companies are entering by the dozen. Why, then, are foreign *banks* reluctant to enter the Israeli market? The explanation provided by our model is that the relations of local banks with client firms result in blockaded entry, despite the liberalization of financial markets. Local banks may have even deterred entry deliberately by strengthening their relationships with local firms. This interpretation has recently been confirmed in a news report about Citibank's intentions to finally enter the Israeli market. The decision was attributed to the recent emergence of many young (innovative) companies that do not maintain relationships with a large local bank, so that Citibank hopes to serve this market niche (Ha'aretz, October 15, 1999). The fact that there are few foreign banks in Germany, where large multi-product (universal) banks are dominant (see Buch and Golder, 1999) is also consistent with this interpretation.

If this explanation is correct, there may be a more general lesson here. Once a concentrated banking system with strong bank-firm ties is in place, this market structure will have a tendency to perpetuate itself due to entry deterring behavior by incumbent banks. This observation is consistent with the relative underdevelopment of arm's length credit markets in Germany, where large banks dominate the financial system and maintain close ties with client firms. By contrast, in the United States, due to the (recently repealed) Glass–Steagall legislation, banks have been less inclined to form relationships with firms (s was low, using the terminology of our model), a fact that may have facilitated the development of the arm's length market.

Applying this logic to the design of financial systems in transition or to developing economies, we speculate that if bank-based, relationship intensive, financial

[23] See also Rajan (1998). Recent mergers between very large banks took place in several large developed economies. For example, Citigroup was created in the US, a merger between two of the largest German banks was seriously discussed, and in Japan three of the top six banks are in the process of merging. This trend is combined, at least in the US and Japan, with fewer restrictions on the scope of bank activities. One interpretation of this consolidation wave is that it is driven by the desire of incumbent financial institutions to limit the ability of potential new competitors to enter the financial system. This is achieved through acquisition of existing banks that already have relationship lending capacity. Such behavior is consistent with the spirit of our analysis, but requires separate modeling.

systems develop there, arm's length credit markets (as well as stock markets) may fail to develop. The reason is that new entrants to these markets will find it hard to attract firms that already have strong ties with banks. If, in the future, the governments of these countries decide to encourage entry to the arm's length segment of the financial system (perhaps in order to increase competition or to provide finance to innovative industries), the removal of formal entry barriers may not suffice. New financial intermediaries may fail to enter because of existing relationships between local banks and their client firms. Moreover, local banks may deliberately strengthen these relationships in view of potential entrants. To enable entry and increased competition, liberalization of financial markets should be accompanied by measures weakening bank-firm ties, or by measures facilitating the growth of new firms or new industries, that have no existing ties with dominant banks.

5. Concluding Remark

The prevalence of relationship banking is often described as important for the development of certain industries, especially in early stages of financial and economic development. This fact, in addition to an increased threat of competition from foreign and non-bank intermediaries, implies that relationship banking is unlikely to disappear in the coming era of financial market globalization. Our model suggests that the amount of relationship lending may, in some cases, even increase.

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