# A Survey Based Assessment of Financial Institution Use of Credit Scoring for Small Business Lending

by

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and

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for


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# A Survey Based Assessment of Financial Institution Use of Credit Scoring for Small Business Lending

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Whereas the use of credit scoring for consumer loans has been commonplace in banks for quite some time, the use of credit scoring for small business loans is a more recent phenomenon. The study attempts to answer several questions related to the use of credit scoring in small business lending as follows:

• How have banks incorporated credit scoring in their small business lending operations?

• How does credit scoring influence the availability of credit to small businesses?

• What factors predict the likelihood of the use of small business credit scoring by banks?

Three basic investigations were conducted for this research. The study investigated the use of credit scoring within banks. The study estimated how small business lending and micro business lending was impacted by the adoption of credit scoring by banks. Finally, the study investigated the factors that affected the likelihood that a bank would use credit scoring for small business loans.

## Overall Findings

While credit scoring has yet to become a primary instrument in loan underwriting for a majority of banks in the United States, there are indications that credit scoring may be providing more borrowing opportunities to small businesses. Although it does not appear that there is geographic expansion resulting from credit scoring, it does appear that there are significant increases in the importance of small business and micro business loans in the total lending portfolio subsequent to the adoption of credit scoring.

## Highlights

The survey confirms that banks implement the use of credit scoring for small business loans in a number of different ways—while a majority of banks depend on the credit score of the owner as the key credit metric, other banks utilize the business score, and still others use both.

• Relationships continue to be the dominant factor in the lending decision to small businesses. When credit scoring was compared with relationships and loan purpose for the credit decision, relationships and loan purpose were considered more important than credit scoring regardless of whether a bank used credit scoring or not.

• The principal alternative use of credit scores after loan underwriting is for the periodic reevaluation of existing loans. Loan monitoring is the next most cited use of small business credit scores. Banks generally perceive an improvement in the credit decision subsequent to the incorporation of credit scoring for small business loans.

• Geographic expansion does not appear to result from the adoption of credit scoring by banks.

• The adoption of credit scoring for small business lending by banks appears to be based on the operational thrust of the bank. Those banks with the larger proportion of total loans relative to total assets tend to be more likely to adopt credit scoring.

• Banks increase their investment in small business loans relative to total loans over time subsequent to the adoption of small business credit scoring.

• Banks with lower ratios of small business loans to total loans tend to adopt credit scoring for small business loans. Similarly, banks with lower ratios

of microbusiness loans to total loans tend to adopt credit scoring for small business loans.

• A bank's investment in small business loans under $100,000 relative to total loans tends to increase with the age of the bank.

• Rural banks are less likely to use credit scoring for small business loans as compared with their urban counterparts.

• Credit scoring appears to be part of a bank's competitive strategy, with those banks with larger investments in lending overall having a greater tendency to adopt credit scoring.

## Scope and Methodology

Survey methods were used to investigate small business credit scoring in banks. A detailed questionnaire was prepared and approved for use by the Small Business Administration. The Office of Management and Budget approved the questionnaire and general survey design (OMB control no. 32450354). Using the June 2004 Call Reports, a sample was drawn from all banks reporting lending to small businesses. A stratified sample of 1,500 banks was drawn that was specifically designed for projectability to the population of banks. The sample included a diverse cross section of large corporate banks to small community banks throughout the nation. The senior credit officer in each bank was asked to complete a survey and return the survey either over fax or e-mail. Each bank was contacted a minimum of two times with telephone calls to encourage a response to the survey. A total of 327 banks responded to the survey. The responses were then analyzed to ascertain the degree to which credit scores are currently being used in banks when making credit decisions for small business loans.

The determinants of small business lending were next analyzed to understand what characteristics of banks lead to investments in small business loans. The data included the survey responses and the June 2005 call report data for each bank in the survey. Two separate ordinary least squares (OLS) regressions were run that differed primarily by their dependent variable. The dependent variable in the first was the ratio of micro small business loans (loans under $100,000) relative to total loans. The second dependent variable was the ratio of all small business loans regardless of size to total loans. Two independent variables were used in each regression to capture the impact of credit scoring on small business lending. The first was a dummy indicator variable that indicated whether the bank used credit scoring. The second independent variable designed to capture the impact of credit scoring was time since adoption. This variable measured the number of years the bank had been using credit scoring for small business lending. Other independent variables were primarily selected based on use in the previous literature. These variables included the natural log of assets, the ratio of total loans to total assets, the ratio of property, plant, and equipment to total assets, the ratio of chargeoffs to total industrial and commercial loans, and the age of the bank in years. The independent variables were consistent across the two OLS regressions, with the exception of a final independent variable, the ratio of micro business loans to total small business loans. This independent variable was only included in the second regression that used the ratio of small business loans to total loans as the dependent variable.

The likelihood of banks adopting credit scoring was investigated using a logistic regression. The dependent variable was the dummy variable indicating whether a bank used credit scoring in small business lending. The independent variables used in the OLS regressions were also used in the logistic regression. In addition, a variable was added for the ratio of farm loans to total loans. This variable was designed to capture any differences between rural lenders and urban lenders.

This report was peer reviewed consistent with the Office of Advocacy's data quality guidelines. More information on this process can be obtained by contacting the director of economic research at *advocacy@sba.gov* or (202) 205-6533.

## Ordering Information

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Dr. Charles D. Cowan
Principal Investigator

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## Executive Summary

Analytic Focus LLC, under contract to the Small Business Administration[1], conducted a survey of banks to determine what information banks use to determine whether to originate loans to small businesses. Analytic Focus administered the contract, entitled, "Impact of Credit Scoring on Lending to Small Firms," during 2005.

Banks are a primary source of funding for small business. Therefore, changes in the small business lending practices of banks have important implications for these firms. It is believed that the competitive landscape for small business loans is changing with the advent of small business credit scoring. The goal of the survey was to determine to what extent banks use credit scoring in making loans to small businesses. We investigate how credit scoring is implemented and what weight it is given in the overall credit extension decision. We also combine the survey responses with bank Call Report data to examine the importance of credit scoring for relative levels of small business lending. Finally, we investigate the factors that suggest that a bank will adopt credit scoring.

A nationally representative, stratified sample of banks was selected from the set of banks reporting small business loans in the June 2004 Call Reports. A detailed questionnaire was prepared and approved for use by the Small Business Administration. The Office of Management and Budget (OMB) as part of the Paperwork Reduction Act review approved this questionnaire and the general survey design.[2] This questionnaire was sent to senior credit officers at each bank in the sample via fax or e-mail. Analytic Focus, LLC followed up with each bank a minimum of two times with telephone calls to encourage response to the survey, with some banks being called as many as five times over a two month period. A total of 327 banks responded to the survey.

Banks are identified by two primary categories for purposes of analyzing the results of the survey. The first category consists of those banks that use small business credit scoring in any form (hereinafter referred to as SBCS banks). These banks may use the individual owner credit

[1] RFQ SBAH-04-Q-0021
[2] OMB approval number 32450354.

score, the business credit score, or both in the loan origination decision. The second category consists of the remaining banks that do not use credit scores for small business lending (hereinafter referred to as NCS banks).

Overall, we find that approximately 53 percent of the respondents do not use any type of credit score for originating small business loans. Lack of confidence in the scores and unique loan aspects are given as the primary reasons for not using these scores. It appears from other responses that this lack of confidence relates primarily to business credit scores that depend to some extent on self-reporting by businesses. The use of business credit scores is limited to approximately 9.5 percent of the total survey respondents. Banks have a great incentive to ensure that the information they obtain from the small businesses is correct to manage credit risk. In contrast to business credit scores, we find that the remaining 43.5 percent of banks using credit scores continue to rely predominantly on the credit score of the individual owner for purposes of originating small business loans.

Our survey results provide some evidence that for those banks using credit scores, credit is being extended to a broader distribution of small business borrowers. Many banks use credit scoring for risk based pricing and in the process make loans to lower credit quality small businesses. Credit scores enable banks to charge risk adjusted premiums on these less credit-worthy loans. The ability to price loans in such a manner makes the business profitable to banks and opens opportunities for more small businesses.

Despite the availability of credit scoring, the relationship of the business with the bank appears to continue to be the dominant factor considered in the lending decision. This finding is true regardless of bank size. This may reflect the value of flexibility in the renegotiation of contract terms in relationship banking as discussed by Boot (2000). It suggests a preference for discretion based versus rules based decision making in banking. In contrast, those respondents who elected a lending methodology based on credit scoring for the most part did so to obtain a quantifiable measure of risk.

One disappointing result of the survey is that there is no indication of any momentum in the development of secondary markets for small business loans. Secondary markets have been critical in improving the availability and price of credit in other loan markets, such as the residential loan market. A credit score provides potential buyers with a quantified risk measure. As credit scores tend to reduce the information asymmetry regarding the quality of loans being sold, credit scoring would be expected to provide a means of facilitating the development of this market. However, respondents generally did not find secondary market sales as an important consideration for the use of credit scores. Despite the ability to obtain a quantified risk measure through a credit score, other factors, such as lack of homogeneity in the loan pool, may slow the development of secondary markets.

By matching the survey responses with the call report data, we are able to further investigate the relationship between small business lending and credit scoring. We provide empirical evidence that suggests that banks increase their investment in small business loans relative to total loans subsequent to the adoption of credit scoring for small business lending. Such a finding suggests a potential improvement in credit availability to small firms over time as banks continue to integrate this technology in their loan underwriting.

The adoption of credit scoring appears to be based on the operational characteristics of the bank. Rural lenders are less likely to adopt credit scoring than other banks. In addition, banks that invest greater proportions of assets in loans have a greater propensity to adopt credit scoring. This may reflect the fact that banks that use credit scoring for other large consumer lending operations transfer the credit scoring technology to small business loan underwriting.

In summary, we present some encouraging data for small business owners and lenders. Rather than limiting the availability of credit, credit scoring appears to encourage lending to small businesses by providing banks with a quantifiable measure of risk. By eliminating some of the informational asymmetry inherent in these loans, credit scoring may increase the lending dollars available to small businesses. Although a more thorough investigation of the impact of credit scoring over time is needed, our results suggest that small businesses and banks alike will benefit from the integration of this technology in the lending process.

# I. INTRODUCTION

Bank operations for lending to small businesses have changed dramatically in many banks with the advent of third party credit scores, such as Fair Isaac's Small Business Scoring Service. Small business information is generally quite opaque and often difficult to assess relative to the credit-worthiness of the business. Credit scores introduce a quantitative measure of risk that may increase the availability of funds to small businesses. This relatively recent innovation has significant implications for the small business customers served by the banks that have adopted this technology.

Banks integrate credit scores in the lending process in several ways. Whereas some banks use the credit score exclusively in the lending decision, others adopt a mixture of credit scoring with relationship lending. Others banks have not integrated the use of SBCS at all; these banks use only relationship lending with a more traditional underwriting approach. In addition, the approach may differ within the same bank by loan size, business sector, or region. The different approaches introduce a complicated framework within which banks now compete for small business loans. Our purpose in this paper is to investigate the integration of credit scoring in the small business lending process and the resulting implications for small businesses seeking financing.

The effect of the use of credit scoring on credit availability continues to be controversial. Advocacy groups are generally concerned with the availability of credit for the disadvantaged segments of the small business population. Poor quality of information as well as overly restrictive score guidelines are often cited as complaints. In addition, if relationship banking provides loans to be made based on more subtle information than that able to be captured by a credit score, a trend toward the use of credit scores may reduce the pool of those small businesses with access to funds. However, to the degree that credit scores eliminate the subjective, and sometimes prejudicial, aspects of lending, credit scores may actually serve to increase the availability of credit.

To the degree that credit scores can be relied upon to measure what they purport to measure; i.e., credit-worthiness, they have several distinct advantages for the lender. They provide a quantitative measure of risk that is not based on a subjective assessment of the borrower. Assuming a consistent application of scores, similar businesses should receive the same treatment in terms of loan acceptance. The technology is now available for a relatively low cost that serves to reduce the screening and monitoring costs. In addition, a quantitative measure facilitates risk-based loan pricing for the bank.

An avenue that holds great promise for the future for both banks and small businesses is the development of a secondary market for these loans. There is a possibility that credit scoring for small businesses may facilitate the development of secondary markets for small business debt similar to developments in the consumer loan markets. Small businesses would benefit as liquidity would increase and more competitors would enter the market.

We present the results of a banking survey conducted in 2005 on behalf of the Small Business Administration in order to provide some insight into lending issues of critical importance to small businesses. The remainder of this report proceeds as follows. We first present the survey design in Section II and then a review of the survey respondents in Section III. Section IV provides highlights of the methods of implementation of credit scoring technology within banks, and Section V provides highlights of respondents' assessments of the impact of small business credit scoring. Section VI provides our empirical investigation of the factors affecting small business lending and the use of credit scoring. We summarize our results in the conclusion.

