

Berger, Allen N.; Frame, W. Scott

**Working Paper**

## Small business credit scoring and credit availability

Working Paper, No. 2005-10

**Provided in Cooperation with:**

Federal Reserve Bank of Atlanta

*Suggested Citation:* Berger, Allen N.; Frame, W. Scott (2005) : Small business credit scoring and credit availability, Working Paper, No. 2005-10, Federal Reserve Bank of Atlanta, Atlanta, GA

This Version is available at:

<http://hdl.handle.net/10419/101032>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

Small Business Credit Scoring and Credit Availability

Allen N. Berger and W. Scott Frame

Working Paper 2005-10  
May 2005

## Small Business Credit Scoring and Credit Availability

Allen N. Berger and W. Scott Frame

Working Paper 2005-10

May 2005

**Abstract:** U.S. commercial banks are increasingly using credit scoring models to underwrite small business credits. This paper discusses this technology, evaluates the research findings on the effects of this technology on small business credit availability, and links these findings to a number of research and public policy issues.

JEL classification: G21, G28, G34, L23

Key words: banks, credit scoring, small business

---

The opinions expressed do not necessarily reflect those of the Federal Reserve Board, the Federal Reserve Bank of Atlanta, or their staffs. The authors thank Will Jackson for encouraging us to write the paper, Leora Klapper for helpful suggestions, and Cordell Wise and Marc Bernstein for insightful conversations. The authors also thank Nate Miller, Mike Padhi, Aruna Srinivasan, Larry White, and Lynn Woosley for prior coauthored work on small business credit scoring without which this paper would not be possible. The views expressed here are the authors' and not necessarily those of the Federal Reserve Bank of Atlanta or the Federal Reserve System. Any remaining errors are the authors' responsibility.

Please address questions regarding content to Allen N. Berger, Senior Economist, Board of Governors of the Federal Reserve System, Washington, D.C. 20551, Senior Fellow, Wharton Financial Institutions Center, Philadelphia, Pennsylvania 19104, [aberge@frb.gov](mailto:aberge@frb.gov), or W. Scott Frame (contact author), Financial Economist and Associate Policy Adviser, Federal Reserve Bank of Atlanta, 1000 Peachtree Street, N.E., Atlanta, Georgia 30309, [scott.frame@atl.frb.org](mailto:scott.frame@atl.frb.org).

Federal Reserve Bank of Atlanta working papers, including revised versions, are available on the Atlanta Fed's Web site at [www.frbatlanta.org](http://www.frbatlanta.org). Click "Publications" and then "Working Papers." Use the WebScriber Service (at [www.frbatlanta.org](http://www.frbatlanta.org)) to receive e-mail notifications about new papers.

## SMALL BUSINESS CREDIT SCORING AND CREDIT AVAILABILITY

### 1. Introduction

Small businesses are an important part of the economy of virtually every nation. In the U.S., for example, small businesses account for about half of all private-sector employment and non-farm gross domestic product according to the Small Business Administration.<sup>1</sup> Nonetheless, small firms have historically faced significant difficulties in accessing funding for creditworthy (i.e., positive net present value) projects due to a lack of credible information about them by potential providers of funds. Small businesses are typically much more informationally opaque than large corporations because they often do not have certified audited financial statements to yield credible financial information on a regular basis. As well, these firms usually do not have publicly traded equity or debt, yielding no market prices or public ratings that might suggest their quality. To address this opacity problem and provide funding to small firms, financial institutions use a number of different lending technologies.

This paper focuses on small business credit scoring (SBCS), a lending technology used by many financial institutions over the last decade to evaluate applicants for “micro credits” under \$250,000 (\$250K). SBCS involves analyzing consumer data about the owner of the firm and combining it with relatively limited data about the firm itself using statistical methods to predict future credit performance. Credit scores have been widely used for many years in consumer credit markets (e.g., mortgages, credit cards, and automobile credits), resulting in low-cost, commoditized credits that are often sold into secondary markets, yielding significant growth in consumer credit availability. However, only in the mid-1990s did financial institutions begin to combine the consumer and business information to create scores for small business credits on a widespread basis, and to date, no significant secondary market for small business credits has emerged. Below, we describe the SBCS technology and its use, review the extant research on its effects on credit availability (broadly defined), and discuss the key research and

---

<sup>1</sup> See “how important are small businesses to the U.S. economy?” under “frequently asked questions” at <<http://app1.sba.gov/faqs/faqindex.cfm?areaID=24>>.

policy issues related to this technology.

To put SBCS into context, it is one of a number of transactions lending technologies for business credits based primarily on “hard” quantitative information.<sup>2</sup> The hard data for transactions technologies are relatively quickly gathered without need for prior contact with the firm and can be relatively easily observed, verified, and transmitted to others. For SBCS, the hard information is primarily personal consumer data on the owner obtained from consumer credit bureaus, data on the business collected by the financial institution, and in some cases information on the firm from commercial credit bureaus. While SBCS is often used to evaluate opaque small businesses, it may also be used for relatively transparent borrowers to reduce underwriting costs.

As an alternative to the transactions technologies, financial institutions also attack the opacity problem using relationship lending based on “soft” qualitative information gathered through contact over time with the firm, and often with its owners, managers, and other members of the local community. The soft information generally takes significant time to accumulate and is not easily observed, verified, or transmitted to others. Financial institutions’ choices among the technologies used to evaluate small business credit applicants vary across both institutions and applicants. These decisions depend on the comparative advantages of the institution, the information available about the firm, and the expected costs and accuracy of each of the feasible technologies, all of which affect the expected profitability.

The remainder of the paper proceeds as follows. Section 2 discusses the development of SBCS over the past decade. Section 3 briefly describes a survey of SBCS that is the basis for much of the active research on this topic. The literature concerning the effects of SBCS on small credit availability is reviewed in Section 4. Section 5 discusses research and policy issues related to SBCS, and Section 6 concludes.

