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Distance, Bank Organizational Structure, and Credit

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Abstract

We survey the extant literature on the effects of both a bank's organizational structure and the physical distance separating it from the lender on lending decisions. Banks do engage in spatial pricing, where the underlying mechanism can be both transportation costs and information asymmetries. Moreover, their ability to discriminate is bounded by the reach of the lending technology of surrounding competitors. It is not entirely clear from an empirical viewpoint that small, decentralized banks have a comparative advantage in relationship lending. Differences in data and methodology may explain these mixed findings. If it does exist, this advantage can be motivated theoretically by the existence of agency and communication costs within a bank.

1. Introduction

The last two decades have witnessed profound changes in the landscape of the banking industry, especially in the U.S. and Europe. Deregulation gave rise to an unprecedented wave of consolidation activity while, at the same time, the relentless technological progress in information processing and communication abilities redefined the operational scope of financial intermediation. A first order effect of technological development seems to have been an increase in the contestability of financial markets. In particular, the facility with which information can now be communicated across large distances resulted in an increase in the geographical reach of all potential financiers. Banks – whose lending activities traditionally relied on their superior ability to overcome informational asymmetries in the credit market – have been forced to revise their *modus operandi* in order to face these new challenges. Widely voiced concerns regarding the potential effects of the referred turbulence in banking markets on the economic activity promptly soared. In particular, these voices questioned to what extent small firms – the engine of economic growth and those that most critically depend on bank financing – would be affected by these changes.

Among the various consequences of the complex reorganization in the banking industry, two of them are particularly visible: banks are becoming larger and more hierarchically complex and they are expanding in their geographical span. In this chapter we review the extant literature on the effects of both a bank's organizational structure and the physical distance separating it from the lender on lending decisions. This is, we believe, a natural step towards understanding the effects on the economic activity of the sea changes taking place in the banking industry, and the fact this topic has recently attracted great attention of researchers seems to cope with this view.

Despite the existence of a rich theoretical background to understand the relation between organizational structure, distance and lending conditions, providing proper empirical tests of these theories has proved an extremely challenging task. One major difficulty is brought up by data limitations. Fortunately, substantial progress has been made in recent years in this respect.

The available evidence suggests that the distance between the borrower and the lender is inversely proportional to the degree of local market power the lender possesses, as the theory predicts. Less obvious is the mechanism driving this effect. The theory suggests that both transportation costs and information asymmetries could induce banks to engage in spatial pricing, but the existing evidence is mixed with this respect; in particular, we should not reject the possibility that both explanations have their own legitimacy.

The role of organizational structure on lending decisions is also far from being a settled issue. Again, data limitations are certainly behind the inability of the empirical literature to reach a consensus. Although the bulk of the evidence indicates that small, decentralized banks are better in providing relationship loans, there are also some conflicting signals, which may reflect more than simply differences in empirical methodology or data. Apparently, the heavy reliance on "soft" information in relationship lending is what creates the difference between lending technologies, i.e. transactional versus relationship lending. Yet it is by no means clear where the competitive advantage of small banks in providing relationship loans stems from. Among competing explanations, we have banks' internal agency costs, vertical and horizontal communication costs (across hierarchies and across distance) and incentives of the credit staff to produce information, all of which are strongly linked to the organizational structure of the bank.

Recent attention has also been drawn to the interrelation between organizational structure and distance as mutual determinants of a lending technology, and hence lending conditions. The coexistence of different lending technologies has a non-trivial effect on the structure of banking markets since the geographical reach of each organization not only is determined by its own choices, but as well by the choices made by the competing banks. In particular, it seems that a bank's geographical reach as well as its ability to price discriminate is negatively related to the reach of the competitors operating in the vicinity.

We organize the rest of the paper as follows. Section 2 reviews the literature on the relation between distance and credit decisions. Section 3 summarizes the literature on the relation between organizational structure and credit decisions. Section 4 concludes.

2. Distance and Credit Decisions

If a borrower is not located next to a bank, the distance between them can act like a "physical gap" separating them.[1] Economic theory has long recognized physical distance as a source of inefficiency in credit markets, causing potentially relevant economic costs for both the banks granting credit and the firms seeking financing.[2] Market imperfections arise because, for given physical locations of borrower and lender, distance creates an imbalance in the competitive environment in the credit market. In particular, distance shifts market power towards the bank that is closest located to the firm; banks located further away are at a competitive disadvantage, since establishing ties with far-away firms requires a higher effort. Not only are there distance-related pecuniary costs such as transportation costs, but there may also be extra efforts required from the bank to assess the creditworthiness of potential borrowers or to monitor firms' investments.

Recent structural changes in the banking industry stemming from technological progress (DeYoung, Hunter and Udell (2004) and Petersen and Rajan (2002)) and consolidation activity (Berger, Demsetz and Strahan (1999)) have resulted in a substantial increase in the geographical reach of banks; consequently, these changes have developed renewed interest in the role of borrower location on lending behavior. A handful of empirical studies now analyze how physical distance separating a bank from its clients affects lending decisions, i.e. the availability and cost of credit for firms.

We start by reviewing the theoretical literature on spatial pricing. Following Degryse and Ongena (2005), we discuss two broad channels through which distance affects lending decisions: transportation costs and asymmetry of information.[3] In the subsequent chapter we review the empirical evidence on spatial pricing and spatial rationing.