## II. SURVEY DESIGN

We now turn to the survey to analyze the impact of credit scoring on small business lending. Research began with the acquisition of reports and data sets from federal regulators. The data sets contained all banks in the United States and Puerto Rico that reported lending to small businesses. From this list of banks, a random sample was designed providing a diverse

cross section of large corporate banks to small community banks throughout the nation. From a population of approximately 7,500 banks reporting lending to small businesses, our sample was 1500 banks or 20 percent.

With the sample selected, we next collected phone numbers for each bank. Once all the numbers were collected, each bank was called to identify the correct officer at the bank who would receive the survey. During the initial calls 7 percent (108) of the banks declined to receive the survey. The rejections ranged from not being allowed to participate in surveys to not having the time.

After all the information was in place from each bank, we faxed and emailed the surveys. This resulted in a small portion of returned surveys, so we began to follow-up with each bank. We resent 195 surveys resulting in 4 percent decline, 27 percent completed, and 69 percent no response.

The final survey results are as follows ( includes resends):

| Action | Amount | Percentage |
|---|---|---|
| Responded | 327 | 22% |
| Declined | 178 | 12% |
| Non-responsive | 994 | 66% |

This survey represents a stratified sample that is specifically designed for projectability to the population of banks. The complete survey design and weighting methodology are presented in Appendix A.

## I II. SURVEY RESPONDENTS

Banks responding to the survey are from a broad cross section of states throughout the United States. A response map is presented below in Figure 1.


**Figure 1. Survey Respondents within the United States excluding Hawaii and Alaska**

As stated previously, the bank sample was drawn from all banks conducting small business lending in the United States. The types of small business lending conducted by banks in the sample are presented in Table 1 by bank size. Lines of credit and equipment leasing represent the largest relative percentages of the loan portfolios regardless of asset size.

| Table 1. Loan Type as a Share of Total Small Business Loans (Mean Response by Bank Asset Size – in Percent) | | | | | |
|---|---|---|---|---|---|
| **Loan Type** | **Assets Less than $100 Million** | **Assets $100 Million to Less than $500 Million** | **Assets $500 Million to $1 Billion** | **Assets Greater than $1 Billion** | **All Banks in Survey** |
| Lines of Credit | 22 | 22 | 21 | 30 | **22** |
| Business Credit Cards | 4 | 5 | 7 | 5 | **5** |
| Receivables Financing | 8 | 14 | 10 | 14 | **11** |
| Equipment Leasing | 21 | 20 | 23 | 17 | **20** |
| Vehicle | 11 | 11 | 9 | 8 | **10** |
| Other | 14 | 26 | 22 | 9 | 19 |

Some loan types were not identified on the survey, and respondents were asked to identify the types of loans included in the unspecified, other category. The most common types of other loans specified include business acquisition loans, agricultural loans and inventory financing.

Fifty-three percent (53%) of the banks that responded to the survey are not utilizing credit scoring in their small business lending activities in any form (NCS banks). The remaining 47 percent of the respondents incorporate credit scoring in the small business credit decision in some form (SBCS banks). For purposes of this report, we further separate SBCS banks into two subgroups.

**OCS:** Banks that use only the firm owner's credit scores**.**

**BCS:** Banks that use business credit scores either solely or in conjunction with owner credit scores.

The group or subgroup of interest is identified within the text as appropriate.

Those respondents that elect not to use credit scoring were asked for the reasoning behind this decision. The provided responses were not mutually exclusive. Table 2 presents the reasons for not adopting credit scoring by bank size. Only 18 respondents in the asset categories greater than $500 million did not adopt credit scoring. Therefore, the answers for the final two categories largely reflect this limited sample size.

| Table 2. Reason for Not Adopting Credit Scoring (Numbe rof Banks in Size Category as a Percentage of Total Respondents to Question) | | | | |
|---|---|---|---|---|
| | < $100 Million | $100 Million- <$500Million | $500Million - $1 Billion | >$1 Billion |
| Lack of Confidence | 35.3 | 42.6 | 10.3 | 11.8 |
| Low Loan Volume | 52.3 | 31.8 | 9.1 | 6.8 |
| Customer Resistance | 22.2 | 44.4 | 0.0 | 33.3 |
| Loans Don't Lend Themselves to Cr Scoring | 36.0 | 46.7 | 9.3 | 8.0 |
| Expense | 30.0 | 45.0 | 20.0 | 5.0 |
| Other | 36.0 | 40.0 | 12.0 | 12.0 |

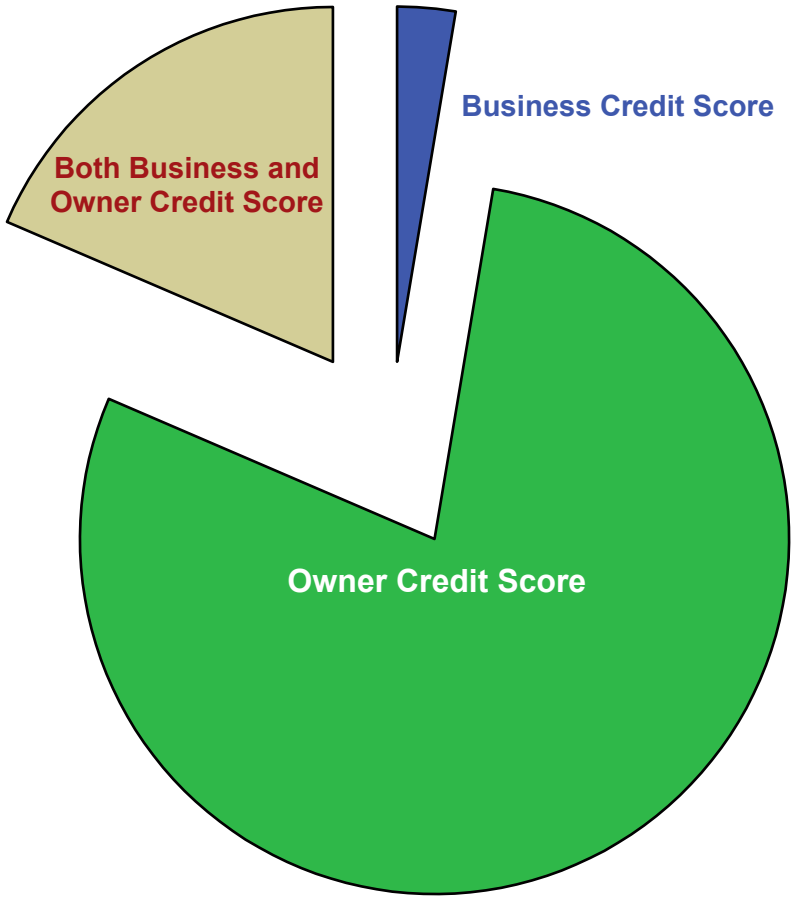
When responding with "Other" the survey requests additional details regarding some sort of specification for this category. Belief that the loan officer was able to evaluate credit in a superior or equivalent fashion was mentioned by 26 respondents. A few respondents indicated that they used credit reports but did not obtain separate credit scores. The remaining specifications for other varied from too small in terms of loan size to too small in terms of overall importance of small business lending to the bank.

Finally, for those banks indicating no use of credit scoring, respondents were asked whether there was any plan to implement this technology over the next 12 months. Only 6 percent of those banks not using credit scoring in small business lending indicate any immediate plans. However, this is quite consistent with a steady rate of implementation of credit scoring for small business loans. To the extent that the survey can be generalized to the population of all banks, this suggests adoption by close to 380 banks over the next year. Such a pattern is consistent with banks not generally having a reputation for the rapid adoption of new technologies as suggested by Frame and White (2004).

The 1998 Federal Reserve Survey of large banks provides evidence that banks implement credit scoring in various ways. This diverse implementation aspect is discussed by Akhavein, Frame, and White (2005) and Frame, Srinivasan, and Woosley (2001). This same pattern is also evidenced in this more recent, broader survey. Figure 2 depicts the credit scoring methodology of respondents. It is clear that banks elect several methods of implementing credit scoring. A large percentage of banks rely on the individual credit score of the business owner, which

confirms the informational significance of this measure as discussed by Mester (1997). It also suggests the importance to small business owners of maintaining excellent personal credit.

**Figure 2. Banks Utilizing Method as a Percentage of All Banks Using Credit Scoring in Small Business Lending**




Not only do banks differ by type of credit score used in the credit decision, but also by the source of the score. The most common source of credit scores is the third party vendor based on 70 percent of responders designating this source. Approximately 11 percent of those responding to this question indicate that they supplement an internal model with third party credit scores. Thus, 81 percent rely on third party scores to varying degrees. Only 11 percent rely exclusively on internal models, about half of which were developed with the assistance of external consultants.

Survey respondents from SBCS banks provide several alternate reasons for the adoption of credit scoring. Table 3 presents the ranking by importance of several factors across all bank size categories. It is clear that the predominant factor influencing the adoption of credit scoring is the ability to quantify the credit decision.

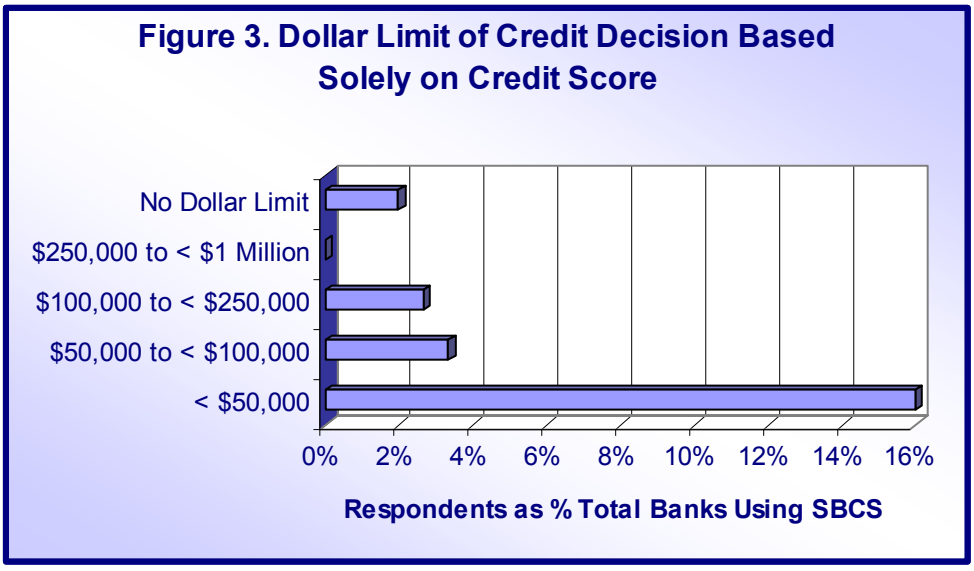
**Table 3. Ranked Importance of Factors Influencing the Decision to Adopt Credit Scoring (Percent)**

| Rank | Competitive Pressure | Regulatory Pressure | Simplify Loan Application | Cost Reduction | Quantify Credit Evaluation | Inexpensive Access to Added Information | Secondary Market Loan Sales | Other |
|---|---|---|---|---|---|---|---|---|
| **1** | 3.3 | 6.5 | 15.8 | 2.6 | 42.8 | 10.5 | 0.7 | 8.6 |
| **2** | 2.6 | 9.1 | 15.8 | 7.8 | 7.9 | 13.2 | 0.7 | 0.7 |
| **3** | 2.6 | 5.8 | 7.2 | 4.6 | 11.8 | 8.6 | 1.3 | 0.0 |
| **4** | 5.3 | 5.2 | 3.3 | 4.6 | 3.3 | 2.6 | 0.0 | 0.0 |
| **5** | 3.3 | 4.5 | 0.7 | 3.9 | 0.7 | 1.3 | 0.7 | 0.0 |
| **6** | 3.9 | 0.6 | 0.7 | 1.3 | 1.3 | 1.3 | 0.7 | 0.0 |
| **7** | 0.7 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 7.9 | 0.0 |
| **Not Important** | 78.3 | 66.9 | 56.6 | 75.2 | 32.2 | 62.5 | 88.2 | 90.8 |

## IV. IMPLEMENTATION OF SMALL BUSINESS CREDIT SCORING

Survey respondents whose banks had adopted credit scoring were asked to respond to numerous questions regarding the impact of this technology on the lending practices of the bank.

The vast majority of banks do not rely solely on credit scores for the purpose of making a credit decision regardless of the type of small business loan. For those banks that do rely on credit scores for the credit decision, the loan amount is generally very small. Sixteen percent of the respondents indicate that the credit score can be used to make loans less than $50,000. The tendency to rely solely on credit scores declines dramatically above $50,000 as depicted in Figure 3. In addition, less than 2 percent of banks that rely solely on credit scores do not establish a dollar limit for the loan decision.




Credit scoring is used in various degrees for all types of small business loans. As noted previously, few banks rely solely on credit scores. We queried banks as to the importance of various factors in the credit decision. Banks were asked to rank the factors from a most important rank of 1 to a least important rank of 6. In addition, if not important in the underwriting process, the banks were asked to leave the factor blank. The results are presented in Table 4 below.