## **2. Small Business Credit Scoring**

Credit scoring is a statistical approach to predicting the probability that a credit applicant

---

<sup>2</sup> The other transactions technologies include financial statement lending, asset-based lending, factoring, and leasing.

will default or become delinquent.<sup>3</sup> While this underwriting method is well established in consumer credit markets, it has only been widely applied to small commercial credits for about the last decade.<sup>4</sup> The primary reason for the delayed response is the significant heterogeneity among borrowers (making prediction difficult) and significant variation in the underwriting approaches both within and across banks and for credits of various sizes (reducing the ability of banks to pool data). The change occurred when analysts determined – particularly for the very smallest credits – that credit information for the principal owner explains a significant amount of the variation in the performance of small business credits. This may reflect in part a correlation between personal and business success and in part a commingling of the finances of the business and the owner. Incorporating this information directly into SBCS models improved prediction and encouraged greater underwriting standardization.

The first SBCS models were constructed by collecting a sample of fully seasoned loans and then dividing them into “goods” and “bads” on the basis of a credit event such as default or delinquency.<sup>5</sup> This binary outcome was then statistically related to a number of characteristics about the principal owner and business that are believed to predict loan performance. With respect to the principal owner, this included credit bureau information on variables such as income, net worth, available credit, prior delinquencies, and prior bankruptcy. Similar information about the business was also used in the statistical model: financial ratios (such as profitability and leverage), the presence of past credit problems (if a business credit report was available from a commercial credit bureau like Dun & Bradstreet or Experian), as well as the type of business (SIC Code). While as many as 50-60 variables may have been considered when building a model, only 8-12 variables were ultimately used because of significant

---

<sup>3</sup> See Hand and Henley (1997) for a detailed overview of consumer credit scoring, including the treatment of various data and statistical issues regularly encountered when building these models. Similar approaches are used to evaluate potential applicants for solicitation (i.e., for marketing purposes) and evaluating borrowers to whom credit has already been extended (i.e., for monitoring purposes).

<sup>4</sup> Similar statistical techniques, such as discriminant analysis, are also used in lending to larger businesses but these are typically not focused on the personal credit history of the owners (Saunders 2000).

<sup>5</sup> The discussion in this paragraph relies on earlier descriptive articles by Eisenbeis (1996), Mester (1997), and Feldman (1997).

multicollinearity. Limited dependent variable estimation techniques, such as logit and probit, were then generally used to analyze the data to see how well the variables predicted the credit events.<sup>6</sup>

While some large banks, such as Wells Fargo, have developed proprietary SBCS models, most institutions have turned to outside vendors. The largest external provider, Fair, Isaac and Company (Fair, Isaac), introduced its first SBCS model in 1995. The model used a sample of more than 5000 small business loan applications over five years from 17 large U.S. banks designed to represent a national pool. This model, which was constructed in cooperation with the Robert Morris Associates, was further refined in 1996 using data from 25 banks. Several large banks began to adopt SBCS following the introduction of the first Fair, Isaac model.

Today, even lenders with proprietary models often purchase credit scores from outside vendors, especially when making loans outside of communities in which they maintain an office. In the case of Fair, Isaac, several models are now available through their Small Business Scoring Service depending on the type of credit (e.g., loans, leases, lines of credit), the type of information available (e.g., application data, business data, consumer data), and the size of the credit (e.g., less than \$50K, less than \$100K, less than \$250K). Although the models have been designed for use for credits up to \$250K, some lenders use them only for amounts less than \$100K. The firm is currently investigating whether current models can be validated above \$250K and also developing new models for these larger credits.

There may be several motivations for lenders to use SBCS. Cost saving is likely a key incentive when banks purchase a score from an outside vendor and use it for automated accept/reject decisions and setting credit terms. This is the lowest-cost method of using the technology and it is likely significantly cheaper than any other transactions or relationship lending technology that might otherwise be employed to evaluate the applicants. However,

---

<sup>6</sup> Eisenbeis (1996) notes, for example, that Dun & Bradstreet's small business credit scores were based on a logit model. However, he argues that a hazard/survivorship model may be better suited for the dynamic nature of the problem, given that the probability of default may not be constant throughout the life of the loan. Mester (1997) further notes that alternative methods of evaluating the data, such as the use of neural networks, have also been investigated.

using SBCS in this way may exacerbate the opacity problem, yield inefficient credit terms, and potentially result in greater future credit losses; although it still may be profitable to underwrite credits this way because of the cost savings. As discussed below, research suggests that many banks use SBCS in this low-cost way, and these are the institutions that tend to expand their lending the most; thereby suggesting it is a profitable strategy. For other banks, the key incentive may be to reduce the opacity problem and set the contract terms more accurately to reduce future credit losses and improve expected revenues on their credits. These improvements may be most likely when credit scoring is used in conjunction with another lending technology – i.e., through adding the scores to information gathered using one or more of the other technologies noted above. As shown below, the research suggests that banks using SBCS in this way tend to have relatively low-risk small business credits.<sup>7</sup>

### **3. Survey Evidence on the Use of SBCS by U.S. Banks**

The primary source of information about whether and how financial institutions use SBCS comes from a telephone survey conducted by the Federal Reserve Bank of Atlanta in January 1998. The survey queried the lead (largest) banks of the 200 largest U.S. bank holding companies in terms of domestic assets on whether and how they used SBCS. Together, these institutions accounted for 71.3% of U.S. domestic banking assets and 53.2% of all commercial loans under \$1 million outstanding as of June 30, 1997. Ten banks were eliminated from the survey process *ex ante* because the either were not principally engaged in small business lending (less than 0.50% of banking assets in small business loans) or were credit card banks. Ultimately, 190 banks were called and 99 responded, a response rate of 52.1%.

Overall, 62 of the 99 responding sample banks said that they used SBCS as of January 1998. The other survey questions were designed not only to gauge the pervasiveness of SBCS in the underwriting process, but also to uncover variation in credit scoring practices across institutions. Particularly, the survey asked about:

---

<sup>7</sup> Another potential motivation for credit scoring concerns the creation of a uniform underwriting process across borrowers. This may better insulate the lender from legal liability associated with disparate treatment of different groups of small business applicants (Eisenbeis 1996).