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[1] Alessandrini, Presbitero and Zazzaro (2006) call this *operational distance.*
[2] An overview of the relevancy of geography in banking is provided in Degryse and Ongena (2004).
[3] In the subsequent theoretical exposition we disregard long-run dynamics by treating the number of banks (or the level of competition) as given. The empirical studies we will analyze cope with this view since they employ samples spanning short time periods. Typically, harsher competition translates into lower loan rates since it reduces the average distances between all possible combinations of firms and neighboring banks. On the other hand, an increase in the number of banks aggravates the adverse selection problem by enabling low-quality firms to obtain financing (Broecker (1990)) and may result in a retrenchment towards relationship lending (Hauswald and Marquez (2006)), resulting in higher loan rates.

2.1. Theory

2.1.1. Transportation Costs

Transportation costs may relate to time, effort and effective outlays born by a borrower who seeks to personally interact with a potential financier. The effect of transportation costs on pricing behavior has been formalized in the context of location or product differentiation models (see the seminal papers by Hotelling (1929) and Salop (1979); see Lederer and Hurter (1986) for a more general approach). More recently, Chiappori, Perez-Castrillo and Verdier (1995) propose a spatial competition model of the banking sector.[4] These models commonly predict that, while firms may incur different transportation costs, banks resort to pool pricing, as they do not observe the location of the borrowers.[5] Banks customarily know the addresses of their loan applicants, however, making this assumption rather implausible. If banks know applicants' addresses, banks can engage in spatial price discrimination based on the physical distance separating them from the firm. Greater distance and hence larger transportation costs result in stronger (local) monopoly power for the bank; accordingly, a bank optimally charges higher loan rates to those borrowers that are located closest to its bank branch. Of course, monopoly power is defined in this setting for given locations of potential competitors. The rationale is that closer borrowers face higher transportation costs when visiting competing banks that are located further away than the lending bank. This allows the lending bank to increase the loan rate by an amount equivalent, in the limiting case, to the opportunity transportation cost faced by the borrower.

In the same way, banks may incur transportation costs related to their lending activities, in particular while screening applicants and monitoring borrowers. Banks may subsequently pass along these costs to the firms by setting higher loan rates. However, the fact that total monitoring costs increases with the borrower-lender distance opens another window of opportunity for banks to engage in discriminatory pricing. Sussman and Zeira (1995) formalize this idea in a costly-state-verification framework and show that banks have local economies of scale with advantages for monitoring the closer they are to their clients. In other words, lenders can extract rents from closer borrowers

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[4] See also Freixas and Rochet (1997) for a review of models of spatial differentiation in banking.
[5] Notice that location is not exogenous in these models. See for instance Hoover (1936) for a spatial price discrimination model with fixed locations.

because more distant competing banks take into account their own higher monitoring costs in their loan terms offers.

In short, spatial price discrimination models based on transportation costs entail the following empirical predictions: (i) a negative relationship between the loan rate and the borrower-lender distance, and (ii) a positive relationship between the loan rate and the borrower-closest competing bank distance.

2.1.2. Asymmetry of Information

In the transportation-cost models analyzed, spatial discrimination simply takes place through loan pricing. If the severity of the asymmetric information problem intensifies with distance, then banks can strategically use their informational advantage to create a threat of adverse selection for their rivals, and thus soften competition. Hauswald and Marquez (2006), for example, develop a model where the quality of a bank's information-generation process is a decreasing function of the distance separating it from the borrower.[6] Because banks receive more precise signals about close borrowers, competing banks face increasing adverse selection problems when approaching these locally captured firms. As a result, the informed relationship bank can charge higher loan rates to closer firms. An increase in distance between borrower and bank, however, curtails the bank's incentives to invest in information-generation activities. Consequently, distance weakens the bank's capability to extract rents from relationship borrowers, at the same time as it aggravates adverse selection problems for the lender with respect to transactional borrowers. Interestingly, the predictions in Hauswald and Marquez (2006) on loan pricing resemble those from transportation-cost models, i.e. loan rates decrease in the distance between the borrower and the relationship lender, but increase in the distance between the borrower and the competing transactional banks. As we will see later, the coinciding predictions on the role of distance on loan rates stemming from such dissimilar theoretical arguments poses serious identification challenges at the empirical level.

Spatial pricing models based on informational asymmetries also demonstrate that geographical credit rationing by banks can occur in equilibrium, where the underlying

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[6] Almazan (2002) analyzes a related model in which a bank's monitoring ability is also a decreasing function of the borrower-bank distance.

rationale is an adverse selection mechanism close in spirit to that in Stiglitz and Weiss (1981). For instance, the model in Hauswald and Marquez (2006) predicts that more distant applicants are more likely to be credit rationed, as banks face an increasing type II error; in other words, lending decisions become less efficient with increasing distance. A similar prediction is put forward by Carling and Lundberg (2005), who propose a simple theoretical model to rationalize the existence of geographical credit rationing. As in Hauswald and Marquez (2006), they also postulate that the precision of the signal that a bank receives when assessing a borrower's default probability decreases with distance, and show that banks optimally turn down credit applications from some distantly located firms. Carling and Lundberg (2005) illustrate the idea that physical distance aggravates the information asymmetry problem with a figurative paradigm, the *Church Tower Principle* (CTP). According to the CTP, a bank is on the church tower, and its visual ability to observe the quality of the surrounding firms is constrained by the distance at which the firm is located from the tower.