**Table 4. Importance of Factors in Small Business Loan Approval (Percent) (1 = Most Important)**

| Rank | Net Worth | Credit Score | Collateral | Cash Flow | Other |
|---|---|---|---|---|---|
| **1** | 9.1 | 6.5 | 19.9 | 58.8 | 2.0 |
| **2** | 20.1 | 5.9 | 37.1 | 21.6 | 1.3 |
| **3** | 26.0 | 14.4 | 17.2 | 4.6 | 2.0 |
| **4** | 18.8 | 20.3 | 9.3 | 5.9 | 0.0 |
| **5** | 14.3 | 39.2 | 6.6 | 0.0 | 0.7 |
| **6** | 1.9 | 0.7 | 0.7 | 0.0 | 0.7 |
| **Not Important** | 9.7 | 13.1 | 9.3 | 9.2 | 93.4 |

Note: Columns may not total to 100 percent due to rounding.

Based on the response, it appears that credit scores for small business loans are still not perceived as adding a great deal of value as compared with more traditional indicators of creditworthiness. The majority of banks rank cash flow of the business as the single most important factor. Collateral is the next most important factor. Using the cumulative ranking

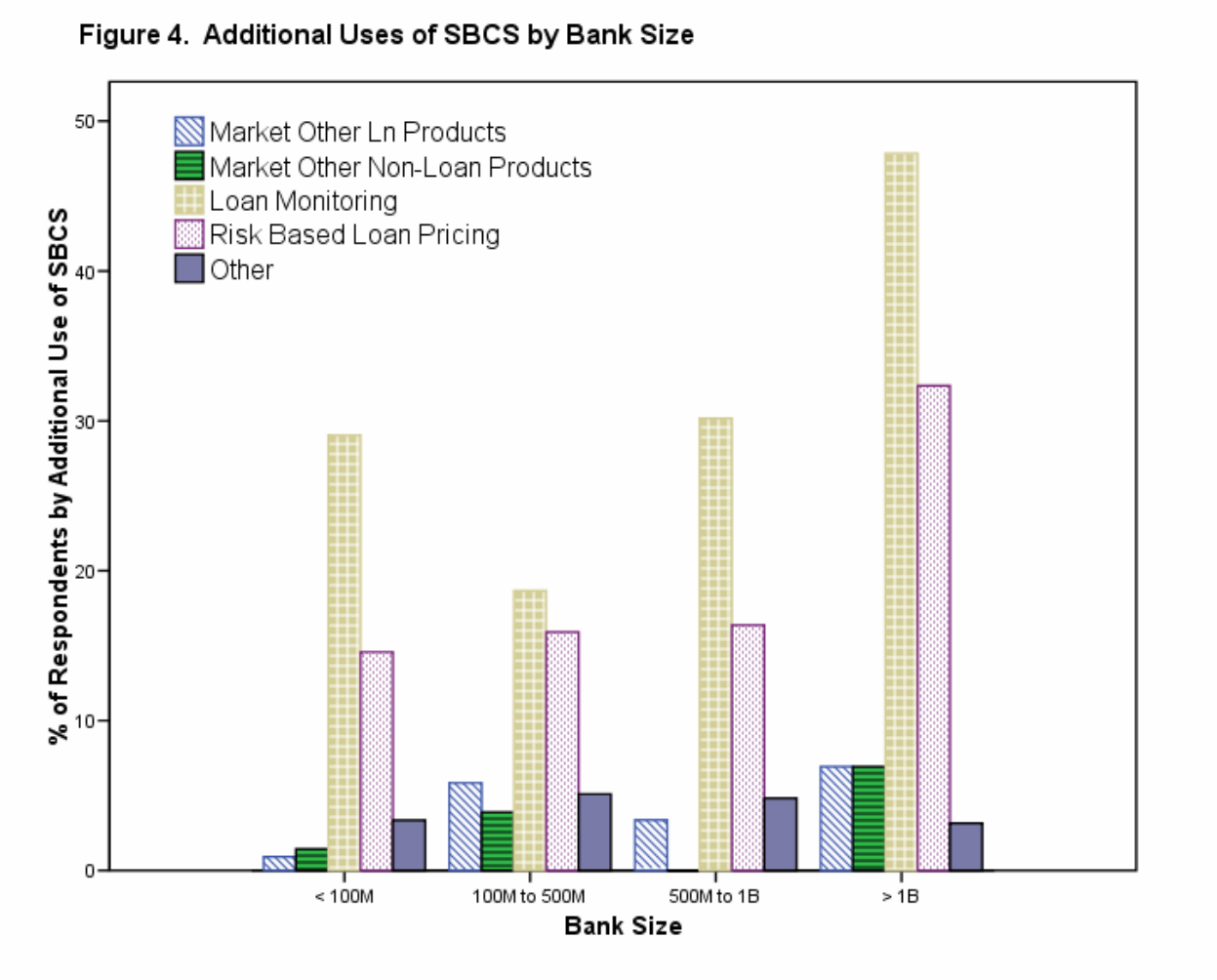
from rank categories 1 through 3, credit scoring is actually the least important factor of those factors listed on the questionnaire other than the unspecified other category. For those banks indicating unspecified other as important, respondents list character, bank relationship, and related business experience as important considerations.

There are numerous potential applications of credit scores in banking, and the survey requested information regarding such other uses. The percentage of banks finding supplemental uses for credit scores beyond underwriting is presented in Figure 4.

The two most frequent uses of credit scoring outside of underwriting based on survey responses are loan monitoring and risk based loan pricing. The most frequently indicated use by respondents is loan monitoring regardless of bank size. This may suggest that banks are reducing their monitoring costs by relying upon credit scoring rather than more costly individual audits of existing loans. Alternatively, it may simply suggest that banks are enhancing existing monitoring processes with credit scores. Credit scoring as an ordinal measure of risk lends itself to risk based pricing. This was the second most common supplemental use of credit scoring based on the survey responses. This loan pricing application suggests consequences for poorer quality credits within the small business sector.

It is also interesting to note that banks are not utilizing credit scoring in the marketing process to any large degree regardless of the size of the bank. Taken in total, less than 7 percent of the banks that use credit scoring use it further for marketing other small business loan products. In addition, less than 5 percent of all banks using small business credit scores extend the use to marketing other small business non-loan products or services.

**Figure 4. Additional Uses of SBCS by Bank Size**




When asked to evaluate the importance of the banking relationship relative to a firm's credit score when making the loan decision, many respondents were unable to indicate the exact weighting. This appears to be an area of some subjectivity on the part of the credit officer as approximately 45 percent of the banks using credit scoring were unable to segregate the decision between these two factors. To the degree that banks were able to identify the significance of the banking relationship relative to the credit score, the results were mixed. The remaining respondents were split almost 50/50 between the banking relationship having credit weight and the credit score having greater weight in the credit decision. It is interesting to note, however, that 75 percent of the banks using SBCS indicate that if a small business has an existing relationship that a credit score is used in determinations regarding credit extensions or new loan applications to these business customers.

# V. RESPONDENT EVALUATION OF THE IMPACT OF SMALL BUSINESS CREDIT SCORING

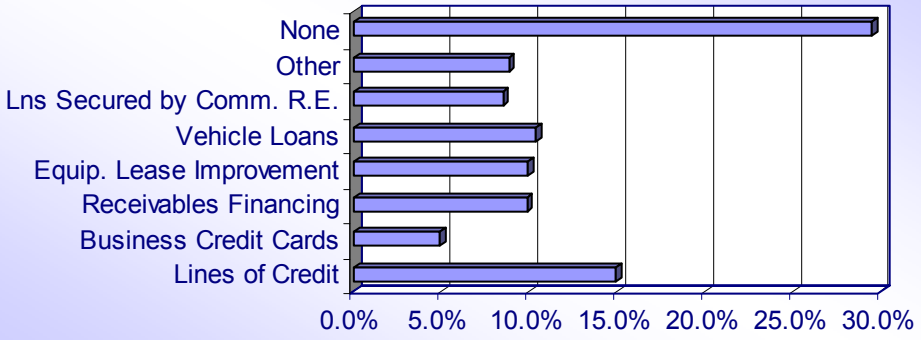
The Small Business Administration is also interested in the changes in small business lending that may occur as the direct result of credit scoring. The survey incorporated several questions designed to elicit this information.

The use of credit scoring does not appear to be making a material impact in the geographic dispersion of small business loan offerings by banks in the sample. Almost 75 percent of the respondents indicate no change in the geographic lending area following the implementation of credit scoring for small business loans. This limited impact in geographic markets is consistent with the findings of Degryse and Ongena (2005).

Of the remaining 25 percent of those using SBCS, the geographic expansion is primarily limited to two asset sizes with expansion differing greatly in degree. Banks with total assets between $100 million and $500 million cite geographic extension into new cities and counties. In contrast, banks with total assets greater than $1 billion cite national expansion for small business loans resulting from the implementation of credit scoring. More than 50 percent of the large banks utilizing SBCS indicate geographic expansion.

We also queried for small business loan product expansion resulting from credit scoring. The results of the survey are depicted in Figure 5. Approximately 30 percent of the banks using credit scoring for small business loans did not incorporate new lines of business as the result of this technology. Of those banks expanding loan product lines, the type of new loan offerings varied a great deal. Lines of credit for small businesses are the most common new product offering with 14.9 percent of banks using SBCS entering this new line of business. Whereas less than 10 percent expanded into other loan categories, those banks expanding in this arena cite primarily unsecured overdrafts as the principal offering.

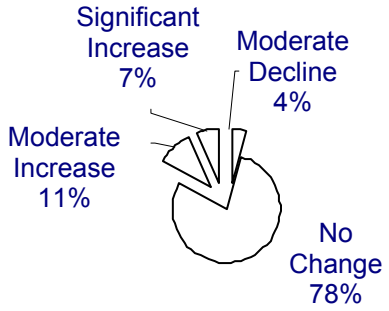
**Figure 5. Share of Banks using SBCS Expanding Small Business Loan Product Offerings by Type**




An increase in loan offerings does not necessarily lead to an increase in the overall volume of small business loans. Therefore, a question was asked directly to ascertain the impact of small business credit scoring on the volume of loans being offered to small businesses. Based on our results, it appears that SBCS makes little difference in the actual volume of loans being offered to the small business community. Sixty-three percent of the banks responding indicate no change in the volume of small business loans resulting from the implementation of credit scoring. Nevertheless, 14 percent of the banks that use credit scoring indicate an increase in volume, with 9 percent indicating a moderate increase and 5 percent indicating a significant increase in volume. Figure 6 depicts the overall results of this question, excluding non-responses, below.

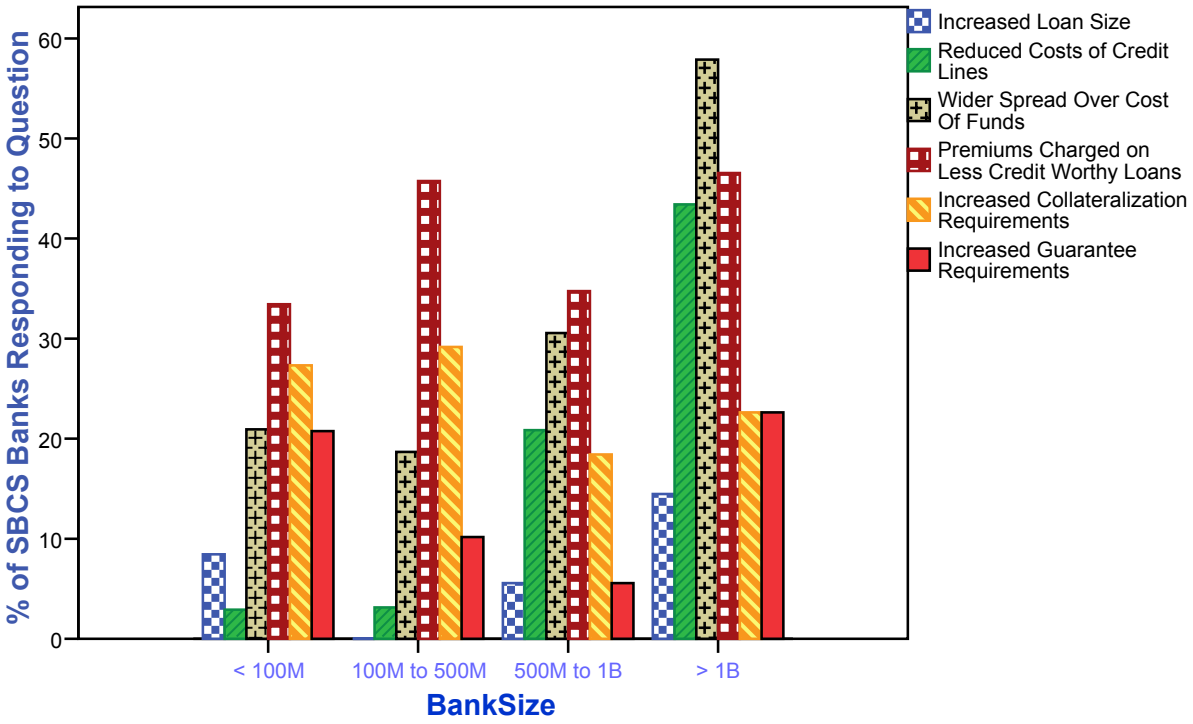
**Figure 6. Estimated Volume Impact of Credit Scoring**

**(Banks as a Percentage of All Responses)**




The use of small business credit scoring appears to be increasing the price of loans to small businesses; i.e., to less creditworthy small businesses. Quantifying risk allows banks to utilize a measure to adjust prices based on scores. However, this extends beyond simply adjusting the price of the loan in terms of the rate offered. It also includes changes in collateral requirements and guarantees required. The results are presented in Figure 7 below.