- The credit sizes scored;
- Whether scores were used for the automatic approval or rejection of applications;
- Whether scores were used to set credit terms;
- Whether the bank developed its own model or if it relied on a vendor-supplied model or scores; and
- How long the bank had been using SBCS.

Table 1 presents the survey results with respect to these questions for the 62 banks responding that they used SBCS. All banks that used SBCS did so for credits under \$100K, while 74.2% of these banks used it for credits under \$250K. Only 21.0% of the scoring banks used the technology on credits between \$250K and \$1 million. Credit scores were used for the automatic approval or rejection of credits by 41.9% of scoring banks and affected credit terms at 32% of the institutions. The overwhelming majority of scoring banks, 87.1%, used models from an external vendor, rather than their own proprietary model.

Two studies have statistically examined the determinants of the probability and timing of large banks adopting SBCS. Frame, Srinivasan, and Woosley (2001) and Akhavein, Frame, and White (2005) both find an important role for organizational structure in the adoption decision: banking organizations with fewer bank charters and more bank branches were more likely to adopt and also adopt sooner. This suggests that large banks with a more “centralized” structure were more likely to adopt SBCS. Today, however, the vast majority of large banks use SBCS and it is small banks that are making the adoption decisions.

#### **4. SBCS and the Availability of Small Business Credit**

Several studies use the Atlanta Federal Reserve survey data to test the effects of SBCS on various measures of credit availability: the quantity of small business credit extended, the risk and opacity associated with this credit, whether low-income areas are served as well as upper-income areas, the geographic spread of the credit, and the length of loan maturities. As shown below, the findings are consistent with increases in all of these dimensions of credit availability due to the adoption and use of the SBCS technology.

The first of the studies finds that the use of SBCS is associated with a significantly

increased quantity of small business credit under \$100K for 1997 (Frame, Srinivasan, and Woosley 2001). This finding is robust to considerations of other banking organization characteristics, such as total size, organizational structure, and the extent of recent merger activity.

Berger, Frame, and Miller (2005) extend the quantity analysis by: 1) examining credits of \$100K-\$250K (as well as those under \$100K); 2) using a longer time frame (1995-1997); 3) analyzing bank-specific and industry learning curves; and 4) studying how differences in the way the technology is used influences the outcomes. For loans under \$100K, they again find that SBCS is associated with a significant increase in the quantity of small business credit overall; but that for individual institutions, it depends on how long the technology has been used and how it is implemented.<sup>8</sup> The increased quantities (and other effects described below) occur primarily after some time has passed for the bank to learn how to use the technology. As well, the increases are concentrated in “rules” banks that purchase scores and use them to set terms and automatically approve/reject credits, rather than in “discretion” banks that employ their own models and use other factors in setting terms and approval/rejection.<sup>9</sup> These results suggest that the increases in credit availability are likely due to the reduced cost of using the SBCS technology, rather than a reduction in informational opacity. As suggested above, the use of “rules” may exacerbate the opacity problem and result in greater future credit losses, but it still may be a profitable strategy because of significantly reduced costs.

Two studies examine the characteristics of the borrowers that receive the additional small business credits resulting from SBCS. Berger, Frame, and Miller (2005) find that the small business credits under \$100K made by scoring banks tend to have higher average interest rates and higher average risk ratings than those of non-scoring banks. This is generally consistent with an increase in lending to opaque borrowers that are typically more risky and would normally imply higher rates than transparent borrowers. The higher interest rates are observed

---

<sup>8</sup> The authors do not find significant changes in the quantity of small business credit for loans \$100K-250K.

<sup>9</sup> “Rules” and “discretion” are shorthand descriptions to separate the primary approaches of the institutions. In practice, all “rules” banks allow for some judgmental overrides, and all “discretion” banks have some automatic rejection parameters.

both for banks using “rules” and “discretion” approaches to the SBCS technology; although the increases are much greater for “discretion” banks. In terms of risk, “rules” banks rate their loans as higher risk, on average, while “discretion” banks rate them as having less risk.

Frame, Padhi, and Woosley (2004) add two more dimensions to the characteristics of the likely SBCS loan recipients, income and location. They examine variation in small business loans under \$100K originated in 1997 by the survey banks in each U.S. census tract. One finding is that SBCS is associated with increased lending of approximately the same magnitude in low- and moderate-income census tracts as in middle- and upper-income tracts. Another finding is that banks using SBCS lend more outside of their local markets than non-scoring banks, all else equal. This is expected, given that SBCS does not require close personal contact (as in relationship lending) or much physical monitoring (as in other transactions technologies). This finding also suggests that SBCS may be associated with increased competition for credits, given that banks are not as constrained by location and, as discussed below, may raise policy questions about appropriate geographic market definitions for antitrust analysis.

Finally, Berger, Espinosa, Frame, and Miller (2005) examine the effects of using SBCS to reduce informational opacity on loan maturity. They exploit the differences in the information sets between banks that use SBCS in a form of the “discretion” manner – that use SBCS, but not to automatically approve/reject applicants – versus those that do not use SBCS at all. Thus, they test the effect of using credit scores in addition to information gathered using one of the other lending technologies in underwriting small business credits. The authors find that debt maturity is significantly longer for low-risk borrowers when they borrow from “discretion” banks that use SBCS to reduce informational opacity. This finding as may be viewed as additional evidence in favor of increased small business credit availability from SBCS – some borrowers are able to secure credit for longer intervals as a result of the use of this technology.

All of the studies reviewed here find that SBCS increases small business credit availability in at least one dimension – overall quantity of lending, lending to relatively opaque, risky borrowers, lending within low-income as well as high-income areas, lending over greater distances, or increasing the maturity of loans. Interestingly, the most significant increases in

credit availability appear to be due to a reduction in lending costs through the application of “rules” that likely reduce costs, rather than a reduction in informational opacity through use of SBCS with “discretion”; although longer loan maturities are observed for these latter institutions.