2.2. Empirical Evidence

2.2.1. Spatial Pricing

Few empirical studies have investigated whether banks engage in spatial pricing. The main difficulty in doing so is, in general, the lack of data that allows the econometrician to identify the effect of the borrower-lender distance on loan prices, while simultaneously controlling for other correlated factors. Such factors comprise the proximity of potential competitors, the geographic density (i.e. the size) of the banking market and the nature of the relationship between the lender and the borrower.[7]

Petersen and Rajan (2002) are the first to provide evidence of spatial loan pricing. They employ the 1993 National Survey of Small Business Finance (NSSBF) and find that a borrower located around the corner from the lender pays on average 126 basis points more than a borrower located 9 miles (the sample median) from the lender. While economically and statistically relevant, the estimated coefficient might be potentially

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[7] This concern follows from growing evidence on the complex web of relations tying market concentration, the nature of the bank-firm relationships, the cost of capital and physical distance. For instance, in highly concentrated banking markets we observe on average higher loan rates (see e.g. Degryse and Ongena (2006)) and (obviously) larger physical distances between banks and firms. Moreover, relationship lending typically corresponds to higher loan rates (Boot (2000)), but also to shorter distances between lenders and borrowers (Berger et al. (2005)).

biased due to the omission of the aforementioned control variables. Moreover, Petersen and Rajan (2002) use predicted distance rather than actual distance in their regressions, where they calculate predicted distance by projecting a set of variables associated to the credit quality of the firm on observed distance. For the reason that predicted distance is essentially a measure of firm transparency, their results primarily suggest that higher quality firms pay lower risk premia. Still, because more transparent firms have greater predicted distance, their findings can also be interpreted as evidence that banks engage in spatial loan pricing.

In a recent study, Degryse and Ongena (2005) provide more comprehensive evidence on the occurrence of spatial price discrimination in bank lending. They employ a dataset comprising the entire loan portfolio of an important Belgian bank that operates throughout Belgium. Unlike the data set employed by Petersen and Rajan (2002), the dataset used in Degryse and Ongena (2005) contains information on both the distance between the borrower and its lending bank and the distance between the borrower and other competing banks, as well as measures of banking competition. In addition, the dataset covers a narrow period of time (1995-1997), during which major technological shifts were unlikely to have occurred. As a result, Degryse and Ongena (2005) can empirically test hypotheses generated by static spatial pricing models. They find that an increase in traveling distance from zero to the sample median (about 4 minutes) drops the expected loan rate by 14 basis points. In addition, they obtain a symmetric and qualitatively similar impact on the loan rate resulting from an analogous increase in the distance to the closest (quartile) competitor, a result that may reflect linear transportation costs.[8] From a variety of exercises, Degryse and Ongena (2005) confirm that transportation costs is the likely cause of the spatial price discrimination documented for

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[8] The cost of one traveling minute equals 3.5 basis points in Degryse and Ongena (2005) and about 5.4 basis points in Petersen and Rajan (2002) (we infer the average speed in the U.S. from Agarwal and Hauswald (2006)). This disparity may largely pertain to differences between the two countries in the value of time, which we approximate by the ratio of their GDP per capita in 1995. Taking into account the computed factor reduces the gap in estimates to the point of insignificance. We find this result surprising given the differences in sample composition and population density between Belgium and the U.S. and given the evidence that the distance between banks and borrowers has steadily increased in recent times (Petersen and Rajan (2002)), whereas physical proximity apparently is still common in European markets (Corvoisier and Gropp (2001) and Buch (2005)).

Belgium, though they do not entirely exclude adverse selection as an alternative explanation.[9, 10]

In an ensuing study, Agarwal and Hauswald (2006) exploit a novel dataset from a major U.S. bank to analyze the effect of borrower proximity on credit-market conditions. In line with the findings in Degryse and Ongena (2005), Agarwal and Hauswald (2006) provide further evidence for loan price discrimination based on firm-bank distance. Their results suggest that a borrower located around the corner from the lender pays on average 195 basis points more than a borrower located 2.6 miles (the sample median) from the lender. In addition, an increase in a firm's traveling distance to the closest competing bank from zero to the sample median (0.55 miles) raises the loan rate by 55 basis points. Agarwal and Hauswald (2006) subsequently show that the statistical significance of these results nearly vanishes with the introduction of a proxy for the bank's proprietary information about the borrower (the bank's internal credit score). Accordingly, they conclude that physical distance is simply a proxy for a lender's informational advantage, hence providing support for models of price discrimination based on information asymmetries.[11]

2.2.2. Spatial Rationing

In theoretical models founded on information asymmetries (Hauswald and Marquez (2006) and Carling and Lundberg (2005)), geographical credit rationing may be the bank's optimal response to the deterioration of the quality of the information pertaining to distantly located firms. Yet it is not clear from an empirical point of view that geographical credit rationing exists. For instance, Petersen and Rajan (2002) find that applications from more distantly located firms are turned down more often in the U.S., though this effect has sharply decreased over time. In contrast, Agarwal and Hauswald (2006) find that the effect of distance on the likelihood of credit denial nearly vanishes once they properly control in their regressions for the credit quality of the borrowers, suggesting that the adverse selection problem relates to the quality of the firm, rather than

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[9] For instance, they find in one of these exercises that borrowers located in densely populated (i.e. urban) areas experience discrimination twice as harshly, which is probably related to higher traveling times in urban areas due to traffic congestion.