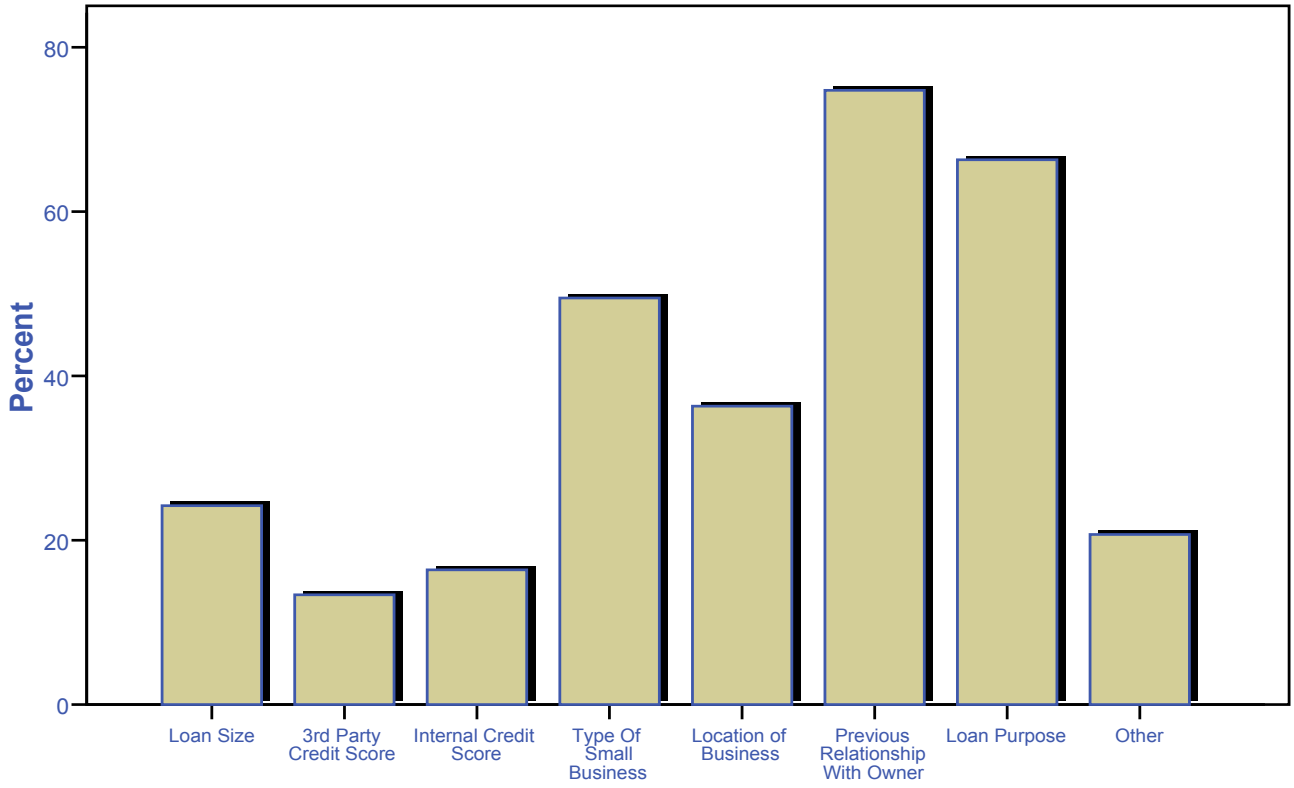
## Figure 7. Share of SBCS Banks Adjusting Loan Price Terms




The implementation of credit scoring is perceived by many credit officers to influence the quality of the credit decision. The vast majority of respondents, regardless of bank size, perceived an improvement in the quality of the credit decision subsequent to the implementation of credit scoring for small business loans. This perceived improvement in quality also translates into perceptions of improved credit quality of the small business loan portfolio. Approximately 47 percent of the respondents using SBCS believed there had been some degree of reduction in the level of credit risk in the small business loan portfolio. This appears to be inconsistent with an extension of credit to lower quality borrowers as suggested by Berger, Frame, and Miller (2005). However, the discrepancy might be explained by the fact that respondents may equate improved risk-based pricing with a reduction in risk. If so, it is still possible that credit is being extended to lower quality borrowers, but with higher premiums charged for reduced credit quality as reflected in Figure 7.

All survey respondents were asked to rank the importance of various factors in making the decision to originate a small business loan. The factors included were loan size, third party credit score, internal credit score, type of business, business location, previous relationship with owner, loan purpose, and other. The results clearly indicate that relationship banking continues to dominate technology for purposes of originating small business loans.

**Figure 8. Factor Ranked as One of the Three Most Important by Banks as Percentage of All Survey Respondents**




If a bank responded that a factor was one of the three most significant factors leading to the origination of a small business loan, that response is depicted in Figure 8. It is not surprising that when considering the response of all survey respondents to questions regarding the importance of factors leading to a small business loan origination that credit scores do not appear to be significant. The importance of credit scores, whether third party or internal, is

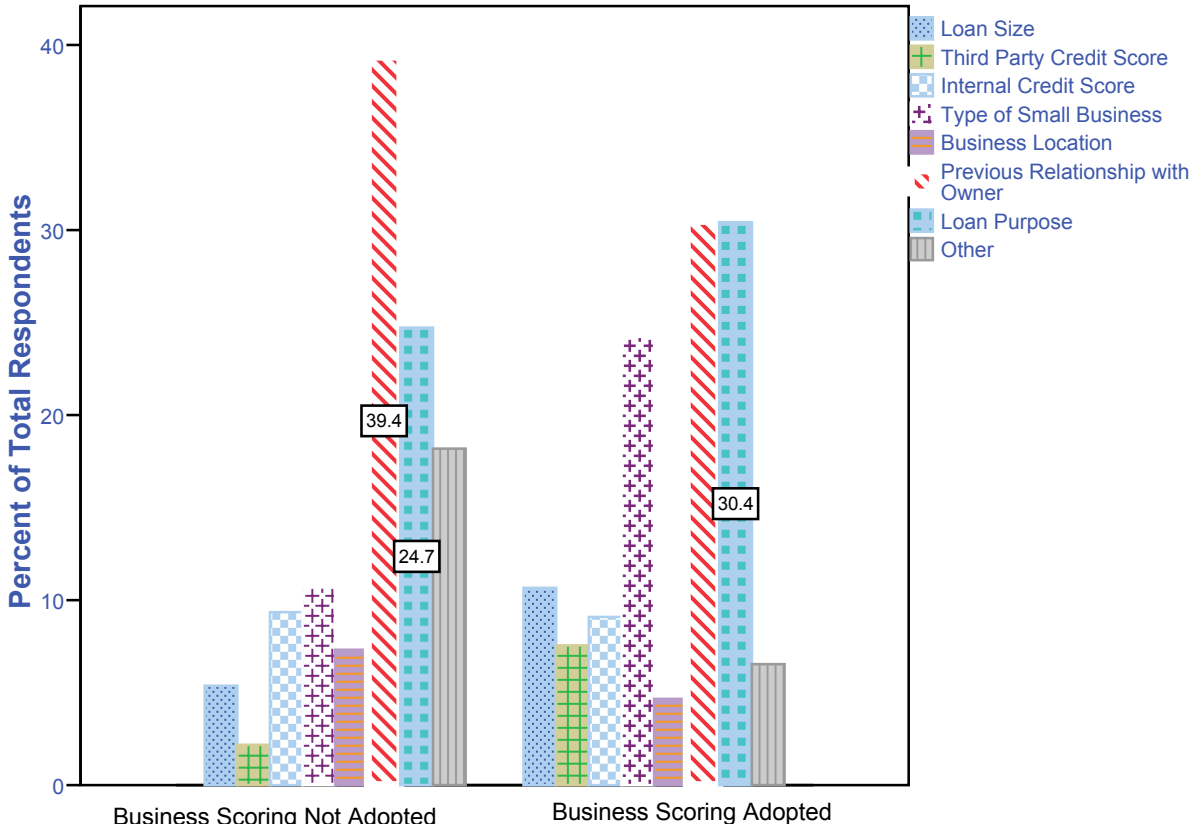
minimized when considering all survey respondents. If all considered the factor important, then presumably all respondents would have adopted the technology.

The responses as presented in Figure 8 appear to indicate that the relationship with the firm's owner continues to be the dominant factor in small business lending. Approximately 75 percent of the respondents included the previous relationship with the business owner as one of the three most important factors considered for loan origination.

We divided the respondents into two groups to further analyze these rankings. The first group consisted of those banks that implemented business credit scores. The second group consisted of those banks that used owner credit scores or no credit scores in the small business loan decision. Figure 9 presents the results of this analysis by cluster. In the presence of business credit scores, the importance of relationship banking declines relative to the importance for banks not using business scores. Whereas almost 40 percent of those banks that do not use business scores responded that the previous relationship with the owner was the most important key in the origination decision, only 31 percent of banks utilizing business scores responded in the same manner. In addition, for those banks implementing business scores, other factors increased in significance for this group, such as the loan purpose and the type of small business. One possible explanation is that the use of business credit scores favors product specialization.

The other unspecified category was evidently more important to those banks not implementing business credit scoring. Approximately 10 percent of total survey respondents indicated that cash flow analysis was an important factor when considering the origination of a small business loan. Two other factors that banks mention are personal guarantees and sufficiency of capital.

**Figure 9. Factors Leading to Origination of Small Business Loan Ranked as First in Importance**




Credit review committees appear to operate similarly, regardless of whether the financial institution adopts credit scoring. The groups are segregated into two categories for purposes of this analysis; i.e., those that adopt credit scoring in any form for small business loans and those banks that do not use credit scoring for small business loans. There is no statistical difference between the mean of the samples for the number of committee members when evaluating differences between credit scoring and non-credit scoring banks. We find a slight difference in committee numbers based on the asset size of the bank. The number of committee members increases with the asset size of the bank, as would be expected. Whereas the smallest banks average five members, the largest banks average eight members. Comparing means reveals that there is a statistically significant difference at the 5 percent level of significance between the smallest asset category and all other asset categories. There is no statistically significant difference in committee numbers between any of the remaining asset categories.

The survey requests that banks indicate the frequency of committee meetings within specified ranges. Table 5 reflects by asset size the share of banks in each category. There is no statistically significant difference whether comparing banks that adopted credit scoring or comparing banks by asset size.

**Table 5. Monthly Frequency of Credit Review Committee Meetings (Percent of Survey Respondents by Asset Size*)**

| Frequency | <$100 Million | $100 Million - < $500 Million | $500 Million - $1 Billion | >$1 Billion |
|---|---|---|---|---|
| 0-3 x per month | 37.0 | 24.6 | 16.7 | 35.7 |
| 3-6 x per month | 31.1 | 45.2 | 45.2 | 42.9 |
| 6-9 x per month | 4.2 | 6.3 | 14.3 | 3.6 |
| 9-12 x per month | 5.9 | 9.5 | 7.1 | 0.0 |
| As Needed | 16.8 | 10.3 | 11.9 | 14.3 |
| Other | 5.0 | 4.0 | 4.8 | 3.6 |

*Columns may not total to 100 due to rounding.

Loan approval authority levels do not generally differ by banks regardless of whether evaluated by credit scoring implementation or bank size. The few differences that do occur can be explained by size rather than by the utilization of credit scoring by the bank. We compare the means of the samples by BCS and all SBCS relative to NCS banks. There is no statistically significant difference at the 5 percent level of significance. However, when comparing means of the loan officer approval authority by size of bank we find that approval levels simply tend to increase with the size of the bank for vehicle loans at the 5 percent level of significance. If the level of significance increases to 10 percent, then vehicle loans and receivable financing authority limits also differ between large and small banks. This result suggests that although the dollar amount of risk may be the same that the relative risk to small banks is greater which may lead to lower loan amount authorizations. However, as this does not hold across all loan categories, there are other considerations for the bank. In addition, higher loan approval limits do not necessarily translate into an easier source of credit for small businesses at larger banks.

Table 6 presents the average maximum loan approval amount for an individual loan officer by type of loan. We compare the smallest banks with the largest banks. We present the mean, and the result of the t-test for testing the mean across samples is provided as well. When

Levene's Test for equality of variance rejects the null hypothesis of equal variance, the t-test presented is based on unequal variances. Approval limits for the unspecified other category are not included as there is no basis for comparison.