## **5. Potential Implications of SBCS for Research and Public Policy Issues**

The results of the empirical studies surveyed above may have implications for research and public policy questions that have been raised over the past decade or so concerning small business credit availability. These include: 1) banking industry consolidation and the emergence of large nationwide institutions; 2) the appropriate geographic definition for banking markets; 3) the potential development of a thick secondary market for small business credits, and 4) the proliferation of the SBCS technology. We examine each of these issues within the context of the recent research on SBCS as well as that on small business finance more generally.

### **A. Bank Size and Industry Consolidation**

SBCS plays an important role in the research and policy issues regarding the comparative advantages of large and small banks and the consolidation of the banking industry. A common research finding is that large banks have a comparative advantage in transactions lending technologies – including SBCS – that are based primarily on the analysis of hard quantitative information and small banks have a comparative advantage in relationship lending that is based primarily on soft qualitative information. These comparative advantages may stem from economies (diseconomies) of scale in the processing and transmission of hard (soft) information (e.g., Stein 2002), agency problems in using relationship lending by large banks created by the wide separation between management and loan officers because the loan officer essentially has proprietary access to the soft information (e.g., Berger and Udell 2002), and Williamson-type (1988) organizational diseconomies in large banks with providing transactions loans to large businesses along with relationship loans to small businesses.

A number of empirical studies provide strong support for these comparative advantages. Recent findings include that large banks tend to base lending decisions more on financial ratios than on prior relationships (e.g., Cole, Goldberg, and White 2004) and that large banks tend to have temporally shorter, less exclusive, less personal, and longer-distance associations with

small business borrowers than small banks (e.g., Berger, Miller, Petersen, Rajan, and Stein forthcoming).

The consolidation of the banking industry has raised considerable policy concerns and academic interest in whether the industry would be able to continue providing adequate credit availability for small businesses, particularly opaque small businesses. In part, these concerns appear to reflect common beliefs that large banks are either disadvantaged in general in small business lending or that relationship lending is superior to all the transactions technologies for lending to opaque small businesses.<sup>10</sup> While it is possible that the disadvantage of large banks in relationship lending would result in reduced supplies of small business credit relative to the small banks they replace, this is not necessarily the case because of the advantage of large banks in the transactions lending technologies, including SBCS. Large banks may be better able to supply credit to relatively transparent small businesses, and they may be less, equally, or better able to supply credit to opaque firms. For transparent small businesses with strong, audited financial statements, large banks may use their advantage in the transactions technology of financial statement lending to provide more credit than the small banks they replace. For opaque small businesses, large banks may use their advantage in other transactions technologies – SBCS, asset-based lending, leasing, and factoring – which may provide credit availability that is on average less than, equal to, or greater than the relationship lending provided by the small banks they replace.

A limited amount of recent evidence suggests that banking industry consolidation may have little or no net effect on small business credit availability. One study finds that the likelihood of a small business borrowing from a large bank is roughly proportional to the local deposit market share of these banks (Berger, Rosen, and Udell 2005) and another finds that small business credit availability is not related to the local market share of large banks (Jayaratne and Wolken 1999). Other research that takes into account the dynamic effects of mergers and

---

<sup>10</sup> A number of studies find that large banks have relatively low ratios of small business loans/assets (e.g., Berger, Kashyap, and Scalise 1995). This finding is often misconstrued as direct evidence of a disadvantage of large banks in small business lending, the numerator of the ratio. However, it is just as likely that this finding primarily reflects the fact that large banks may expand the assets in the denominator of the ratio, as large banks have more large business loans because of greater legal lending limits and better diversification.

acquisitions (M&As) – including temporary disruptions and strategic changes in behavior – finds that these events often do reduce small business lending by the participating banks. However, these studies also find that “external effects” or general equilibrium effects occur that tend to offset the reduction in credit availability. Other banks that are already present in the same local markets respond by increasing their own supplies of small business credit (e.g., Berger, Saunders, Scalise, and Udell 1998, Avery and Samolyk 2004). In addition, new small banks (de novo entrants) are often created that tend to specialize in small business lending (Berger, Bonime, Goldberg, and White 2004).

Bank consolidation will likely continue. Some research suggests that technological progress favors large banks over small banks, possibly in part because advances in information technologies and financial technologies tend to improve the hard information lending methods more than relationship lending, which changes relatively little over time (e.g., Berger 2003). As discussed below, technological change may favor multimarket banks over single-market banks as well. Nonetheless, the literature also suggests that a segment of small, community banks remains quite profitable and is likely to remain viable in its niche in the future (e.g., DeYoung, Hunter, and Udell 2004).

Finally, despite the general comparative advantage of large banks in hard information technologies, it is important to note that small banks are not precluded from using SBCS. Any bank in the U.S. may purchase a score from an external vendor and thereby benefit from the scale economies in gathering and processing the data and developing the prediction models. Unfortunately, the available data does not provide any information on the extent to which small banks use SBCS.

#### **B. The Effects of SBCS on Local Market Competition and Antitrust Issues**

U.S. antitrust analysis is conducted in the context of definitions of the relevant product and geographic markets. For banking, the product market definition is considered to be a “cluster” of products and services that are offered primarily by commercial banks. The geographic market definition is local – generally encompassing the Metropolitan Statistical Areas (MSAs) or non-MSA county in which the affected bank branches are located. The vast

majority of the research on bank competition in the U.S. has also adopted this same local market definition, although many products within the cluster of banking services are offered across much wider geographic areas. Small business lending, an important product for commercial banks, has historically been considered a local activity, although this may be changing. As discussed above, one of the SBCS credit availability studies found that SBCS is associated with more small business lending outside of the bank's local markets (Frame, Padhi, and Woosley 2004). This is not surprising, given that SBCS does not require close contact with the borrower. This finding is also consistent with small business lending at greater distances by large banks found by other researchers without information on which lending technologies the banks use (e.g., Petersen and Rajan 2002, Hannan 2003, Hannan and Brevoort 2004).<sup>11</sup>

This research is also part of a bigger picture in which large, multimarket banking organizations appear to be improving their abilities over time to manage their retail lines of business over greater distances and compete more effectively against small, single-market banks. Examples of findings include reduced distance-related diseconomies of management (e.g., Berger and DeYoung forthcoming); more uniform pricing of deposits within a state (e.g., Hannan and Prager 2004, Heitfield and Prager 2004), different prices for single-market banks in local markets with greater shares of multimarket banks (e.g., Hannan and Prager 2004, Park and Pennacchi 2004, Berger, Rosen, and Udell 2005), and significantly reduced performance of small, single-market banks in these markets (Berger, Dick, Goldberg, and White 2005).

