

Chapter 2

Financial Innovation, Organizations, and Small Business Lending

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Abstract Technological innovation and changes in bank organizational structure have each had a significant effect on small business lending. Both of these phenomena have a spatial dimension. Technological innovation may allow banks to lend at a longer distance if it significantly diminishes the importance of direct customer contact. If consolidation produces fewer banking offices, then the average distance between borrowers and lenders will necessarily increase. The impact of these effects on small business lending, however, greatly depends on the extent to which hard information about borrower quality is a good substitute for soft information. This chapter assesses the theoretical and empirical evidence on the extent to which these changes will likely effect small business lending.

2.1 Introduction

There has been a considerable amount of interest in how technological innovation and changes in bank organizational structure have affected small business lending. Technological innovations in recent decades have changed the nature of loan underwriting in a variety of ways. These include, for example, financial statement analysis using spread sheet software; bank–borrower interface through Internet communication; and statistical analysis of borrower quality through credit scoring. Changes in bank organizational structure may have also had an impact on small business lending. Banking industry consolidation has led to an increase in the average size and complexity of banking institutions. This could affect small business loan underwriting if larger and more complex institutions underwrite small business loans differently than smaller and less complex institutions.

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Both of these phenomena have a spatial dimension. Technological innovation may allow banks to lend at a longer distance if it significantly diminishes the importance of direct customer contact. With respect to organizational structure, if consolidation produces fewer banking offices and more concentration, then the average distance between borrowers and lenders will necessarily increase. Moreover, these two phenomena may be related in the sense that increases in efficiency from technological innovation may promote consolidation by reducing the importance of having smaller banks located closer to their borrowers.

The magnitude of these effects on small business lending, however, greatly depends on the extent to which hard information about borrower quality is a good substitute for soft information. On the one hand, hard information is quantifiable and easily stored and can be produced and communicated over long distances. Examples of hard information include financial statements and credit scores. On the other hand, soft information cannot be easily stored; and it can neither be easily generated over long distances, nor be easily communicated over long distances or within large and complex banking organizations. Examples of soft information include assessments of managerial skill, managerial integrity, and strategic decisions. Soft information is likely generated at the loan officer level and is most associated with a type of loan underwriting known as “relationship lending”. If technological innovation significantly expands the ability of banks to produce hard information, then banks might substitute hard information for soft information – and, therefore, substitute transactions-based lending for relationship lending. This could occur if innovations make hard information less expensive to produce, and/or if these innovations improve the informativeness of hard information relative to soft information. This, in turn, could reduce the importance of small banks and rationalize the consolidation of the banking industry.

In this chapter, we offer an assessment of the academic literature on these phenomena. Specifically, we examine the theoretical and empirical evidence on the extent to which technological innovation and changes in bank organizational structure have an effect on small business lending and the distance between borrowers and lenders. We begin with an overview of the literature on relationship (vs. transactions) lending and its centrality to the debate over distance and lending. Then we turn to an assessment of the research on the impact of technological innovation on small business loan underwriting followed by an assessment of the literature on bank consolidation and organizational form and their impact on small business lending.

2.2 Relationship (Versus Transaction) Lending and Distance

The academic information-based literature on bank lending started from the perspective that bank lending differed from public debt in terms of the production of private information (e.g., James 1987, Lummer and McConnell 1989, Rajan 1992). With some risk of oversimplification, this led to the view that bank lending – particularly small business lending – was best characterized as relationship lending.

Relationship lending emphasizes the accumulation of soft information over time and over the provision of multiple products. The empirical evidence on relationship lending suggested that borrowers benefit from better credit terms and credit availability as the relationship grows in strength (e.g., Petersen and Rajan 1994, 1995, Berger and Udell 1995, Harhoff and Körting 1998, Elsas and Krahnen 1998).¹

A more refined view of small business lending emphasized a distinction between relationship lending and transactions lending (Boot and Thakor 2000, Cole et al. 2004, Berger et al. 2005, Agarwal and Hauswald 2007). Transactions lending, which is based on hard information, may come in a variety of forms, including financial statement lending, small business credit scoring, factoring, asset-based lending, equipment lending, real estate-based lending, and leasing. The initial emphasis in this research was based on the assumption that transactions lending was better suited for relatively transparent small businesses, while relationship lending was better suited for more opaque small businesses. Additional work in this area, however, suggests the possibility that all of the transactions-based lending “technologies” except financial statement lending may be well suited for many opaque small borrowers (Berger and Udell 2006, Berger and Black 2007, Uchida et al. 2007). These technologies do not focus on the overall quality of the firms (which may be quite opaque), but, rather, they focus on the quality of specific assets that are used as collateral and which can be valued using hard information, e.g., accounts receivable (factoring), accounts receivable and inventory (asset-based lending), and equipment (equipment lending).