**Table 6. Maximum Loan Officer Approval by Loan Type (Testing the Equality of Means Across Samples)**

| | Banks < $100,000 Million | Banks > $1 Billion | t-test |
|---|---|---|---|
| Lines of Credit | 177,846 | 302,306 | -1.54 |
| Business Credit Cards | 13,112 | 29,180 | -1.24 |
| Receivables Financing | 192,085 | 315,582 | -1.69* |
| Equipment Lease Improvement | 173,460 | 332,665 | -2.06* |
| Vehicle Loans | 153,688 | 326,103 | -2.14** |
| Secured by Commercial Property | 236,319 | 546,199 | -1.40 |

*Significant at the 10 percent level **Significant at the 5 percent level

Forty-five percent of the respondents to the survey indicate no requirement for the small business firm to maintain a deposit account in order to receive a small business loan. However, approximately one quarter of the 45 percent state that an account is encouraged but not required. Written responses indicate that loan pricing and deposit relationships are tied together suggesting that small businesses that maintain deposit accounts enjoy lower borrowing costs. However, we cannot confirm this without having access to both the loan and deposit files maintained by banks.

For those banks requiring deposit accounts, there does not appear to be any difference in requirements between credit scoring banks and non-credit scoring banks. Both groups most frequently require business checking accounts. This result does not change if the sample is segregated by asset size. The one difference based on asset size is that some smaller banks tend to request alternate types of deposit relationships, including certificates of deposits and business savings accounts. The larger banks tend to require solely the business checking account.

The final aspect of small business lending that we investigate is the alternative uses of credit scores by banks. Within consumer portfolios, credit scores are used to target market a

large range of products. Although this is certainly a long run potential of credit scoring, it appears that the primary extension of this information is to monitor existing loans as shown in Table 7. Those banks that adopted business scoring are somewhat more aggressive with using credit scores to market small business loan and non-loan products. Clearly, the primary alternative use of credit scores beyond origination is the monitoring of existing loans. More than half of those banks using credit scores utilize them for evaluating existing loans.

| Table 7. Extensions of Credit Scores Beyond Loan Originations | | | |
|---|---|---|---|
| | % OCS | % BCS | % SBCS |
| Marketing Small Business Loan Products | 6.7% | 13.3% | 8.0% |
| Marketing Non-Loan Small Business Products | 5.8% | 10.0% | 6.7% |
| Periodically Evaluate Existing Loans | 54.2% | 60.0% | 55.3% |

# VI. EMPIRICAL INVESTIGATION OF SMALL BUSINESS LENDING AND CREDIT SCORING

## *A. Literature Review*

A great deal of extant literature that shows that asymmetric information between borrowers and lenders leads to an inefficient allocation of capital. Information sharing among banks is seen to reduce this asymmetry and mitigate market inefficiencies. Theoretical models have been used to make predictions regarding the impact of information sharing by banks through such technology as credit bureaus and more specifically, credit scores. Many of these models are developed in the context of consumer lending rather than small business lending. Nevertheless, the earlier theoretical models apply to the degree that lending for small business loans is similar to consumer lending.

Common filters, such as credit reports, are shown to lead to increased lending when adverse selection has eliminated high quality borrowers from the market (Pagano and Jappelli (1993)). Shaffer (1998) models common filters for lenders, such as credit scores, as a solution to

adverse selection. Several models predict that information sharing leads to a reduction in defaults, including Pagano and Jappelli (1993), Padilla and Pagano (1997), and Padilla and Pagano (2000). This suggests that banks that use credit scoring would improve the credit quality of their portfolios.

Although not isolated to small business lending, Shaffer (1998) provides a model that suggests an interesting hypothesis related to credit scoring. Shaffer suggests that a bank's preference for a common filter, such as a credit score, will be greater during recessions than during the expansion phase of the credit cycle. Cowan and Cowan (2003) present a risk based loan pricing model that analyzes the pricing impact of various lending methodologies, including credit scoring. The model differentiates between banks based on the implementation of technology. The model predicts that loan pricing varies by the method of implementation of credit scoring, which is consistent with the empirical findings of Berger, Frame, and Miller (2005).

Despite the importance of this innovation to the small business market segment, little empirical evidence has been presented regarding the overall impact of this technology. Limited research is possible given the paucity of data regarding the internal lending operations of banks as well as the coincident borrowing activities of small businesses. Information required to investigate the impact of credit scoring on small business finance is proprietary. This includes lending decisions from the initial use of credit scores through the pricing of loans, as well as the resulting portfolio risk aspects of these decisions. An exception is the Survey of Small Business Finance (SSBF) conducted by the Board of Governors of the Federal Reserve System. Surveys were taken in 1987, 1993, 1998, and 2003. The 2003 data will be available soon.

Preliminary evidence and significant insights into credit scoring for small business loans is also available based on an important telephone survey conducted by the Federal Reserve Bank of Atlanta in January of 1998. The survey provides the basis for several papers that utilize the survey data in conjunction with additional bank data to analyze various aspects of the impact of this technological innovation (Frame, Srinivasan, and Woosley (2001), Frame, Padhi, and Woosley (2004), Akhavein, Frame, and White (2005), Berger, Frame and Miller (2005), Berger

and Frame (2005)). This survey is limited to large institutions, given that at the time of the survey in 1998 SBCS was limited almost exclusively to the largest banks. However, given this limitation to the largest banks, the results cannot be generalized to the population of all banks.

Empirical evidence confirms that the banking industry is still in the process of integrating credit scoring into its back office underwriting operations for small business loans. Not all banks use credit scores for small business lending. Available data suggests that larger banks adopted these scores first, although some small banks are buying these scores as well. Furthermore, banks that use SBCS may use them in different ways. (Frame, Srinivasan, and Woosley (2001), Berger and Udell (2002), Cole, Goldberg, and White (2004), and Akhavein, Frame, and White (2005)). This may reflect the cost of entry for large banks into this loan market that has been dominated by community banks specializing in relationship lending. Alternatively, it is consistent with large and small banks favoring different technologies: transactions-based v. relationship-based. Such differences are reflected in other consumer segments as well which suggests that relationship banking will survive the technological innovation.

The initial evidence from these empirical studies also suggests an increased supply of small business loans, albeit at higher prices. Generally, SBCS is seen to lead to expanded credit supply for small businesses. (Frame, Srinivasan, and Woosley (2001), and Berger, Frame and Miller (2005)). This increase is not limited to high-income areas, but extends to low-income and moderate-income neighborhoods (Frame, Padhi, and Woosley (2004)). The benefit appears to be the provision of small business loans to riskier businesses according to Berger, Frame and Miller (2005). The Berger, Frame and Miller (2005) paper is significant in that it is the first to provide empirical evidence of the risk and pricing characteristics of small business loans originated by banks that utilize credit scoring. The authors are able to match the 1998 telephone survey conducted by the Federal Reserve Bank of Atlanta with the Federal Reserve's Survey of Terms of Bank Lending (STBL) by using information not disclosed to the public regarding responding banks.

There is conflicting evidence regarding changes in distances between business firms and lenders. Petersen and Rajan (2002), Hannan (2003), and Frame et al. (2004) substantiate an increase in distance between lenders and small business borrowers. Hannan (2003) provides support for a dramatic increase in out-of-market loans when measured by numbers of loans and suggests that credit scoring facilitates this increase. Frame et al. (2004) investigate the impact of credit scoring on in-market versus out-of-market lending. They find that out-of-market lending increases for both low and high-income areas but at a cost of reduced lending in-market. In contrast, Degryse and Ongena (2005) and Brevoort and Hannan (forthcoming) document findings that fail to substantiate an increase in distance between lenders and small business borrowers. In particular, Brevoort and Hannan (forthcoming) demonstrate that small banks find distance more of a deterrent than large banks for commercial lending.

Kolari and Zardkoohi (1997) hypothesize that the ratio of small business loans as a percentage of assets is negatively related to age. Using data based on 1993 through 1995, they find that age is negatively related to loans with original amounts less than $100,000 but positively associated with loans with larger original loan amounts. They argue that this is consistent with young banks marketing themselves to small business customers as well as the growing coincident with business customers.

Evidence from the 1998 Federal Reserve Survey suggests that SBCS may not be used by most banks in credit decisions above $100,000. Given the response of the 1998 survey, empirical evidence is limited to a large degree to micro-loans; i.e., small business loans of $100,000 or less. An exception at the overall level is provided by Berger, Frame, and Miller (2005) who find little impact of credit scoring for loans ranging in amount at origination from more than $100,000 to less than $250,000.

The purpose of this study is to contribute to the literature that investigates the importance of credit scoring for small business lending. We summarize the results of the study conducted across a broad cross section of banks on behalf of the SBA. Our results suggest that credit scoring may indeed lead to increased credit availability, although marginally so.

## *B. Investigation of Factors Impacting Small Business Lending*

We are interested in answering the question of whether the use of credit scoring by banks influences the relative level of small-business lending. We are also interested in identifying factors that are important predictors of small business lending. In order to address these issues, we match the survey respondent's June 30, 2005 Call Report data with the survey response to analyze the impact of credit scoring. The Call Report data is publicly available from the website of the Federal Reserve Bank of Chicago (www.chicagofed.org).

Before proceeding with estimation, we begin with a Hausman Specification Test for simultaneity. The problem of simultaneity is of concern because it is possible that those banks with large concentrations of small business loans will be driven to adopt credit scoring by this aspect of their operations. This issue is raised as a concern in both Frame, Srinivasan, and Woosley (2001) and Berger, Frame, and Miller (2005). However, whereas Frame, Srinivasan, and Woosley (2001) adopt a simultaneous equation estimation approach to account for this difficulty, Berger, Frame, and Miller (2005) do not. Ultimately, Frame, Srinivasan, and Woosley (2001) do not find that the ratio of small business loans to total assets is significant in predicting the probability of adopting credit scoring in their model. Consistent with these previous studies, we do not find any statistically significant evidence of simultaneity at the 5 percent level of significance based on the Hausman Specification Test. Therefore, we proceed without using a simultaneous equation framework.

We analyze the impact of credit scoring on small business lending by estimating two OLS regressions. The first regression investigates the importance of credit scoring on the smallest size small business loans; i.e., loans with original amounts less than $100,000. This definition matches the definition used by Frame, Srinivasan, and Woosley (2001). The second regression uses a broader definition of small business loans and explores the impact of credit scoring for all size small business loans as reported on the Call Reports.

$$\begin{aligned} MICRORATIO_i = \quad & b_0 + b_1 SCORING_i + b_2 LNASSETS_i + b_3 EQUITYRATIO_i \\ & + b_4 CORATIO_i + b_5 LOANRATIO_i + b_6 PPERATIO_i \\ & + b_7 TSA_i + b_8 AGE_i \end{aligned} \tag{1}$$

$$SBLRATIO_i = b_0 + b_1SCORING_i + b_2LNASSETS_i + b_3EQUITYRATIO_i + b_4CORATIO_i + b_5LOANRATIO_i + b_6PPERATIO_i + b_7TSA_i + b_8AGE_i + b_9MICROSBL \quad (2)$$

The dependent variables are the ratio of micro small business loans to total loans of bank i (MICRORATIO), and the ratio of total small business loans to total loans (SBLRATIO). These variables differ from the previous literature as the concentration of loans is investigated relative to total loans rather than relative to total assets. We believe this is important for isolating any relationship between credit scoring and small business lending as total assets may include many other types of investments other than loans.

The summary statistics for all the independent variables in the regressions are provided in Table 8. The first independent variable is the dummy variable that takes on the value of 1 for those banks that adopt credit scoring and zero otherwise (SCORING). This variable is designed to capture the importance of credit scoring in a bank's relative investment in small business loans is captured in this variable.

The next four independent variables are drawn directly from Frame, Srinivasan, and Woosley (2001). The natural logarithm of total assets (LNASSETS) is used to capture the influence of size and sophistication. The ratio of total equity to total assets (EQUITYRATIO) is used to capture overall bank risk. We use the ratio of commercial and industrial charge-offs to total commercial and industrial loans (CORATIO) to account for small business lending risk. The total loans and leases to total assets ratio (LOANRATIO) is used to control for the importance of lending in the bank.

Frame, Srinivasan, and Woosley (2001) also use two variables, number of banks, and number of branches, to capture the impact of organizational structure. For example, more centralized banks tend to have more branches and be more transactions-based lenders. The number of banks is not relevant in the current study given the broader spectrum of banks by size as opposed to a model developed for multi-bank holding companies. In the absence of

branch data, we use total property, plant, and equipment as a percentage of total assets (PPERATIO) as our proxy for organizational structure.