[10] In a recent study, Casolaro and Mistrulli (2007) find with an Italian dataset that spatial pricing is mainly confined to transactional loans, where asymmetries of information are likely to be less of an issue.

[11] The bank's internal credit score itself could also be the avenue through which loan officers price discriminate, a possibility not addressed in their paper.

to distance. Findings by Carling and Lundberg (2005) and Uchida, Udell and Watanabe (2007) indicate the absence of distance related credit rationing in Sweden and Japan, respectively.

We offer three potential, not necessarily mutually exclusive, explanations for the lack of conclusive evidence on the incidence of spatial credit rationing. First, as suggested in Petersen and Rajan (2002), technological progress may be indeed breaking the "tyranny of distance" in small business lending. Petersen and Rajan (2002) also document that this trend goes back as far as the late 1970s, which might explain why studies that employ more recent data do not find evidence of spatial credit rationing. Second, transportation costs (that are fixed per loan), rather than informational asymmetries, may be to a large extent driving the spatial price discrimination documented (as Degryse and Ongena (2005) argue). Third, we have disregarded so far the firm's incentives concerning the choice of a financing provider. Relationship lending has been often recognized as a market response to potential credit rationing, which primarily affects small firms. Relationship lending relies largely on "soft" information (e.g. a character assessment) that is accumulated over time by the bank through multiple interactions with the firm. Because this "soft" information is typically collected and processed at the local level (as it requires a physical presence) and since it is not easily transferable (see Petersen (2004) and Stein (2002)), relationship lending becomes less feasible across large distances. Consistent with this view, there is evidence that small firms seek to establish ties with local financial institutions (see Amel and Brevoort (2005), Kwast, Starr-McCluer and Wolken (1997)). This is corroborated by the findings of a strong negative correlation between the firm-bank distance and the likelihood that they build strong ties (Berger et al. (2005), Petersen and Rajan (2002)). This suggests that the empirical literature may have failed to detect spatial credit rationing simply because small firms internalize the pervasive effects of information asymmetries by seeking relationship loans from local banks.[12]

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[12] The evidence that the geographic density of banking markets has increased substantially (Petersen and Rajan (2002)) reinforces this claim.

2.2.3. Distance and Collateral Requirement

We are not aware of any empirical study investigating the effect of bank-firm distance on collateral requirements. Petersen and Rajan (2002) and Berger et al. (2005) find that collateralized loans are made, in average, at greater physical distance from the lender. However, they assume in their regressions that the causation effect goes from the collateral variable to the distance variable, hence disregarding potential endogeneity issues.[13]

We believe that an empirical test of the effect of physical distance on collateral requirements would shed light on the nature of the mechanisms underlying the documented spatial pricing. For instance, if information asymmetries are driving the observed spatial pricing, as adverted in Agarwal and Hauswald (2006), then the likelihood that the loan is secured by collateral should increase with distance (*ceteris paribus*). In contrast, if collateral requirements are not related to distance, then we can rely on the models based on transportation costs to explain spatial pricing (as in Degryse and Ongena (2005)).

We estimate the effect of the distance between borrower and lender (*Distance*) on the likelihood that the loan is secured by collateral (*Collateral*).[14] For this purpose we employ both the 1993 NSSBF and the Belgian dataset used by Degryse and Ongena (2005).[15] By applying the two datasets we can retain differences between Belgium and U.S. in banking markets landscapes as a possible route to reconcile the conflicting views of Degryse and Ongena (2005) and Agarwal and Hauswald (2006).

First, we present the results for the 1993 NSSBF data set of estimating a *logit* regression of *Collateral* as a function of firm, loan characteristics and *Distance*.[16] Our

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[13] In fact, a more correct interpretation of the theory (e.g. Hauswald and Marquez (2006)) is that distance has a casual effect on the severity of information asymmetries, and therefore on the probability that collateral is pledged. Collateral is perceived as a component in loan contracts that arises as a consequence of moral hazard (Boot, Thakor and Udell (1991)) and/or adverse selection (Bester (1985), Chan and Kanatas (1985) and Besanko and Thakor (1987)) in credit markets.

[14] We believe that in a sequential setting it is more sensible to assume that the choice of the lending bank (where the distance is implied) precedes the design of the loan contract. This is the case by definition when the firm has a pre-established relationship with the bank.

[15] Unfortunately, the two datasets contain different types of information, which restrains us from performing a totally controlled (i.e. ceteris paribus) empirical test.