Another important distinction between relationship lending and some of the transactions-based lending technologies is cost. Because relationship lending is labor intensive, it is likely to cost much more than many of the transactions-based lending technologies; particularly financial statement lending, credit scoring, equipment lending, real estate-based lending and leasing (DeYoung et al. 2004). This is consistent with empirical work that shows that large banks tend to earn lower risk-adjusted yields and tend to charge lower loans rates on small business loans (e.g., Hannan 1991, 1997, Berger and Udell 1996, Carter et al. 2004, Berger 2006).

On the spatial dimension, relationship lending may also differ significantly from transactions lending. Specifically, it has been hypothesized that in order for relationship lenders to collect soft information they need to be located close to their borrowers. This proximity enables loan officers to personally contact their borrowers at a lower cost and to use their knowledge of the local community to better assess managerial skills, integrity, and strategic decision making (e.g., Sussman and Zeira 1995, Hauswald and Marquez 2006). Transactions lending, in contrast, has no such spatial limitation because the (mostly electronic) generation, storage, and transmission of hard information is not likely dependent on distance.

It is difficult to directly test the spatial hypotheses on distance and lending (including the hypothesis that distance matters to relationship lending but not to

¹For a review of the relationship lending literature see Berger and Udell (1998), Boot (2000) and Elyasiani and Goldberg (2004).

transactions lending) because the individual lending technologies are generally not observable by the empiricist.^{2,3} Nevertheless, the findings in some studies are suggestive. For example, some studies have found that larger banks tend to lend at longer distances and depend more on hard information in loan underwriting – which would support the hypotheses on distance and lending if large banks emphasize transactions loans and small banks emphasize relationship loans (Berger et al. 2005, Cole et al. 2004, Uchida et al. 2008, forthcoming). Another approach emphasizes an analysis of the residuals estimated from loan pricing regressions. Using this approach one study found that the soft information component of loan underwriting diminishes with distance (Agarwal and Hauswald 2006). Another study using a different methodological structure found that greater distance led to more deviation from hard information-based loan pricing (Cerqueiro et al. 2007). However, they interpreted this result as attributable to risk and not to the accumulation of soft information.

2.3 Innovation and Small Business Loan Underwriting

There is little doubt that technological and financial innovations over the past three decades have had a profound effect on the banking industry. There is no shortage of examples of this phenomenon. ATM machines and the shift to an electronic payments system, for example, have profoundly affected the way in which banking services are delivered. Innovation in back-office technology was an important factor driving the securitization of the residential mortgage market.⁴ Many researchers have also argued that technological innovation has had an equally powerful effect on small business loan underwriting essentially arguing that technological innovation has reduced the absolute and relative cost of transactions-based lending vis-à-vis relationship lending leading to increased credit availability and substitution effects.⁵ That is, innovation could lead to an increase in credit availability to formerly rationed small businesses for whom information production becomes

²For a rare exception see Agarwal and Hauswald (2007) who are able to distinguish between relationship lending and transaction lending at the loan level.

³The lack of data on lending technologies also makes it difficult to test the impact of market structure on credit availability to small businesses. Some theoretical work suggests that increased competition impedes relationship lending (but not transactions lending) (Petersen and Rajan 1995); but other theoretical work (Boot and Thakor 2000) – and the structure, conduct and performance hypothesis – suggests the opposite. Empirical evidence on the importance of these effects is mixed, possibly in part because it suffers from this inability to isolate relationship loans (e.g., Laderman 2006, Carbo-Valverde et al. 2009).

⁴For a more comprehensive analysis of technology driven changes in the banking industry over this period see DeYoung et al. (2004).