All of these findings suggest that technological change – including the introduction of SBCS – may have increased the competition for small business customers and potentially widened the geographic area over which these firms may search for credit. Presumably, a small business with an acceptable credit score could now shop nationwide through the Internet among lenders using SBCS, although the exact extent to which this occurs is unknown.<sup>12</sup> What is clear,

---

<sup>11</sup> The increased distances in the other studies may also reflect the use of other transactions technologies that do not require close contact with the firm (e.g., financial statement lending).

<sup>12</sup> A perusal of websites for Capital One and American Express suggest that this is plausible for very small credits. Capital One appears to offer small business credit card products with lines up to \$20K and SBA-guaranteed loans for amounts up to \$50K. American Express offers small business credit lines and term loans (24 or 36 months) for amounts between \$10K-100K.

however, is that historical local market definitions for bank competition used in antitrust analysis are being strained, that competition for small business credit is considerably greater than in the past, and that small business credit availability has increased as a result.

### **C. Secondary Markets for Small Business Credits**

The development of a deep secondary market for small business credits has long been predicted, but has not yet occurred. The most recently cited reasons for this are the lack of standardized underwriting practices as well as an abundance of bank liquidity in the 1990s (Temkin and Kormedi 2003). The lack of standardized underwriting, coupled with borrower heterogeneity results in severe asymmetric information problems between potential buyers and sellers of credits. SBCS may serve to ameliorate such information problems, and ultimately aid in the development of secondary markets for small business credits, especially if an industry scoring standard becomes accepted that serves to economize on the number of metrics that investors have to interpret.<sup>13</sup> That said, the liquidity need for such a market is unclear, especially for commercial banks that maintain large portfolios of liquid assets or assets that may be relatively quickly sold or securitized (e.g., cash, securities, consumer credits, residential mortgages) and have relatively easy access to additional debt financing in the form of federally insured deposits, federal funds, and Federal Home Loan Bank advances. A secondary market for small business credits may be more appealing to non-bank financial institutions, although the extent to which they rely on SBCS is presently unclear.

The limited secondary market for small business credits that exists is for loans guaranteed by the Small Business Administration (SBA) under their Section 7(a) program. Further, this securitization market is largely comprised of loans originated by non-bank financial institutions (Temkin and Kormendi 2003, Table 2). Board of Governors of the Federal Reserve System (2002, p. 60) presents data on the SBA's Section 7(a) program as well as securitization activity in these small business loans and others.<sup>14</sup> The SBA loans are the most amenable to

---

<sup>13</sup> For example, in consumer loan securitizations, borrower credit scores from Fair, Isaac (FICO scores) are universally accepted measures of credit quality.

<sup>14</sup> About half of the guaranteed portion of SBA 7(a) loans are currently securitized. In this case, the guaranteed portion of the loan balance (75-80 percent depending on loan size with a maximum of \$750,000) is first separated



securitization because of the federal guarantee as well as standardized underwriting, loan characteristics, and collateral.

The implementation of the Basel II capital accord may help encourage secondary markets for relatively safe small business credits by concentrating the benefits of holding them. In the U.S., the largest banking organizations (at the least the largest 10 and perhaps another 10 to 20 organizations) will adopt Advanced Internal Ratings-Based (A-IRB) approach of Basel II, while other banks will stay on Basel I requirements. As currently designed, the A-IRB approach gives small business credits managed as “retail exposures” – presumably including credits based primarily on SBCS – and some loans to firms with under €50 million in sales preferential capital treatment generally, and the capital reduction is greater, the safer is the credit.<sup>15</sup> This would reduce the marginal costs to the large banks of holding small business credits that receive favorable capital treatment.

While it is not possible to accurately estimate the effect on marginal costs, one study estimates an upper bound for the average large U.S. bank for its average small business loan of about 16 basis points (Berger 2004). This may create a substantial incentive to start a secondary market because the capital benefits are concentrated in the relatively few large banking organizations operating under Basel II that could buy the credits from others. This could occur through the securitization of loan pools as in other areas of consumer finance, like credit cards, or through outright loan sales. One example of the latter phenomenon is Wells Fargo’s “agent banking program,” whereby participating community banks originate small business loans based on Wells Fargo’s proprietary credit scoring models and then sell the loans to Wells Fargo and receive an origination fee. Such direct sales methods, if adopted by other large banks, could

---

from the unguaranteed portion. Securities are then issued against guaranteed portion using a simple structure, not unlike mortgage-backed securities issued by Ginnie Mae, Fannie Mae, or Freddie Mac. The unguaranteed portion of SBA loans usually remains on the originators’ balance sheet, although in some cases these amounts have been securitized as well using more complicated security structures often coupled with “spread accounts” to provide sufficient credit enhancement.

<sup>15</sup> In other nations, the largest banks will likely adopt one of the IRB approaches and small banks will likely adopt the Standardized Approach, which gives a 25% reduction in required capital on some small business loans (estimated to be about half of them in Spain, see Saurina and Trucharte 2004).

have significant effects in encouraging more widespread use of SBCS by community banks and non-bank lenders.