[16] We use a specification similar to that in Chakraborty and Hu (2006) (model (1) in table 2, p. 97), who also employ the 1993 NSSBF, with the following differences: (i) we use the variable *Main Bank* as a proxy for the scope of the bank-firm relationship rather than the number of financial services, (ii) we correct the

findings, reported in table 1, indicate that an increase in distance between lender and borrower from zero to the sample median raises the probability of the loan being secured by collateral by 2%.[17] The effect is statistically significant at the 5% level but economically modest (as the sample median loan is secured by collateral). Second, we perform the same exercise using the Belgian sample. We report the results in table 2. Employing a specification identical to that used in Degryse and Van Cayseele (2000) (model (1) in table III, p. 105) we find a negative, though both economically and statistically negligible effect of *Distance* on *Collateral*. We also acknowledge a substantial difference in fit between the two models (in terms of pseudo-R^2); in particular, it seems that the information contained in the Belgian sample is far more relevant in predicting when a loan is secured by collateral.

These results are not necessarily inconsistent with the view that different mechanisms may drive spatial pricing discrimination in loan markets in U.S. and Belgium. In particular, our findings do not contradict the finding in Degryse and Ongena (2005) that transportation costs cause the discrimination they document for Belgium, whereas asymmetries of information seem to be an important determinant of the spatial pricing discrimination observed for the U.S.

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age of the firm by the duration of the relationship between bank and firm, and (iii) we that add to the model the bank-firm distance (the variable of interest), as well as a variable indicating whether the firm is located in a Metropolitan Statistical Area.

[17] Recent empirical evidence supports collateral as a device to solve moral hazard problems (see Cerqueiro, Degryse and Ongena (2007), who similarly employ the 1993 NSSBF, and Jimenez, Salas and Saurina (2006)).

Table 1

Incidence of collateral in the 1993 NSSBF

The table lists the coefficients and the standard errors from a logit regression where the dependent variable is one if the firm pledged collateral for the most recent loan. Besides the variables reported, each regression includes eight 2-digits SIC code dummies and three variables controlling for the type of organization of the firm. We refer to Chakraborty and Hu (2006) for a detailed description of the dataset and variables. The symbols *, ** and *** denote significance at the 10, 5 and 1% level, respectively.

Variable	Coefficient		Standard Error
Log of length of relationship (years)	-0.2	**	0.08
Main bank (0/1)	-0.2		0.15
Number of borrowing sources	0.0		0.03
Log of firm's age at start of relationship (years)	-0.2		0.21
Log of total assets	0.1	**	0.04
Debt-to-assets ratio	0.1		0.07
Profit-to assets ratio	0.0		0.02
MSA (0/1)	-0.1		0.14
Distance to lender (miles)	0.0	*	0.04
Number of Observations	1,656		
Pseudo-R^2 (%)	4.83		

Table 2

Incidence of collateral in the Belgian sample

The table lists the coefficients and standard errors from a logit regression where the dependent variable is one if the firm pledged collateral for the most recent loan. Besides the variables reported, each regression includes 49 two-digit NACE industry dummies, eight regional dummies, two year dummies, four dummies for the revisibility of the loan, five dummies for the purpose of the loan and three dummies for the governance characteristics of the firm. We remit to Degryse and Van Cayseele (2000) for a detailed description of the dataset and variables. The symbols *, ** and *** denote significance at the 10, 5 and 1% level, respectively.

Variable	Coefficient		Standard Error
Small firm (0/1)	0.7	*	0.34
Log of length of relationship (years)	0.5		0.10
Main bank (0/1)	-0.0	**	0.06
Log of loan size	0.4	**	0.08
Log of repayment duration	0.6	**	0.16
Distance to lender (minutes)	-0.0		0.06
Number of Observations	15,044		
Pseudo-R^2 (%)	80.29		

3. Organizational Structure and Credit

A recent body of literature draws attention to the relation between the organizational structure of a bank and its proclivity to provide credit to particular types of firms. This literature is founded on the view that relationship lending is associated with an intrinsically different lending process than transactional lending. As a result, a bank that favors relationship lending requires a different organizational form from one that specializes in arm's length lending (Berger and Udell (2002)).

Under relationship lending, loan officers collect proprietary information over time through frequent and personal contacts with their clients, as well as with the local community. This information is "soft" in nature, being difficult to store and credibly communicate to others, creating within a firm challenges at the organizational level. In particular, large banks, where multiple layers of management separate the agents who collect this "soft" information from the ultimate decision-makers, may have a competitive disadvantage in relationship lending (Berger and Udell (2002)) and Stein (2002)). In contrast, a complex organizational structure may give the bank an advantage in transactions-based lending, where the decisions are essentially based on automatisms that are fed on objective criteria, or "hard" information (e.g. balance sheet or income statement information).

Relationship lending is often seen as a powerful mechanism that allows a bank to overcome information asymmetries in credit markets (Boot (2000)), which should primarily affect small and opaque businesses. It is not surprising, as a result, that the recent organizational changes driven by consolidation in the banking industry (Berger et al. (1999)) have risen widely expressed concerns of a severe cut-back in small business lending. At the same time, these concerns have sparked a renewed interest by scholars in the broader relation between the organizational design of banks and lending conditions, in particular pertaining to small firms.

We start by providing an overview of the theoretical literature that studies organizational design and delegation of authority in the context of the banking industry. We subsequently review the relevant empirical evidence in light of this theory.