⁵See, for example, Petersen and Rajan (2002), Berger and Udell (2006), and DeYoung et al. (2007). See also Hauswald and Marquez (2003) for a theoretical model of the effect of advances in information technology on credit markets and an analysis of market structure and the incentives to gather information.

cost-effective. It could also lead to a substitution effect where the decreased relative cost of these transactions-based technologies shifts the optimal underwriting technology away from relationship lending for some small businesses. In this section, we explore this argument and suggest the possibility that a more circumspect view may be appropriate.

It is easy to list examples of where technological innovation has likely reduced the cost of delivering transactions-based lending technologies. For instance, communications and software innovations have likely reduced the cost of monitoring accounts receivable, the essential collateral component of two important lending technologies – factoring and asset-based lending. Equipment lending offers another example. Some equipment liquidations are now conducted by liquidators who use online auctions. Many of these liquidators also act as equipment appraisers relying on information compiled in databases from their liquidation activities.⁶ And, of course, the canonical example cited in the academic literature is the introduction of spreadsheet software used to spread and analyze borrower financial statements.

Somewhat surprisingly, however, there is virtually no direct evidence presented in the literature on the magnitude of the cost savings from these innovations nor is there evidence on whether they have significantly improved the ability of lenders to assess borrower quality. For example, no one denies that spreadsheet software has made “number crunching” easier than it was two decades ago. However, it is not clear that the (“old-fashioned” method of) manual spreading of financial statements and the manual calculation of financial ratios (in the pre-software era) was a particularly expensive or time-consuming activity. It was mostly conducted by relatively low-paid credit analysts (at least, relative to loan officers) and may have involved only 20-30 minutes of time for a good analyst (based on my own personal experience as a bank credit analyst). Thus, when amortized over a \$1,000,000, or even \$500,000, loan, this innovation may not have been as economically important as some have suggested in the academic literature.

The innovation in small business lending that has received the most attention in the recent academic literature is small business credit scoring. But despite the abundance of research on this innovation there are still some interesting and unanswered questions about the nature of its overall impact. On the consumer side, credit scoring was first used in the 1950s and is now widely used for most types of consumer lending. It was adapted by large banks to the micro-end of small business lending in the 1990s for loans below a specified ceiling set by the adopting banks – the ceiling appears to range from \$100,000 to \$250,000. The credit scoring models themselves appear to combine data on the entrepreneur from credit bureau reports with mercantile credit information from third party information exchanges such as Dun and Bradstreet, along with other entrepreneur and firm information.⁷

⁶See Udell (2004) for more detail on equipment lending, equipment appraising, and liquidation.

⁷Dun and Bradstreet is the world's largest third party information exchange. It is similar to a credit registry except that it is a for profit private enterprise.

The general finding in the empirical literature on small business credit scoring is that the use of this technology is associated with an increase in lending to marginal borrowers and an increase in overall lending (Frame et al. 2001, Berger et al. 2005). However, it is not clear from the empirical evidence whether the benefits from the adoption of credit scoring come solely from decreased underwriting costs or they come in part from an improvement in failure prediction power possibly at the expense of a decrease in failure prediction power (DeYoung et al. 2004).⁸ Another somewhat unresolved issue is the extent to which the increase in commercial lending from small business credit scoring is due to a substitution from consumer lending. It is possible that many loans that used to be underwritten as consumer loans to entrepreneurs (and booked in a different portfolio) are now underwritten with small business credit scoring (and booked in the commercial and industrial loan portfolio).

As we noted above, one of the potential implications of these types of technological and financial innovations in SME financing is a shift toward more transactions-based lending that would allow banks to lend at a longer distance. There have been a number of studies that have found evidence consistent with this hypothesis. Specifically, studies have found that the average distance between small business borrowers and their banks has increased over the past several decades. The first of these studies estimated that the median small business borrower–lender distance grew from 2 miles to 5 miles from 1973 to 1993 (Petersen and Rajan 2002). Subsequent research on the growth of borrower–lender distance and the increase in out-of-market lending has shown generally similar effects (Hannan 2003, DeYoung et al. 2007, Degryse and Ongena 2005, Brevoort and Hannan 2006).⁹

While the evidence of a growing distance between borrowers and lenders is consistent with the substitution of hard information for soft information (i.e., transactions-based lending technologies for relationship lending), it is also consistent with other hypotheses. In particular, in the US the finding could be an artifact of the dismantling of restrictions on branch and interstate banking that occurred during this period. It is also possible that the increase in distance is confined to transactions-based lending and not due to a substitution between relationship lending and transactions-based lending or due to an increase in the distance at which relationship lending takes place. That is, small businesses with prior transactions-based loans may have simply changed the banks (from local to less-local) from which they procure these transactions-based loans but not their relationship loans.