In the future, government participation may aid in the development of secondary markets for small business credits, although government subsidies can be socially counterproductive to the extent they encourage negative net present value lending. In 1994, the Riegle Community Development and Regulatory Improvement Act took two steps aimed at reducing transactions costs for this market: 1) removing state-level investment restrictions and securities registration requirements and the establishment of favorable federal regulatory treatment, and 2) reducing capital requirements for securitized loans in which recourse is retained (Board of Governors of the Federal Reserve 2002). Since then, there has been some discussion of creating a government-sponsored or government-owned enterprise to guarantee payment on securities backed by small business loans.<sup>16</sup> This would shift the information-related risks and attendant transactions costs associated with the secondary market for small business loans from originators and investors to taxpayers. The most recent incarnation of this idea was originally provided for in a Senate bill reauthorizing SBA programs for 2004-2006 (S. 1375) that would have given the SBA permission to create a pilot program to guarantee a portion of the return on securitized pools of non-SBA-guaranteed small business loans. This provision was ultimately struck from the final bill, but remains as stand-alone legislation – The Small Business Liquidity Act of 2003 (S. 1713).<sup>17</sup> Notably, a joint report issued by the Board of Governors of the Federal Reserve and the U.S. Securities and Exchange Commission (2000) concluded that there were no major impediments to the development of this market that required further legislative or administrative

---

<sup>16</sup> In the mortgage market, analogous institutions already exist. Fannie Mae and Freddie Mac are government-sponsored enterprises with federal charters, but publicly traded shares listed on the New York Stock Exchange. Ginnie Mae, by contrast, is a government-owned corporation.

<sup>17</sup> This proposal would involve the SBA providing, for a fee, credit enhancement guarantees of, or a commitment to guarantee, a portion of the principal and interest on securities issued and managed by not less than two qualified entities authorized and approved by the SBA. (The SBA would be required to set and maintain standards for qualified entities, including standards relating to delinquency, default, liquidation, and loss rates.) The SBA's credit enhancement guarantees would act as second-loss guarantees, available only after the full payment of guarantees offered by the qualified entities authorized to act as issuers and managers of pools or trusts of loans. The legislation can be accessed at: <http://thomas.loc.gov/cgi-bin/query/z?c108:S.1713>.

action.

#### **D. The Proliferation of SBCS**

The use of SBCS will likely continue to evolve. We discuss two broad trends that appear to be occurring: 1) increasing usage of SBCS in the U.S. and abroad, and 2) innovations that may expand the coverage of the technology to more potential borrowers and larger credits. Each of these will further be enhanced to the extent that a thick secondary market for small business loans develops.

SBCS has become an entrenched technology in the U.S. that is now used by banks of all sizes, although large banks remain the most likely to automatically approve/reject credits and set contract terms based on credit scores. Thus, large U.S. banks are more likely to take a “rules” approach to SBCS, while small banks use greater “discretion”. Outside of the U.S., SBCS appears to be used on a widespread basis only in a limited number of developed nations. However, there are some efforts to expand SBCS to developing nations: the World Bank and Fair, Isaac have recently formed a joint venture to determine the feasibility of developing a pooled-data SBCS models for Brazil, Columbia, and Mexico (Miller and Rojas 2004).<sup>18</sup>

As noted above, most SBCS models rely heavily on the personal credit history of the principal owner provided by one or more of the consumer credit bureaus (e.g., Equifax, Experian, or TransUnion). As well, in some cases, the models also use business data provided by a commercial credit bureau (e.g., Dun & Bradstreet). It follows that the availability of information on more consumers or businesses or more detailed data on them may aid the proliferation of SBCS. Some recent developments suggest that some of these changes may be occurring.

With respect to consumer information, Fair, Isaac has launched a new consumer scoring system based on how well consumers handle their bank accounts or payments on retail purchase plans in an effort to reach consumers that do not have enough credit history to generate

---

<sup>18</sup> At least one multinational banking organization uses a form of SBCS in developing nations. Citibank’s “Citibusiness” initiative targets credit to small and medium enterprises in industrial segments of a nation identified as having growth potential based on industry-level hard information, in some cases without historical credit information on the specific firms.

traditional consumer scores (Kim 2004). The new system could add scores on 25 million consumers in addition to the 160 million consumers that currently have scores. In the long run, this could result in greater use of SBCS as more business owners have consumer scores for use in generating the small business scores.

With respect to business information, Dun & Bradstreet (D&B) has greatly expanded the number of companies covered as well as the depth of information provided.<sup>19</sup> Further, they have entered into a business alliance with Fair, Isaac, which involves D&B sharing their business credit database and Fair, Isaac building various scoring models.<sup>20</sup> The more detailed business data may be particularly helpful in the development of models aimed at larger credits (e.g., between \$250K and \$10 million), for which business information likely becomes of greater importance relative to consumer information. Another example of expanded business coverage is that Equifax is maintaining a credit information repository on behalf of the non-profit Small Business Financial Exchange, which includes participation by 23 of the 25 largest U.S. small business lenders. This improved pooling of information may combat fraud and reduce lender risks and from borrowers obtaining credit from multiple sources.<sup>21</sup>

## **6. Conclusions**

Small business credit scoring (SBCS) is a relatively new transactions lending technology for making “micro credits” under \$250,000 (\$250K) that was adopted by most large U.S. banking organizations in the latter half of 1990s and has since become more widely used in the U.S. and abroad. The extant research strongly suggests that SBCS has increased small business credit availability in a number of dimensions, including: increasing the quantity of credit extended; increasing lending to relatively opaque, risky borrowers; increasing lending within

---

<sup>19</sup> They now offer an entire suite of risk management products that can be accessed over the Internet either on a subscription or single firm request basis ([www.dnb.com](http://www.dnb.com)).

<sup>20</sup> See <<http://www.fairisaac.com/Fairisaac/Solutions/Scoring++Predictive+Modeling/Scoring++Predictive+Modeling++Business+Scores.htm>>.

<sup>21</sup> See <<http://www.equifax.com/EquifaxSMB/html/worksFull.htm>>. Without a centralized information exchange, large nationwide small business lenders have been soliciting business from many of the same customers. These customers may appear to be relatively low risk *ex ante*, their risk of default increases markedly *ex post* if they accept a number of these offers simultaneously.

low-income areas; lending over greater distances; and increasing loan maturity.