**Table 8. Summary Statistics**

| Variable Name | Variable Definition | Mean | Median | Std Dev |
|---|---|---|---|---|
| SCORING | A dummy indicator variable that takes on a value of 1 if the bank has adopted credit scoring and a value of 0 otherwise. | 0.47 | 0.00 | 0.49 |
| LNASSETS | The natural logarithm of total domestic banking assets. | 12.14 | 11.99 | 1.33 |
| EQUITYRATIO | Total equity capital as a percentage of total domestic banking assets. | 10.47 | 9.66 | 3.12 |
| CORATIO | Net commercial and industrial loan charge-offs as a percent of total commercial and industrial loans. | 1.67 | 0.21 | 4.80 |
| LOANRATIO | Total loans as a percent of total assets. | 67.58 | 68.75 | 14.32 |
| PPERATIO | Property, plant, and equipment as a percentage of total assets. | 1.78 | 1.56 | 1.34 |
| AGE | The number of years since the bank became insured. | 46.63 | 58.50 | 26.73 |
| TSA | The number of years since the bank adopted credit scoring. | 2.22 | 0.00 | 4.64 |
| MICROSBL | Total micro small business loans as a percentage of total small business loans. | 21.85 | 19.92 | 12.80 |

We measure the distance in time since adoption of credit scoring (TSA) for each bank using credit scoring in small business lending. Time is measured in years. This is similar to Berger, Frame, and Miller (2005) who use a three-year window to analyze the potential industry learning curve associated with the adoption of credit scoring.

We draw upon Kolari and Zardkoohi (1997) who hypothesize that the age of a bank is negatively related to small business lending activity. Due to missing data for the date of commencement of operations, we use of the number of years since the bank obtained insurance (AGE) to control for the influence of age on small business lending.

We add a variable to test a hypotheses not included in the previous literature. We hypothesize that banks that have a greater proportion of micro business loans in their small

business loan portfolios will tend to have a higher proportion of small business loans overall. We use the ratio of micro business loans to small business loans to capture this effect (MICROSBL). This variable captures aspects of lending that we believe may influence a bank's relative investment in small business loans and is only included in the regression for all small business loans.

The results for the regressions developed to analyze the influence of credit scoring on concentrations in small business lending are presented in Table 9.

**Table 9. OLS Regression Estimates (N=327)**

| | Dependent Variable: MICRORATIO Adj $R^2$=34.0% | | Dependent Variable: SBLRATIO Adj $R^2$=41.7% | |
|---|---|---|---|---|
| **Independent Variable** | Coefficient | t-stat | Coefficient | t-stat |
| (Constant) | 9.38*** | 25.26 | 40.67*** | 48.51 |
| SCORING | -2.28** | -2.00 | -5.86** | -2.28 |
| LNASSETS | -3.10*** | -10.18 | -8.11*** | -10.62 |
| EQUITYRATIO | -0.01 | -0.06 | -0.01 | -0.02 |
| CORATIO | 0.16* | 1.73 | -0.12 | -0.56 |
| LOANRATIO | -0.05* | -1.75 | 0.10* | 1.68 |
| PPERATIO | -0.24 | -0.87 | -1.41** | -2.29 |
| AGE | 0.07*** | 4.91 | 0.02 | 0.63 |
| TSA | 0.25* | 1.95 | 0.59** | 2.08 |
| MICROSBL | -- | -- | 0.34*** | 4.38 |

*Statistically Significant at the 10% level **Statistically Significant at the 5% level
***Statistically significant at the 1% level

There are two measures within the OLS regressions related to credit scoring, SCORING and time since adoption (TSA). Both of these variables provide insight into the impact of credit scoring on small business lending.

We find that the use of credit scoring is negatively related to the ratio of small business loans to total loans for both micro loans and all small business loans. The results are significant both statistically and economically. The estimated coefficient on SCORING is -2.28 for micro

loans and -5.86 for all small business loans. Thus, banks that adopt credit scoring have micro loan ratios and small business loan ratios significantly below the sample mean. Both estimates are significant at the 5 percent level of significance. This suggests that those banks that use credit scoring have lower concentrations of small business loans overall relative to all loans. This does not necessarily mean that credit scoring does not lead to increased credit availability, particularly when considering the results as a whole. The SCORING variable is measuring all banks that have adopted credit scoring regardless of when the use of credit scoring began in the bank. The average time since adoption for credit scoring banks is only approximately five years. If banks that have not traditionally been large small business lenders are the banks that adopt credit scoring, one would ***not*** expect the ratio of small business loans to total loans to be immediately on par or surpass the ratio evidenced by more traditional small business lenders. This may be a positive indication of credit availability if it means that those banks that adopt credit scoring increase their relative holdings of small business loans over time as suggested by our results for the second credit scoring variable.

The time since adoption (TSA) of credit scoring measures the number of years since the bank adopted credit scoring if at all. The estimated coefficient on TSA is 0.25 for micro loans and 0.59 for all small business loans. The coefficient estimate for the MICRORATIO regression is only significant at the 10 percent level of significant with a p-value of 0.052. The coefficient estimate for TSA in the SBLRATIO regression is significant at the 5 percent level of significance. These coefficient estimates relate to annual increases. For every year that credit scoring has been used, the ratio of micro loans to total loans increases. Similarly, for every year that credit scoring has been used, the ratio of small business loans to total loans increases. These results suggest that banks that have adopted credit scoring tend to increase their investment in small business loans. Thus, the availability of credit to this market appears to improve subsequent to a bank's adoption of this technology.

Given the combined results on SCORING and TSA, it is possible that credit scoring will facilitate bank participation in the small business loan market. Credit scoring of small business loans may enhance the attractiveness of these loans to bank management by providing an avenue for better management of the credit risk inherent in loan portfolios. Such an

interpretation is consistent with our findings for the relationship between MICRORATIO and SBLRATIO and the time since adoption of credit scoring. However, as this negative relationship is inconsistent with the previous literature, we investigate it further for possible alternative explanations.

The finding of a negative relationship between the MICRORATIO and SCORING differs from Frame, Srinivasan, and Woosley (2001) as well as Berger, Frame, and Miller (2005) who find a positive relationship. It is unlikely that using total loans in the denominator as compared with the previous literature's use of total assets accounts for the difference in the result. More likely, it is based on the difference in the samples. As noted previously, these prior two studies use a sample that is limited to the very largest banks. Those large banks that adopt credit scoring may be the ones with larger concentrations of small business loans. However, when a cross section of banks is analyzed of various asset sizes, a greater concentration of small business loans for small banks may overwhelm the previous effect.

We investigate the difference in means between banks with assets in excess of $1 billion and banks with total assets equal to or less than $1 billion. We find that the difference in the means of both dependent variables are statistically significant between these bank cohorts. Large banks in the sample average only 4.4 percent of loans in micro loans and 22.1 percent of total loans in small business loans. This compares with a mean of 9.8 percent and 39.7 percent respectively for the smaller banks. We therefore perform additional tests to ascertain whether the intercept term or the slope term associated with the SCORING variable differs by asset category. We fail to reject the null hypothesis that the coefficients associated with the intercept and slope indicator variables for large banks are equal to zero at a 95 percent confidence level. Thus, bank size differences do not appear to account for the negative coefficients on SCORING.

Another possible explanation for the negative relationships between SCORING and SBLRATIO and MICRORATIO is the interaction between the size of the bank and the adoption of credit scoring. If more large banks adopt credit scoring and these banks have lower relative investments in all sizes of small business loans, then the coefficient on SCORING results to some degree from the reduced ratios of large banks. We calculate a measure of interaction by

multiplying SCORING times LNASSETS. Incorporating this interaction term in the regression, we find that it is not statistically different from zero. Therefore, the interaction does not account for the negative relationship. This result suggests that banks that adopt credit scoring do tend to have lower investments in small business loans relative to the investment in total loans.

Given the inability of these alternative explanations to satisfactorily explain our findings, it is very possible that those banks with greater concentrations of consumer loans[3] that depend heavily on credit scoring are transferring this technology to small business loans[4]. If this were true, it would account for the negative relationship between SBLRATIO and SCORING as well as the negative relationship between MICRORATIO and SCORING. Thus, banks that are more heavily invested in consumer loan products such as residential mortgage and consumer credit cards may extend credit-scoring technology to small business loans by depending on the importance of the business owner's credit score in making the lending decision. Given the tendency for banks that use credit scoring to increase their concentration in small business loans over time, this suggests that there may be an increase in capital to small businesses that would not be available without credit scoring.

In addition to the credit scoring variables, we investigate several other independent variables are for their influence on small business lending. Our estimates reflect that small business loans with original amounts less than $100,000 as a percentage of total loans is negatively related to bank size as measured by LNASSETS. The estimated coefficient on LNASSETS for micro loans is -3.10, and it is statistically significant at the 1 percent level of significance. The result for total small business loans is similar. The estimated coefficient on LNASSETS for total small business loans is -8.11, and it is significant at the 1 percent level of

[3] Keith Leggett, Senior Economist in the Office of the Chief Economist at the American Banker's Association, suggested the use of the Federal Deposit Insurance Corporation's (FDIC) demographic information regarding asset concentration specialization in the regressions. This demographic information will be used in future research to investigate further whether consumer banks are the group adopting this technology for small business loans.

[4] We developed a variable of consumer loans relative to total loans to investigate whether our scoring variable was simply picking up the impact of consumer lenders being less invested in small business loans. We measured consumer loans as total residential first and second mortgages plus consumer credit cards. Although the results are not reported here, we found that the coefficient on SCORING remained negative and statistically significant for both regressions despite the addition of this new variable.

significance. This suggests that larger banks tend to have a smaller concentration of their loan investments in small business loans and is consistent with the evidence presented by Frame, Srinivasan, and Woosley (2001). Whereas they estimate a -2.44 coefficient on LNASSETS, our coefficient of -3.10 is based on total loans and so would be expected to be somewhat higher.

The equity ratio (EQUITYRATIO) captures overall risk characteristics of a bank. We do not find any statistically significant relationship between the banks' equity ratio (EQUITYRATIO) and its concentration in small business loans. This holds for both micro loans and total small business loans. Despite higher risk weightings for this asset category in general, the results do not support any differences in equity ratios related to investments in small business loans. It is also consistent with the findings of Frame, Srinivasan, and Woosley (2001) who do not find a statistically significant relationship based on micro loans to total assets.

We also find a positive relationship between the ratio of commercial and industrial charge offs to total commercial and industrial loans (CORATIO) to the ratio of micro business loans to total loans (MICRORATIO) but only at the 10 percent level of significance. In contrast, we show no statistically significant relationship between CORATIO and the ratio of total small business loans to total loans (SBLRATIO). The positive association suggests that those banks that invest a higher concentration of loans in this loan segment are subject to higher risks. However, although the estimate is statistically significant, it is not economically significant. Thus, given the lower confidence level and the economic insignificance of the estimate, there is little difference in investment in micro loans relative to total loans for banks with higher risk profiles. Moreover, the results do not provide any empirical evidence of differences in proportional investments in total small business loans based on charge off rates.

The ratio of loans to total assets (LOANRATIO) captures the importance of lending overall in the bank's asset portfolio. We do not find any statistically significant evidence that this ratio is an indicator of the relative level of investment in micro or total small business loans. The result suggests that the small business lending decision is not driven by the overall lending decision. It suggests that market segments are identified and lending decisions made based on the identification of attractive lending opportunities rather than targeted investment levels.

The results for the ratio of property, plant and equipment to total assets (PPERATIO) is mixed. There is no statistically significant relationship between this ratio and the investment in micro loans relative to total loans (MICRORATIO). However, the relationship is statistically significant at the 5 percent level of significance between this ratio and the ratio of small business loans to total loans (SBLRATIO). The estimated coefficient for SBLRATIO is -1.41.

Finally, we do not find any support for the Korali and Zardkoohi (1997) hypothesis that the ratio of small business loans as a percentage of assets is negatively related to age. This variable is only statistically significant for micro loans. The estimated coefficient is 0.07. Although this appears to be economically insignificant, it is not. This suggests that the investment in micro loans relative to total loans increases with each year. Banks in the sample are as young as one year old and average approximately 46 years. This suggests that banks not only continue to make an investment in micro business loans over time, but that the investment in this smallest segment increases relative to total loans over time. In contrast, we find no statistically significant relationship between AGE and the relative investment in total small business loans. Thus, the importance of small business loans to the overall loan portfolio may not reflect a decision of young banks to invest more heavily in these more informationally opaque firms as proposed by Korali and Zardkoohi (1997).

## C. *Investigation of the Propensity to Adopt SBCS*

We are also interested in identifying bank specific characteristics that may lead to the adoption of credit scoring for small business lending. Therefore, we develop a logistic regression to investigate the propensity for banks to adopt credit scoring for small business lending. The model is set forth in equation (3) below. The dependent variable is SCORING. It is an indicator variable with a value of one for those banks that adopt credit scoring for small business loans and zero otherwise.

$$\begin{aligned} SCORING_i = \quad & b_0 + b_1 LNASSETS_i + b_2 EQUITYRATIO_i \\ & + b_3 CORATIO_i + b_4 LOANRATIO_i + b_5 PPERATIO_i \\ & + b_6 AGE_i + b_7 SBLRATIO_i + b_8 MICRORATIO_I \\ & + b_9 LNSBL_i + b_{10} LNMICRO_i + b_{11} FARMLNRATIO_i \end{aligned} \qquad (3)$$

With only one exception, we use the same variables in this equation as those used in the OLS regressions. The above model includes an additional independent variable. We hypothesize that rural banks are less likely to adopt credit scoring. Assuming that rural banks are more likely to make farm loans, we use the ratio of farm loans to total loans (FARMLNRATIO) as an indication that a bank primarily serves a rural community. This includes all farm related loans regardless of size.