⁸A related issue is whether information innovation necessarily benefits borrowers. It has been shown theoretically that in some cases innovation can lead to more capture, increasing borrower costs and lender profits (Dell’Ariccia and Marquez 2004). One paper has been able to examine the issue of capture using data and a methodology that can distinguish between relationship loans and transactions loans at the loan level. It finds evidence of capture in relationship loans (Agarwal and Hauswald 2007).

⁹One study found that *within* nine US metropolitan areas the distance between borrowers and their lenders actually decreased between 1997 and 2001 (see Brevoort and Hannan 2006, Brevoort and Wolken 2009: Chapter 3, this volume).

Finally, it is not clear that the observed changes in distance are large enough to affect soft information production. That is, an increase of 3 miles in the distance between a borrower and lender may not have an appreciable impact on the ability of a loan officer to accumulate soft information about his or her borrowers.¹⁰

Additional evidence in the literature offers insight on these issues. Consistent with the interpretation that transaction lending does not require a strong relationship, it has been shown that small business borrowers are far less “loyal” to their banks when it comes to motor vehicle loans, equipment loans, and mortgages than they are to lines of credit which are more likely to be relationship-based (Berger and Udell 1995). Petersen and Rajan (2002) concluded that their finding of an observed increase in distance was mostly due to a greater use of information technology (which could be interpreted as increased use of transactions lending). They drew this conclusion because their distance findings controlled for consolidation and other factors, and because bank employment normalized by bank lending shrank (consistent with a technology-labor input substitution). Unlike Petersen and Rajan, DeYoung et al. (2007) were able to directly link changes in distance to a specific lending technology. They found that recent increases in borrower-lender distance are related to the use of small business credit scoring although they also find a secular trend toward increasing distance unrelated to credit scoring that might be related to other technological innovation.

2.4 Banking Industry Consolidation and Small Business Lending

The world has seen a global trend toward banking industry consolidation. This trend has been associated with a decrease in the number of small banks and an increase in the average size and complexity of banks. Theoretical arguments suggest that small banks might be best suited to deliver relationship lending because their simple organizational structure does not require the internal transmission of soft information as part of the loan underwriting process (Stein 2002). Thus, banking consolidation could have negative consequences for small businesses if a reduction in small banks leads to a reduction of relationship lending, and transactions lending is not a good substitute for some types of opaque SMEs.

Policy concern over this issue is heightened by the fact that large banks appear to have a lower propensity to lend to small businesses based on simple balance sheet calculations showing that large banks allocate a lower fraction of their assets to small business lending than do small banks (e.g., Berger et al. 1995, Keeton 1995, Strahan and Weston 1996, Alessandrini et al. 2008 on the different asset allocation

¹⁰ Arguably, loan officers accumulate information about their borrowers by visiting them personally. The additional time involved in traveling an extra 3 miles may not be economically significant. That is, as long as the increased distance does not move the borrower out of the local “information market”, the 3 extra miles may not matter.

of acquired banks). In addition, a number of studies have found that larger institutions tend to have weaker relationships with their borrowers, and they tend to lend less on soft information. In addition, larger institutions tend to lend to older and larger SMEs with stronger financial statements (e.g., Haynes et al. 1999, Cole et al. 2004, Scott 2004, Berger et al. 2005). There is also evidence that as lending decisions are made higher in the organizational structure there is less emphasis on soft information (Liberti and Mian 2009).