Banks tend to use the SBCS technology in very different ways to achieve very different objectives. In some cases, banks use “rules” to automatically accept/reject credit applicants and to set credit terms based on purchased credit scores. The primary motive for these banks is likely reduced underwriting costs. This method may exacerbate informational opacity problems, yield less accurate credit terms, and result in greater future credit losses, but may nevertheless be profitable because of the lower costs. The research suggests that most of the increases in credit availability are concentrated in these “rules” banks.

Other institutions use more of their own “discretion” by adding credit scores to information gathered one or more of the other lending technologies. The motives for these banks are likely to reduce opacity problems and set the credit terms more accurately to reduce future credit losses and improve expected revenues, although this method also raises underwriting costs. The research suggests that “discretion” banks are successful in lowering the reported risk and lengthening the maturity of their small business credits.

The effect of SBCS on credit availability is related to a number of important research and policy questions concerning: Bank size and industry consolidation; Bank competition and the appropriate geographic market definition for banking research and antitrust analysis; Development of secondary markets for small business credits; and Proliferation of the SBCS technology. With regard to issues of bank size and consolidation, the research suggests that SBCS is one of several “hard” information transactions lending technologies in which large banks have a comparative advantage, whereas small banks have a comparative advantage in relationship lending using “soft” information. The recent research does not suggest, however, that bank sizes or consolidation are associated with significant differences in small business credit availability overall or for opaque small businesses in particular. Large banks may use SBCS and the other transactions technologies to supply credit to opaque firms. Notably, despite the comparative advantage of large banks, small banks also have access to SBCS by purchasing scores from external vendors.

With regard to bank competition and geographic banking market definitions, the data

suggest that SBCS is associated with lending at greater distances from the bank, and this is part of a larger, technologically-driven phenomenon in which large, multimarket banks are competing more effectively against small, single-market banks. These changes imply greater competition for small businesses credits and potentially greater credit availability in any one local market, given that the potential competitive suppliers may be located outside the market. This also raises significant questions about the use of the local market as the definition for antitrust purposes.

With respect to potential development of a significant secondary market for small business credits, continued improvements in the SBCS technology and possible acceptance of an industry standard may help, but bank demand for the additional liquidity appears limited. The Basel II Accord may encourage the development of such a market by concentrating the benefits of holding some relatively safe small business credits in the very largest U.S. banking organizations through reduced capital requirements on these credits. This could occur through a market for securitized credits similar to markets for consumer credit card and residential mortgage debt. Alternatively, the market could develop through direct loan sales from small banks to large institutions. A secondary market could also be aided by other regulatory changes or government subsidies via credit guarantees or loan purchases, although such subsidies may be counterproductive by encouraging negative net present value lending.

With respect to proliferation of SBCS, the technology has spread from mostly large U.S. institutions to banks of all sizes in the U.S as well as to banks in a few developed nations. Some recent developments by credit bureaus and credit scoring vendors may result in useful credit information being available on more consumers and businesses, and in some cases, more detailed information on existing businesses. These developments may eventually expand the availability of SBCS to more businesses and possibly allow SBCS to be applied to larger credits.

Given the importance of these research and policy issues, further research about SBCS and credit availability is needed. Unfortunately, there is a noticeable lack of new publicly available data on which to conduct additional research, given that the last survey was in 1998. Hence, it seems that new SBCS surveys could be conducted that document the proliferation of the technology to small U.S. banks and to other nations. Further, information about changes in

the quality and depth of commercial credit information, the creation of new models, and the performance of scored credits would also be valuable.

## References

- Akhavein, Jalal, Frame, W. Scott Frame, and Lawrence J. White, forthcoming. "The Diffusion of Financial Innovation: An Examination of the Adoption of Small Business Credit Scoring by Large Banking Organizations." *Journal of Business*.
- Avery, Robert B., and Katherine A. Samolyk, 2004. "Bank Consolidation and the Provision of Banking Services: Small Commercial Loans." *Journal of Financial Services Research* 25: 291-325.
- Berger, Allen N., 2003. "The Economic Effects of Technological Progress: Evidence from the Banking Industry." *Journal of Money, Credit, and Banking*, 35, 141-176.
- Berger, Allen N., 2004. "Potential Competitive Effects of Basel II on Banks in SME Credit Markets in the United States." Federal Reserve Board working paper. <http://www.federalreserve.gov/generalinfo/basel2/docs2004/basel2sme508.pdf>.
- Berger, Allen N., Seth D. Bonime, Lawrence G. Goldberg, and Lawrence J. White, 2004. "The Dynamics of Market Entry: The Effects of Mergers and Acquisitions on Entry in the Banking Industry." *Journal of Business*, 77: 797-834.
- Berger, Allen N., Astrid A. Dick, Lawrence G. Goldberg, and Lawrence J. White, 2005. "The Effects of Competition from Large, Multimarket Firms on the Performance of Small, Single-Market Firms: Evidence from the Banking Industry." Federal Reserve Board working paper.
- Berger, Allen N., Marco Espinosa-Vega, W. Scott Frame, and Nathan Miller, 2005. "Debt, Maturity, Risk, and Asymmetric Information." *Journal of Finance*.
- Berger, Allen N., and Robert DeYoung. forthcoming. "Technological Progress and the Geographic Expansion of the Banking Industry." *Journal of Money, Credit, and Banking*.
- Berger, Allen N., W. Scott Frame, and Nathan Miller, 2005. "Credit Scoring and the Availability, Price, and Risk of Small Business Credit." *Journal of Money, Credit, and Banking*, 37.
- Berger, Allen N., Anil Kashyap, and Joseph Scalise, 1995. "The Transformation of the U.S. Banking Industry: What a Long, Strange Trip It's Been." *Brookings Papers on Economic Activity*, 2, 55-217.
- Berger, Allen N., Nathan H. Miller, Mitchell A. Petersen, Raghuram G. Rajan, Jeremy C. Stein, forthcoming. "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks." *Journal of Financial Economics*.
- Berger, Allen N., Richard J. Rosen, and Gregory F. Udell, 2005. "Does Market Size Structure Affect Competition? The Case of Small Business Lending." Federal Reserve Board working paper.