3.1. Theory

The economics literature has recently drawn substantial attention to the organizational design of firms, focusing in particular on the distinctive features of centralized and decentralized systems. The comparative performance of the decentralized and centralized allocation systems is typically analyzed on the basis of communication and information processing they entail, as well as on the incentives these systems induce on individual agents. Decentralization involves the distribution of information processing responsibilities across agents and minimal communication requirements, resembling a market-based system consistent with self-interested behavior of agents. This implies, however, that an agent who is a delegated decision-making authority tends to act in its self-interest, rather than the interest of the organization; in other words, decentralization may give rise to internal agency costs. If these incentive problems cannot be contractually remedied *ex ante*, the choice between a centralized and a decentralized system follows from the balance between these internal agency costs and communication or information processing costs. In particular, a decentralized system is generally the preferred design when these agency costs are not too severe (Mookherjee (2006)) or when the activity of the organization crucially depends on the agent's expertise (Berger and Udell (2002), Stein (2002)).

The fact that information is critical to the activity of lending makes the banking sector especially interesting to analyze organizational theories. Following the recent consolidation activity (Berger et al. (1999)), academics have increasingly focused their interest to theories that enabled them to assess the potential implications of the induced changes in the organizational structure of banks on small business lending.[18] The general upshot of these organizational theories is that small banks should be more inclined than their larger counterparts to lending to small and opaque firms. The main reason supporting this claim is the existence of organizational diseconomies that restrict the scope of large banks in their lending activities. While several theories have been proposed to motivate the existence of such organizational diseconomies, it seems that

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[18] There is ample evidence of the importance of a bank relationship to small firms in terms of credit availability (Petersen and Rajan (1994)), lower loan rates (Berger and Udell (1995) and Degryse and Van Cayseele (2000)) (in relationship duration and scope, respectively), reduced collateral requirements (Berger and Udell (1995)) and intertemporal risk sharing (Petersen and Rajan (1995)).

these diseconomies stem altogether from a common origin – the fact that small business lending and transactions-based lending are two inherently different activities.[19]

In small business lending, the bank bases largely its credit decisions on proprietary or "soft" information about the firm and its owner gathered through a multiplicity of contacts over time. This information allows the bank to assess the quality of the firm beyond what the financial statements of the firm (the "hard" information) might otherwise indicate; therefore it may confer this bank with a competitive advantage over banks that make their decisions merely on the basis of "hard" information, as they obtain a less precise signal of the creditworthiness of the firm. This "soft" information is, however, hardly verifiable by anyone else than the agent who produces it, and thus difficult to transmit to others or to store. Consequently, the inexistence of proper channels to communicate this "soft" information within a bank requires that internal adjustments be made at the organizational level. In particular, the bank should adopt a more general communication code as well as alternative channels of information transmission within the organization, which imposes a cost in terms of specialization (Crémer, Garicano and Prat (2007)). Put differently, the optimal organizational structure minimizes communication costs and expected information losses that result from both horizontal and vertical communication of subjective information.[20]

The subjective nature of "soft" information is essentially what makes small business lending different from transactional lending, and what restrains more centralized banks (e.g. a large bank holding company) from being as competent at relationship lending as decentralized banks (e.g. a small community bank). This point is demonstrated, for example by Stein (2002), who investigates how the organizational structure of a bank affects the incentives of loan officers to produce and use different types of information. Stein (2002) shows that loan officers in hierarchically complex organizations will have less incentive to collect "soft" information since they do not generally have decision making authority, and instead have to report that information to their superiors.[21] In contrast, a decentralized organization is more likely to reward research efforts of loan

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[19] See for example Boot (2000) and Berger and Udell (2002).
[20] See, for instance, Becker and Murphy (1992), Bolton and Dewatripont (1994), Radner (1993) and Garicano (2000).
[21] See also Aghion and Tirole (1997).

officers by ensuring that they will have access to funds that they can use to capitalize on that expertise. Of course, one can argue that "soft" information can be somewhat hardened and subsequently passed on "upwards".[22] The model in Stein (2002) suggests that in this case small banks may still be more efficient providers of relationship-based loans than large banks, since the incentives problem turns into a bureaucracy problem, i.e. loan officers reallocate excessively their effort from "field work" to report writing.

The prediction that a narrower gap between allocation and control promotes relationship lending is shared by Berger and Udell (2002), though they rely on a different mechanism to motivate the existence of organizational diseconomies in large banks. Berger and Udell (2002) address the key role that a loan officer plays as a repository of "soft" information within a bank and focus on the agency problems that this gives rise to. As suggested before, these agency problems stem from the intangible nature of "soft" information and, in particular, from the difficulty in disseminating this information within an organization. This creates a trade-off in terms of the efficiency of a decentralized system. On the one hand, as asserted in Stein (2002), banks have to delegate more authority to their loan officers, since loan officers are in a unique position to personally contact with the firm, its owner and the local community, i.e. they have the greatest exposure to "soft" information. On the other hand, delegation may aggravate agency problems if the incentives of the loan officer are not properly aligned with those of the bank.[23] The implications arising from this trade-off have been extensively analyzed in the principal-agent theory. According to this theory, a bank that specializes in relationship loans should invest more in monitoring their loan officers as well as in the performance of their loans (Udell (1989), Berger and Udell (2002)).[24] Ultimately,

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[22] Petersen (2004) argues that the categorization of information into "hard" and "soft" is often too restrictive. He further suggests that "hard" and "soft" information are the extremes of a continuum along which information can be classified. An illustrative example of hardening "soft" information is a loan officer filling a report where he evaluates several attributes of an applicant (e.g. honesty and managerial competence).