The estimated results for the logistic regression are presented in Table 10. With a logistic regression, the beta coefficients (B) cannot be interpreted directly. However, the sign of the coefficient and the significance of the result provide important insights into predictors.

**Table 10. Logistic Regression (N = 327)**

| | Dependent Variable: SCORING | |
|---|---|---|
| **Independent Variable** | Coefficient | Wald |
| (Constant) | -1.946 | 0.65 |
| LNASSETS | 0.63 | 1.52 |
| EQUITYRATIO | -0.04 | 0.71 |
| CORATIO | 0.07* | 2.93 |
| LOANRATIO | 0.03** | 6.02 |
| PPERATIO | 0.04 | 0.18 |
| AGE | 0.00 | 0.52 |
| SBLRATIO | 0.02 | 1.29 |
| MICRORATIO | 0.00 | 0.01 |
| LNSBL | -0.95 | 2.12 |
| LNMICRO | 0.17 | 0.26 |
| FARMLNRATIO | -.039** | 6.36 |

*Statistically significant at the 10 percent level
**Statistically Significant at the 5 percent level

We find a limited number of variables that contribute to the likelihood of adopting small business credit scoring. It is clear from the results that the two most important variables that indicate that a bank will adopt small business credit scoring are the LOANRATIO and FARMLNRATIO. The first variable measures the importance of lending overall to the bank, and the second variable proxies for the importance of the rural lending to the bank.

The results of the logistic regression suggest that the greater the overall investment in lending for the bank relative to total assets, the more likely the bank is to adopt small business credit scoring. There is a positive relationship between LOANRATIO and SCORING, and this relationship is statistically significant at the 5 percent level of significance. This relationship suggests that the greater the lending volume, the greater the propensity for the adoption of credit scoring in small business lending.

As expected, the greater the investment in farm related loans relative to total loans, the lower the likelihood that a bank will adopt credit scoring. The negative relationship between these loans and the adoption of credit scoring is statistically significant at the 5 percent level of significance. The result suggests that rural banks are less likely to adopt credit scoring as compared with their urban counterparts[5].

The decision to invest in small business credit scoring technology is positively related to the charge off ratio (CORATIO). Although the coefficient is only significant at the 10 percent level of significance, it provides some support for the argument that higher perceived risk levels motivate a greater investment in a technology that purports to improve risk management. It is important to recognize that this logistic regression is based on a snapshot in time and does not incorporate the change in this ratio over time since the adoption of credit scoring. Chargeoffs result from historical decisions. Without a time series that links the initial time of the credit decision to the initial adoption of credit scoring, it is not possible to evaluate the impact of the decision to adopt credit scoring on the credit worthiness of the bank's portfolio. Thus, although there is some indication that banks that adopt credit scoring have greater loan risk, this cannot be used to conclude the adoption of credit scoring does not reduce risk.

In contrast to Frame, Srinivasan, and Woosley (2001) who find that the probability of using credit scoring is positively related to the number of branches, we do not find a statistically significant relationship between the probability of using credit scoring and the ratio of the

[5] W. Scott Frame, Financial Economist and Associate Policy Advisor with the Federal Reserve Bank of Atlanta, suggested that the farm lending ratio may not only be picking up rural banks, but also rural Midwestern banks particularly if there is geographic clustering in using SBCS technology.

bank's investment in fixed assets relative to total assets. A possible explanation for the difference is that given the broader sample used in this paper that banks with all sizes of branch networks adopt credit scoring. Within the Frame et al. (2001) sample, the number of branches would have provided a good indication of the bank's involvement with retail banking rather than wholesale or investment banking. With our sample, our sample generally represents retail banks and therefore we may not be able to capture this "customer contact" aspect if all banks engage in retail banking regardless of the size of their branch network.

As anticipated, we do not find any statistically significant relationship between the proportional investment in small business loans or micro loans relative to total loans and the probability of adopting credit scoring. In addition, the level of micro business loans and small business loans as measured by the log of these variables is not significant. Both of these findings are consistent with the previous finding of Frame, Srinivasan and Woosley (2001) who find that neither the proportion nor the level of the smallest small business loans are significant in the decision of the largest banks to adopt credit scoring.

Asset size as measured by the natural log of total assets does not influence the probability of adopting credit scoring. Again, this finding is consistent with the finding of Frame, Srinivasan, and Woosley (2001) who do not find a statistically significant result for micro loans.

The decision to adopt credit scoring appears to be driven by both the importance of lending to the bank as well as the type of lending conducted by the bank. In particular, banks that make a high percentage of farm related loans relative to total loans are not likely to adopt credit scoring. In addition, there is some indication that banks with higher risk levels as measured by the commercial and industrial charge off ratio are more likely to adopt credit scoring. This may reflect a response to perceived risk levels in particular since charge offs result from historical decisions.

# VII. CONCLUSION

Banks are in the process of integrating credit scoring into their small business operations to various degrees. For those respondents that have declined to adopt the technology to date, the lack of confidence in the score was the primary reason for failure to adopt the technology. This is not surprising given that the development of business scores suffers from some of the same information asymmetry problems that confront banks engaged in small business lending. Perhaps it is this reason that leads SBCS banks to indicate that a previous relationship is more important than the credit score in the determination of the lending decision.

Regardless of whether banks adopted any form of credit scoring, relationship banking continued to dominate the lending decision regardless of bank size. This may reflect the value of flexibility in the renegotiation of contract terms in relationship banking as discussed by Boot (2000). It suggests a preference for discretion based versus rules based decision making in banking. In contrast, those respondents who elected a lending methodology based on credit scoring for the most part did so to obtain a quantifiable measure of risk.

Geographic expansion does not appear to be directly related to the use of credit scoring by the credit scoring institutions. The decision to implement credit scoring is not perceived to lead to a decision to expand the lending territory. It may be that geographic expansion is a function of multitude of interrelated factors; such as types of lending, branch network, and technological advances. This would be consistent with the interaction affects found to be influential by Brevoort and Hannan (forthcoming). Future research will use advanced models to elicit this relationship.

There is some evidence that banks are using credit scoring for risk-based pricing and in the process making loans to lower credit quality small businesses. Credit scores allow banks to charge risk adjusted premiums on these less credit-worthy loans. All credit scoring banks with assets less than $1 billion indicated that the primary difference in pricing subsequent to the use of credit scoring was the implementation of risk premiums for lower credit quality borrowers. For banks with more than $1 billion in assets, the credit risk premium was the second pricing

adjustment to result from credit scoring. The ability to price loans in such a manner makes the business profitable to banks and opens opportunities for more small businesses.

It is clear that small business lending is in a state of transition, in which credit scoring plays a part. Credit scoring is one of several banking innovations changing the lending landscape for small business loans. The primary use of credit scores outside the small business loan origination is loan monitoring. Our results do not indicate any momentum in the development of secondary markets for small business debt. However, we would expect that secondary markets would be developed over the long run. We do find some trend toward specialization, which suggests that small businesses may benefit from selecting banks that cater to their niche.

We provide empirical evidence of a significantly negative relationship between small business loan concentrations and credit scoring There are several possible explanations for this finding, including the possibility that banks that have not been the leaders in small business lending use this technology to be able to more effectively compete in this market. Additionally, we show that small business loan concentration increases with the length of time since adoption. This result is consistent for both micro business loans and all small business loans. This suggests that banks tend to increase their investment in small business and micro business loans relative to their total loan portfolios subsequent to the adoption of credit scoring. It appears that banks may be using credit scoring to facilitate expansion in small business loans which is very good news for small businesses.

Credit scoring appears to be a strategic decision that is differentiated by the operational structure of the bank. The greater a bank's investment in lending relative to assets, the more likely the bank is to use credit scoring. In addition, we find that rural banks are less likely to adopt credit scoring relative to their urban counterparts.

In conclusion, this survey data provides numerous opportunities for additional research in small business lending. More advanced models will allow us to identify subtleties in the data. Topics for future papers include issues related to the diffusion of this technological innovation for the small banks as well as differences between relationship and transaction based lenders.

Of great interest to small business borrowers and lenders is the impact of credit scoring over time. Thus, important future research would evaluate changes in credit availability over time subsequent to the adoption of credit scoring. Our current study has provided evidence related to the levels of small business credit in 2005. We intend to develop a panel data set that will allow us to evaluate changes over time more specifically.

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# APPENDIX A: SAMPLE DESIGN AND WEIGHTING

To select a sample of banks for the proposed survey, we relied on the June 2004 Call Reports, supplemented with information from the FDIC List of Institutions. Call Reports are filed by all banks each quarter with the banking regulators and provide a great deal of information about financial characteristics of the bank. Each June, the Call Reports collect information about Small Business and Agricultural lending. This information helps to determine which banks are making small business loans and the importance of such loans to the financial institution relative to other investments made by the bank.

Between the time the June Call Reports are filed and now, a number of banks have gone out of business through mergers, acquisitions, or in a few cases closings. At the same time, new banks have come into existence but have not filed a June report giving the small business loan information. Additionally, there are a number of banks that have no small business loans because their focus is on other lines of business. The following sections give a description of how we formulate the population, obtain a listing of banks, stratify the population, and sample within strata to obtain our final sample.

### Sampling Frame

As noted in the introduction, our initial sampling frame is all banks that filed a June 2004 Call Report. Because of the relatively large number of banks that merged or were acquired, we merged the data from this list with the current list of institutions from the FDIC. This operation has the additional value of adding information about each institution that is not available from the Call Reports. Table A1 shows the counts of the number of banks obtained in this way.

Table A1: Banks in the June, 2004 Call Report, Supplemented by the Current FDIC Institution List

| Source | Number |
|---|---|
| On June 04 Call, not on Current | 232 |
| On Current, not on June 04 | 997 |
| On both files | 7,950 |
| Total | 9,179 |

We have no information regarding small business lending from the current institution list, and some of the listings on the current list are not on the Call Reports because they have no obligation to file. Therefore, these 997 are not considered to be part of the population of banks who filed a call report in June, 2004. Of the banks that did exist in June, 2004 who did file a report, 232 either merged or went out of business, or were closed by the FDIC. As there would be no one to talk with about current lending policy, these are also eliminated from the population.

This leaves 7,950 financial institutions that completed a June, 2004 Call Report. These banks were of different types, some of which did not do small business lending. However, even obvious types which have an orientation away from small business lending do make some small business loans. Using data from section RC-C of the Call Report, focusing on number and amount of small business loans, we find that some banks make secured loans in amounts under one million dollars, some banks make construction and i (C&I) loans in amounts under one million dollars, and some banks make both. We tabulated these categories by the asset specialization type of each bank to see if there were any categories of banks that should be eliminated from consideration in the population. Table A2 presents this categorization.

Table A2: Distribution of Banks by Asset Specialization and Whether Any Small Business Loans

| Asset Concentration Hierarchy | No Loans | Either C&I or Secured | Both C&I and Secured | Total |
|---|---|---|---|---|
| International Specialization | 0 | 1 | 4 | 5 |
| Agricultural Specialization | 714 | 15 | 988 | 1,717 |
| Credit-card Specialization | 17 | 8 | 3 | 28 |
| Commercial Lending Specialization | 233 | 37 | 3,801 | 4,071 |
| Mortgage Lending Specialization | 90 | 60 | 347 | 497 |
| Consumer Lending Specialization | 39 | 2 | 67 | 108 |
| Other Specialized < $1 Billion | 186 | 12 | 198 | 396 |
| All Other < $1 Billion | 376 | 19 | 667 | 1,062 |
| All Other > $1 Billion | 3 | 10 | 53 | 66 |
| Total | 1,658 | 164 | 6,128 | 7,950 |

Note that in these categories, even international banks and those who specialize in credit-cards report some small business loans. A different tabulation of whether loans were made by entity type gives a similar story. Table A3 presents this result.

Table A3: Distribution of Banks by Entity Type and Whether Any Small Business Loans

| Entity Type | No Loans | Either C&I or Secured | Both C&I and Secured | Total |
|---|---|---|---|---|
| Commercial bank | 1,598 | 90 | 5,797 | 7,485 |
| US branch of a foreign bank | 3 | 3 | 5 | 11 |
| State-chartered savings bank | 51 | 56 | 278 | 385 |
| Cooperative bank | 6 | 15 | 48 | 69 |
| Total | 1,658 | 164 | 6,128 | 7,950 |

Remember that these are counts of banks by reported types and whether they lend to small businesses. The questions in the survey are oriented towards small business lending practices, so asking the 1,658 banks that do no small business lending would be fruitless. These were eliminated from the population.

Further investigation of the eight U.S. branches of foreign banks showed that none of these banks supplied other information that will be needed for analysis. In particular, they report no information on assets, deposits, equity, or liabilities. Because these banks have no reports of any ancillary information, they are eliminated from the population. This leaves U.S. banks that reported some small business lending, regardless of their primary focus or activities. Table A4 summarizes these banks.