- Berger, Allen N., Anthony Saunders, Joseph M. Scalise, and Gregory F. Udell, 1998. "The Effects of Bank Mergers and Acquisitions on Small Business Lending." *Journal of Financial Economics*, 50, 187-229.
- Berger, Allen N., and Gregory F. Udell, 2002. "Small Business Credit Availability and Relationship Lending: The Importance of Bank Organisational Structure." *Economic Journal*, 112, F32-F53.
- Board of Governors of the Federal Reserve System, 2002. *Report to Congress on the Availability of Credit to Small Business*. [http://www.federalreserve.gov/boarddocs/rptcongress/sbc\\_rep.pdf](http://www.federalreserve.gov/boarddocs/rptcongress/sbc_rep.pdf)
- Board of Governors of the Federal Reserve System and U.S. Securities and Exchange Commission. (2000) *Report to Congress on Markets for Small Business and Commercial Mortgage-backed Securities*. <http://www.federalreserve.gov/boarddocs/rptcongress/markets2000.pdf>
- Cole, Rebel A., Lawrence G. Goldberg, and Lawrence J. White, 2004. "Cookie Cutter versus Character: The Micro Structure of Small Business Lending by Large and Small Banks." *Journal of Financial and Quantitative Analysis*, 39(2), 227-251.
- DeYoung, Robert, William C. Hunter, and Gregory F. Udell, 2004. "The Past, Present, and Probable Future for Community Banks." *Journal of Financial Services Research*, 25(2-3), 85-133.
- Eisenbeis, Robert, 1996. "Recent Developments in the Application of Credit Scoring Techniques to the Evaluation of Commercial Loans." *IMA Journal of Mathematics Applied in Business and Industry*, 7, 271-290.
- Feldman, Ronald, 1997. "Small Business Loans, Small Banks and a Big Change in Technology Called Credit Scoring." Federal Reserve Bank of Minneapolis' *The Region*, September, 19-25.
- Frame, W. Scott, Aruna Srinivasan, and Lynn Woosley, 2001. "The Effect of Credit Scoring on Small Business Lending." *Journal of Money, Credit, and Banking*, 33(3), 813-825.
- Frame, W. Scott, Michael Padhi, and Lynn Woolsey, 2004. "The Effect of Credit Scoring on Small Business Lending in Low- and Moderate Income Areas." *Financial Review*, 39(1), 35-54.
- Hand, David J., and Henley, W. E., 1997. "Statistical Classifications Methods in Consumer Credit Scoring: A Review." *Journal of the Royal Statistical Society*, 160, 522-541.
- Hannan, Timothy H. and Kenneth Brevoort, 2004. "Commercial Lending and Distance: Evidence from Community Reinvestment Act Data." Federal Reserve Board working paper, 2004-24.
- Hannan, Timothy H., 2003. "Changes in Non-Local Lending to Small Business." *Journal of Financial Services Research*, 24, 31-46.

- Hannan, Timothy H., and Robin A. Prager, 2004. "The Competitive Implications of Multimarket Bank Branching." *Journal of Banking and Finance* 28: 1989-1914.
- Heitfield, Erik, and Robin A. Prager, 2004. "The Geographic Scope of Retail Deposit Markets." *Journal of Financial Services Research*, 25: 37-55.
- Jayarathne, Jith, and John D. Wolken, 1999. "How Important Are Small Banks to Small Business Lending? New Evidence from a Survey of Small Firms." *Journal of Banking and Finance*, 23: 427-58.
- Kim, Jane J., 2004. "New Borrowers Get Credit Break." *Wall Street Journal* (August 5), D2.
- Mester, Loretta J., 1997. "What's the Point of Credit Scoring?" Federal Reserve Bank of Philadelphia *Business Review*, September/October, 3-16.
- Miller, Margaret, and Dina Rojas, 2004. Improving access to credit for SMEs: An empirical analysis of the viability of pooled data SME credit scoring models in Brazil, Colombia, and Mexico, paper presented at the World Bank Conference on "Small and Medium Enterprises: Overcoming Growth Constraints" (October 2004).
- Park, Kwangwoo, and George Pennacchi, 2004. "Harming depositors and helping borrowers: The disparate impact of bank consolidation." University of Illinois working paper.
- Petersen, M.A., and R.G. Rajan, 2002. "The information revolution and small business lending: Does distance still matter?" *Journal of Finance*, 57: 2533-2570.
- Saunders, Anthony, 2000. *Financial Institutions Management*, Boston: Irwin McGraw-Hill.
- Saurina, Jesús, and Carlos Trucharte, 2004. "The Impact of Basel II on Lending to Small- and Medium-sized Firms. A Regulatory Policy Assessment based on Spanish Credit Register Data." *Journal of Financial Services Research*, 26, 121-144.
- Stein, Jeremy C., 2002. "Information Production and Capital Allocation: Decentralized versus Hierarchical Firms." *Journal of Finance*, 57(5), 1891-1921.
- Temkin, K., and R.C. Kormendi, 2003. "An Exploration of a Secondary Market for Small Business Loans." Washington, DC: Small Business Administration (April). [http://www.sba.gov/advo/research/rs227\\_tot.pdf](http://www.sba.gov/advo/research/rs227_tot.pdf).
- Williamson, Oliver, 1988. "Corporate finance and corporate governance." *Journal of Finance*, 43: 567-91.

Table 1  
 Survey Results for Large U.S. Banks Using Small Business Credit Scoring  
 Data as of January 31, 1998

	Number	% of Scoring Banks
Loan Sizes Scored:		
Under \$100,000	62	100.0
\$100,000 - \$250,000	46	74.2
\$250,000 - \$1,000,000	13	21.0
Automatic Approval / Rejection	26	41.9
Setting Loan Terms	20	32.3
Use Proprietary Models	8	12.9
Average Number of Months	24	---

Source: Frame, Srinivasan, and Woosley (2001).