[23] These agency problems may result in the collusion between the loan officer and the firm (Tirole (1986)), manipulation of "soft" information (Godbillon-Camus and Godlewski (2005), Ozbas (2005)), excessive use of "discretion" in defining loan terms (Cerqueiro, Degryse and Ongena (2007)), overlending or hiding a deteriorating condition of a borrower (Berger and Udell (2002)).

[24] Godbillon-Camus and Godlewski (2004) use a principal-agent framework to study a loan officer's incentives to manipulate the signals conveyed about potential borrowers, which are based on "soft" information. They suggest that an adequate compensation scheme solves *ex ante* these agency problems.

because these monitoring costs increase with the hierarchical complexity of the organization, small decentralized banks are endowed with another source of comparative advantage in small business lending.

The theoretical models presented so far neglect the fact that the competitive structure of credit markets (and hence lending conditions) are determined by the reach of all the competing banks, which in turn largely depend on their organizational structure. In other words, the organizational choices made by a bank's rivals bound its own scope concerning lending decisions. Degryse, Laeven and Ongena (2007) bridge this gap by investigating how differences in rival banks' organizational structures shape banking competition. They start by bringing into a theoretical model the evidence that banks engage in spatial price discrimination (Degryse and Ongena (2005)) together with the view that organizational structure affects the nature of the lending technology (Stein (2002)). Their model extends the Hotelling (1929) location differentiation framework in that they allow a bank's organizational structure to act as a lending technology that determines a bank's geographical reach. Though they assume that the marginal cost associated to distance (transportation or monitoring costs) is identical across firms and banks for one visit, the required number of visits or monitoring effort is determined by the lending technology. For instance, large, hierarchical organizations with automated decision-making mechanisms have an economic advantage at lending to distant firms since their technology is more cost-effective; because these organizations rely to a larger extent on "hard" information, they will communicate less often and in impersonal ways with their borrowers, resulting in lower distance-related costs.

3.2. Empirical evidence

3.2.1. Organizational structure and information use within a bank

A recent stream of empirical work delves into the transmission of different types of information within an organization. Liberti and Mian (2006) investigate the effect of credit approval at higher hierarchical levels on the importance of "hard" and "soft" information in the credit approval decision.[25] They use a dataset consisting of detailed information from the credit folders of a multinational bank in Argentina. The data

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Ozbas (2005) analyze the optimal level of organizational integration when the agents' (i.e. loan officers') access to resources depends on the signals they communicate to their superiors.

[25] See also Liberti (2005).

contains objective as well as subjective assessments collected by the loan officer during the application process. This dataset also contains information on how far in the hierarchical ladder (and where) the application needs to travel before reaching the final credit decision. Consistent with organizational theories, Liberti and Mian (2006) find that "hard" information gains importance while "soft" information loses importance when going up the hierarchical ladder. They also find that these changes in "hard" and "soft" information sensitivity are particularly abrupt when the higher-level officer is located in a different branch. This is in line with the view in Petersen (2004), who asserts that the subjective nature of "soft" information makes its communication across large distances difficult. Liberti and Mian (2006) also find that the decrease in sensitivity to "soft" information is less pronounced when information is assembled by more experienced loan officers. They cannot say, however, whether this result is due to a "reputation effect" or due to superior communication skills of more experienced loan officers (Ozbas (2005); see also Crémer, Garicano and Prat (2007))

Despite providing support to the view that communicating subjective information across hierarchies is costly, Liberti and Mian (2006) are unable to isolate the channel driving this effect. Their results strongly suggest that it is the physical distance (and not necessarily the hierarchical gap) generating the loss of credit sensitivity to "soft" information, which Casolaro and Mistrulli (2007) define as informational distance. Consistent with this view, Casolaro and Mistrulli (2007) find that loan rates charged by Italian banks correlate negatively with the distance between the borrower and the bank's headquarters, a measure of the bank's ability to extract "soft" information from the borrower. Mian (2006) employs data from Pakistan and also shows that the geographical distance between a foreign bank's headquarter and the local branches leads the bank to shy away from relationship lending. In contrast, Liberti (2004) provides support for the loan officers' incentives view in Stein (2002) by demonstrating that relationship managers who receive more authority put more effort into collecting "soft" information from their corporate clients.

In short, it is not clear whether the depreciation of "soft" information across hierarchies results mainly from failures in the communication process, incentive problems or from agency problems that eventually reduce the reliability and usefulness of

"soft" information to the eyes of higher hierarchies. This issue remains an open question that awaits further research.