In addition, there is evidence that functional distance as well as operational distance may matter (for this distinction, refer to Alessandrini et al. 2009). Operational distance refers to the distance between the borrower and the lender as discussed above. Functional distance refers to the distance between the branch (or location) where a loan is originated and the headquarters in the banking organization where the lending decision is made. Empirical evidence suggests that credit availability and innovation adoption are inversely related to functional distance (Alessandrini et al. 2008, 2009: Chapter 5 this volume). These findings on operational and functional distance are suggestive of large banks being less able to produce soft information and less inclined to make relationship loans and implying that banking consolidation could have a negative effect on small businesses.

There is also evidence that suggests that the impact of consolidation and the associated shift in the size structure of the banking market on small business lending may be relatively benign. One study found that the likelihood of an SME receiving a line of credit from a small bank is roughly proportionate to the presence of small banks in the local market (Berger et al. 2007). Other studies found that while merged banks tend to reduce their small business lending, other banks in the local market tend to increase their small business lending (Berger et al. 1998, Alessandrini et al. 2008). And, yet another study found that whether a merged bank decreases its small business lending depends on how the acquisition is handled organizationally. If the acquired bank is allowed to keep its charter and operate as a separate subsidiary, small business lending tends not to change after the acquisition. However, the merging of charters tends to be associated with a reduction in small business lending (Hancock et al. 2006). The finding in DeYoung et al. (2007) that the most important factor driving recent increases in borrower–lender distances was the adoption of small business credit scoring suggests that innovation has made distance less important for some types of borrowers. Consistent with this conclusion is recent evidence that most of the increase in out-of-market small business lending has been confined to the smallest category of loans (i.e., loans under \$100,000 which are most likely to be credit scored) (Brevoort 2006).

Consequently, forecasts of the demise of small business lending in a post-consolidation world may be premature. To the extent that large banks replace community banks through mergers and acquisitions, the small business transaction lending that was formerly done by the acquired community banks can be assumed by the surviving large banks without affecting underwriting costs. Moreover, demand for relationship lending may impose a limit on consolidation. That is, consolidation may proceed only to the point where enough community banks (or small bank affiliates of large banking holding companies) survive to ensure that a sufficient amount

of relationship lending is provided to small businesses that need it (DeYoung et al. 2004).¹¹ Alternatively it may be possible for large banking groups to adopt a flexible decentralized strategy, maintaining local chartered banks with their proximity-relationship assets, at least in some percentage (Hancock et al. 2006).

2.5 Conclusion

In this chapter, we have examined the academic research on the impact of innovation and organizational change on bank small business lending. Technological innovation appears to have had a significant impact on how many small business loans are underwritten. Though it seems likely that one type of lending, relationship lending with its emphasis on soft information, has been less affected by technological innovation than the other lending technologies which are based on hard information. This differential impact may affect how banks interact spatially with their borrowers. The balance of the literature suggests that innovations in transactions-based technologies appear to be associated with the ability of banks to lend to these borrowers at longer distances. However, the literature also suggests that relationship lending likely still requires the proximity of the borrower to the lender. In addition, it appears that relationship lending is best delivered by smaller banks because of problems associated with producing and communicating soft information in large and complex banking institutions. Thus, it appears that increases in bank-borrower distance driven by the consolidation of the banking industry are likely to be mostly associated with loans that are underwritten by larger banks using transactions-based lending technologies and not relationship lending. Moreover, the necessity that relationship lending be underwritten by small local banks – or, at least, small affiliates of large banking organizations – probably imposes a limit on the nature and amount of banking industry consolidation. Estimating this limit with any precision, however, appears quite difficult.

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¹¹ One recent paper emphasized that the viable model for community (i.e., small) banks in the long run is likely one that emphasizes “personalized service and relationships based on soft information” (DeYoung et al. 2004). The authors identified the “profitable” sector of the community banking segment of the industry in the US today (i.e., the sector whose average ROE is equal to the average ROE of large banks). They suggested that the number of these ‘profitable’ small banks may be the best forecast of how many community banks might ultimately survive industry consolidation. However, they also emphasized that estimating how many community banks there will be in the future is also a “fool’s” game.

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The Changing Geography of Banking and Finance

Alessandrini, P.; Fratianni, M.; Zazzaro, A. (Eds.)

2009, XII, 300 p. 18 illus., 7 illus. in color., Hardcover

ISBN: 978-0-387-98077-5