3.2.2. Organizational structure and information use across banks

The theory predicts that organizations where there is a narrower gap between allocation and control are more efficient providers of relationship-based small business loans. There has been a recent considerable research effort to empirically test this premise, primarily in response to the public concerns that the financial services industry consolidation trend might result in the reduction in the availability of credit to small firms (Berger et al. (1999)). These concerns are founded on the fact that small businesses have crucially relied on banks to satisfy their credit needs (Cole, Wolken and Woodburn (1996), Berger and Udell (1998)), and further reinforced by the evidence that large banks allocate smaller percentages of their assets to small business loans than do small banks (Berger and Udell (1996), DeYoung, Goldberg and White (1999), Keeton (1995), Peek and Rosengren (1996), Strahan and Weston (1996)). Moreover, it is empirically well established that small banks are better able to collect and act on "soft" information (Scott (2004), Cole, Goldberg and White (2004), Berger et al. (2005), Uchida, Udell and Watanabe (2007), Casolaro and Mistrulli (2007)), which presupposes that the organizational design of small banks enables them to shoulder such screening and monitoring efforts. Contradictory evidence is provided, for example, by Jayaratne and Wolken (1999); they find that the probability that a small firm is credit rationed does not significantly depend on the presence of small banks in the market, suggesting that small banks do not have a cost advantage in making small business loans. A similar conclusion can be drawn from Black and Strahan (2002), who find that the liberalization of banking laws in the U.S. increased the rate of creation of new businesses, though it simultaneously reduced the number as well as the share of small banks.

The documented evidence provides insufficient indication that a bank's organizational structure affects credit availability to small businesses. In fact, the theory clearly states that it is organizational complexity rather than bank size shaping a bank's proclivity to make small-business loans. Not surprisingly, studies that analyze the effect of organizational complexity on lending conditions to small firms also provide inconclusive evidence, which may be explained by the variety of dimensions of

organizational complexity these studies employ. For instance, Strahan and Weston (1998) find that the organizational complexity of a holding company (measured as the total number of bank subsidiaries and the number of states in which it operates) is not significantly associated with its propensity to lend to small firms. In contrast, Keeton (1995) finds that banks with a large number of branches and banks owned by out-of-state holding companies devote lower proportions of their deposits to small businesses than do comparable banks. DeYoung, Goldberg and White (1999) control for the confounding effects of a bank's size and age and obtain similar results. Degryse, Laeven and Ongena (2007) demonstrate that the presence of larger and hierarchically organized rivals in the vicinity reduces the geographical reach of the lending bank and assuages spatial pricing.

Studies that focus on the effects of mergers and acquisitions (M&As) are also relevant in this context as M&As should involve significant changes in organizational focus. This literature could not agree on an unambiguous effect of consolidation in banking markets on credit supply to small firms. The available evidence indicates that small bank M&As have a positive effect on small business lending (Strahan and Weston (1996, 1998)), whereas large bank M&As have the opposite effect (Berger et al. (1998), Peek and Rosengren (1998), Sapienza (2002)). These results are particularly interesting as they rule out the existence of a monotonic relation between the organizational complexity of a bank and its propensity to lend to small businesses. In particular, these results suggest that portfolio-diversification considerations or regulatory constraints may prevent low-capitalized, small banks from fully concentrating on relationship loans.

Substantial academic interest has been also devoted to the countervailing force that technological progress may play on the organizational advantage that small banks apparently have in small business lending. The exponential development in information and communication technologies led to the emergence of automated decision mechanisms (e.g. credit scoring), which enable organizational complex organizations to generate large volumes of small loans at distance (Cyrnak and Hannan (2001)) and at low cost (Berger and Udell (1996)).[26] Consistent with this view, Frame, Srinivasan and Woosley (2001) and Frame, Padhi and Woosley (2001) find that the adoption of small

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[26] See Altman and Saunders (1997), Hand and Henley (1997) and Mester (1997) for detailed information about the introduction of credit scoring models in the banking industry.

business credit scoring by large banks substantially increased their portfolio share of small business loans. In addition, Berger, Frame and Miller (2005) show that the adoption of small business credit scoring by large banks is associated with expanded credit availability for risky, small businesses. Yet, many firms, perhaps due to poor credit histories or to intrinsic opaqueness, may not be eligible for such a scored-based, transactional loan. While a large bank is likely to ration credit to these applicants, small banks may still be able to offer these firms the traditional relationship-driven loans.

4. Conclusion

A growing body of theoretical and empirical literature studies the real effects of the recent changes at the organizational as well as operational level in the banking industry. We review the literature that focuses on the effects of both bank-firm distance and bank organizational structure on lending decisions.

Despite the several empirical attempts to test the existing theories, many questions remain unanswered. Concerning the role of distance, there is strong evidence of spatial pricing by banks, but it is still unclear what is the underlying mechanism driving it. In particular, we question: (i) if transportation costs drive spatial pricing, then why has the distance between firms and banks increased steadily (leading to such an apparent inefficient outcome)? (ii) if information asymmetry is instead the main driving mechanism, why there is so little evidence on the occurrence of spatial credit rationing? Concerning organizational structure, it is not clear the extent to what small banks have the widely preached advantage in relationship lending. The incongruous empirical findings suggest that, if present, that advantage should not be immense; but even more puzzling is the nature of that potential advantage, which can result from agency or communication costs that banks face internally.

In short, despite notable research efforts, the complex net of relations linking distance, organizational structure and lending conditions is far from dismantled. As a result, the most likely conclusion springing from this chapter is that further research is definitely warranted.

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