Table A4: Banks with Some Small Business Lending and With Reported Information on Assets

| Entity Type | No Loans | Either C&I or Secured | Both C&I and Secured | Total |
|---|---|---|---|---|
| Commercial bank | 0 | 90 | 5,797 | 5,887 |
| U.S. branch of a foreign bank | 0 | 0 | 0 | 0 |
| State-chartered savings bank | 0 | 56 | 278 | 334 |
| Cooperative bank | 0 | 15 | 48 | 63 |
| Total | 0 | 161 | 6,123 | 6,284 |

**Stratification**

The population should be stratified to encourage comparison between subgroups of interest and also to ensure representativeness of national projections. Questions asked in this survey have not been asked of banks and financial institutions previously. Therefore, we don't know what the distribution of responses might be, how they might be correlated with other variables, nor differences in variances between subgroups. Furthermore, there are a number of different questions regarding lending practices to be asked on the survey, so it is impossible to concentrate on a single question to suggest how the sample should be allocated.

Because of these concerns, we have attempted to stratify on three key variables: size of the bank proportion of secured loans devoted to small business lending, and proportion of Commercial and Industrial (C&I) Loans devoted to small business lending. The choice of these variables will be explained in this section, as well as the impact on the final sample distribution.

Size of the bank is important because of the resources the bank has available to devote to analysis of risk in small business lending. Additionally, with the expected changes in regulatory supervision and the push to tie reserves to credit risk in a bank's portfolio, larger banks are paying much closer attention to risk measures than previously. We would like to

compare the strategies of large, medium, and small banks to ascertain how they deal with these issues.

Previous analyses by the SBA have used a set of categories for comparison of groups of banks, and the stratification proposed here continues this stratification by breaking banks into four groups. Table A5 presents the distribution of banks by size in terms of assets.

Table A5: Distribution of Banks by Size in Terms of Assets

| Size | Number | Percent |
|---|---|---|
| < $100M | 2,480 | 39% |
| $100M-$500M | 2,943 | 47% |
| $500M-$1B | 428 | 7% |
| > $1B | 433 | 7% |
| Total | 6,284 | 100% |

From the Call Reports, we have two additional variables available for analysis. One is the dollar amount of secured loans made to small businesses, the second is the amount of C&I loans made to small businesses. There is a further breakdown by size of loan made, but there are two problems with looking at the amounts made. First, smaller banks tend to make smaller loans, so knowing the size of the loan is redundant with the size of the bank. Secondly, use of the sizes of the loans for additional information greatly expands the number of strata that would be used, also the cross-tabulation of size of loans (in three groups for each type) by size of bank results in the use of seven variables for stratification, making the sampling process very unwieldy and creating a table of banks with many zero cells.

We concentrated on grouping banks into groups that had significant resources devoted to small business loans versus those that had fewer resources in small business lending. To do this, we looked at the distribution of banks across resources in small business lending. We calculated the ratio of small business loans to the total assets of each bank. Table A6

summarizes the percentile distribution of banks on the ratio of secured small business loans and the ratio of C&I small business loans.

Table A6: Distribution of Bank Ratios of Lending to Assets

| | Percentiles | | | | | | |
|---|---|---|---|---|---|---|---|
| | 5% | 10% | 25% | 50% | 75% | 90% | 95% |
| Secured Loans to Total Assets ($) | 0.0120 | 0.0243 | 0.0539 | 0.0966 | 0.1509 | 0.2134 | 0.2598 |
| C&I Loans to Total Assets ($) | 0.0082 | 0.0177 | 0.0388 | 0.0684 | 0.1083 | 0.1584 | 0.2024 |

Using these cut points, we created two new variables. The first is a split of banks into those below the median ratio for secured loans to total assets (those with a ratio less than .0966), banks in the third quartile of banks (ratio of .0966 to .1509), those in the top quartile but not in the top five percent (ratio of .1509 to .2134), and those in the top five percent (ratio greater than .2598). The second variable is a similar split of banks, but using the C&I Loans to Total Assets ratio into four groups. A cross-tabulation of these variables is presented in Table A7.

The goal was to identify those banks that are heavily invested in one or the other types of small business loans. These banks have made a specific commitment to small business lending and may have very different views of credit risk, the value of a relationship to the bank , the value of a relationship to the borrower, and other variables that go into determining a lending strategy. Accordingly, we split banks into bands of commitment to small business lending.

Table A7: Distribution of Banks According to their Commitment to Small Business Lending

| | Percentile Ratio of C&I Loans to Total Assets | | | | |
|---|---|---|---|---|---|
| Percentile Ratio of Secured Loans to Total Assets | Bottom 50% | 3rd Quartile | 75 to 95% | Top 5% | Total |
| Bottom 50% | 1,919 | 637 | 442 | 144 | 3,142 |
| 3rd Quartile | 683 | 461 | 360 | 67 | 1,571 |
| 75 to 95% | 432 | 396 | 347 | 82 | 1,257 |
| Top 5% | 108 | 77 | 108 | 21 | 314 |
| Total | 3,142 | 1,571 | 1,257 | 314 | 6,284 |

There are banks that are in the top five percent of C&I lending that have a lesser commitment to secured loans. Similarly, there are banks that are in the top five percent of issuing secured loans to small businesses (relative to total assets), but are in the bottom 50 percent of lenders offering C&I loans. Very few banks have their ratios in the top five percent for both types of small business loans. To have sufficient loans in a stratum and to capture the commitment to small business lending, we created the bands outlined in Table A7. A bank that is in the bottom 50 percent of loans for both secured and C&I lending is in group 1. A bank whose highest ranking on either variable is in the third quartile is in group 2. A bank whose highest ranking on either variable is in the top five percent is in group 4. The remaining banks are in group 3. Table A8 summarizes the final categorization.

Table A8: Distribution of Banks on the Combination of the Two Ratios Describing Types of Small Business Loans

| Two Ratios Are: | Number | Percent |
|---|---|---|
| Neither > Median | 1,919 | 31% |
| Neither > 75% | 1,781 | 28% |
| Neither > 95% | 1,977 | 31% |
| One or Both > 95% | 607 | 10% |
| Total | 6,284 | 100% |

A final tabulation of size by the grouping variable in Table 8 gives the strata proposed for this survey. This tabulation is given in Table A9.

Table A9: Distribution of Banks by Size and by Grouping on Commitment to Small Business Lending

| | < $100M | $100M-$500M | $500M-$1B | > $1B | Total |
|---|---|---|---|---|---|
| Neither > Median | 692 | 749 | 181 | 297 | 1,919 |
| Neither > 75% | 630 | 888 | 160 | 103 | 1,781 |
| Neither > 95% | 814 | 1,055 | 79 | 29 | 1,977 |
| One or Both > 95% | 344 | 251 | 8 | 4 | 607 |
| Total | 2,480 | 2,943 | 428 | 433 | 6,284 |

## Sample Size and Allocation

For this project, we proposed a sample size of 1,200 based on the budget available to conduct the research. We anticipate a reasonable response rate of 80 percent, so we plan to sample 1,500 banks with the expectation of a final sample of 1,200 returns. The next question is to determine how to allocate the sample to the cells in the three way table. Three choices are available.

One option is to sample equal sizes in all cells. For the purpose of comparison between groups, this would be the optimal allocation of the sample as each group in the population would have equal sizes for the comparison tests. There are 16 cells in the table, meaning there would be 1,500/16 = 94 banks per cell. This isn't entirely practical as there are several cells that have fewer than 94 banks per cell. An adjustment would be required to be made.

A second approach is to use a proportional allocation of sample to cells. In the absence of any information about the variances to be measured and how they would vary between strata, this allocation is optimal for making national estimates, although it can be deleterious for making comparisons between subgroups. This allocation takes us to the other extreme, where now several of the small cells have only one bank selected.

A third approach is to recognize the nature of the distribution of banks across regulators, and capitalizing on the finite population correction factor within each stratum. From equal allocation, it is possible to shift some sample cases into those areas where we get the greatest variance reduction. Balancing the reduction in national estimates with comparisons between groups of banks plays a major role in the allocation. The distribution of the sample is presented in Table A10.

Table A10. Distribution of Sample of Banks for Survey

| | < $100M | $100M-$500M | $500M-$1B | > $1B | Total |
|---|---|---|---|---|---|
| Neither > Median | 139 | 147 | 74 | 89 | 449 |
| Neither > 75% | 132 | 165 | 71 | 64 | 431 |
| Neither > 95% | 155 | 186 | 61 | 29 | 431 |
| One or Both > 95% | 95 | 83 | 8 | 4 | 190 |
| Total | 521 | 580 | 214 | 185 | 1,500 |

## Sample Selection

As described earlier, within each cell in table nine above, banks are ordered from highest proportion of loans to small businesses (by dollar) to lowest. A systematic sample was then selected in each cell using the number of banks in the cell and the sample desired. An overall sample of 1,500 banks was selected to be contacted and surveyed using the questionnaire developed for this study.

## Weighting and Estimation

Using the information described above, weights will be computed based on the likelihood of selection in each stratum and these weights will be used in the analysis to guarantee that estimates from the sample are projectable to the full population of reporting banks that loan to small businesses.

We naturally expect some nonresponse from the survey, and expect to adjust sample weights to correct for nonresponse. Adjustments would be in the form of a second stage adjustment to the weights calculated from the probability of selection. The second stage adjustment would further extrapolate from the received sample to the expected sample (described in Table 10). The first stage weights extrapolated from the sample in Table 10 to the population in Table 9 on a cell by cell basis. Sensitivity tests will also be conducted to determine if the range of weights is extended too much by adjusting for nonresponse.

# APPENDIX B: SURVEY RESPONSE SUMMARY

Each survey question is presented below with the weighted survey responses.

1. What is the approximate % of each type of **small business loan** shown below as a % of total loans to small businesses?

| Loan Type | Mean Response |
|---|---|
| Lines of Credit | 23% |
| Business Credit Cards | 5% |
| Receivables Financing | 11% |
| Equip/Lease Improvement | 20% |
| Vehicle Loans | 11% |
| Loans Secured by Commercial Property | 45% |
| Other | 20% |

2. Does your bank use credit scores in any aspect of underwriting **small business loans**?

| Response | Banks |
|---|---|
| Yes, credit scores calculated for the business | 4 |
| Yes, personal credit scores for the owner of the business | 123 |
| Yes, both business and personal credit scores of the owner | 27 |
| No | 173 |

3. If you do not currently use credit scores, do you plan to implement credit scoring for **small business loans** during the next 12 to 18 months?

| Response | Banks |
|---|---|
| Yes | 12 |
| No | 161 |

4. For which of the following reasons does your bank not currently use credit scores for **small business loans**? (*Please check all that apply).*

| Reason for Not Using SBCS | Banks |
|---|---|
| Lack of confidence in credit scores. | 67 |
| Low loan volume. | 47 |
| Customer resistance. | 10 |
| Loans do not lend themselves to credit scoring. | 77 |
| Expense. | 22 |
| Other | 50 |

5. Approximately when did your bank begin using **small business** credit scores?

| Year | Banks |
|---|---|
| 1994 or Prior | 22 |
| 1995 | 13 |
| 1996 | 8 |
| 1997 | 8 |
| 1998 | 9 |
| 1999 | 13 |
| 2000 | 11 |
| 2001 | 14 |
| 2002 | 17 |
| 2003 | 14 |
| 2004 | 16 |
| 2005 | 8 |

6. What is the source of the bank's **small business** credit scores? *(Please circle only one response)*

| Source of Credit Scores | Banks |
|---|---|
| Bank developed its own scoring model. | 11 |
| Bank developed scoring model with help from outside sources. | 10 |
| Bank developed scoring model that it supplements with scores from 3rd party vendors. | 16 |
| Bank purchases scores from 3rd party vendors | 105 |
| Other | 12 |

7. Which credit rating services do you use? *(Please check all that apply)*.

| Credit Rating Service | Banks |
|---|---|
| Moody's | 5 |
| Fair Isaacs | 40 |
| Dun and Bradstreet | 16 |
| Experian | 58 |
| Other | 63 |

8. For what **small business loan** types are credit scores used for automatic approval or rejection of loan applications? *(Please check all that apply).*

| **Type of Loan with Auto Approve Based on Credit Scoring** | **Banks** |
|---|---|
| Lines of Credit | 18 |
| Small Business Credit Cards | 8 |
| Receivables Financing | 10 |
| Equipment/Lease Improvement | 18 |
| Vehicle Loans | 15 |
| Small Business Loans Secured by Commercial Property | 16 |
| Other | 3 |
| None | 117 |

9. For what size **small business loans** types are credit scores used for automatic approval or rejection of loan applications? *(Please check all that apply).*

| **Size of Loan with Auto Approve Based on Credit Scoring** | **Banks** |
|---|---|
| Less than $50,000 | 26 |
| $50,000 to less than $100,000 | 5 |
| $100,000 to less than $250,000 | 5 |
| $250,000 to less than $1,000,000 | 0 |
| No dollar limit | 6 |
| No automatic approval | 106 |

10. For what **small business loan** types are credit scores used as part of the loan evaluation process for loans not automatically approved or rejected? *(Please check all that apply).*

| **Loan Types for which Credit Scores Used** | **Banks** |
|---|---|
| Lines of Credit | 121 |
| Small Business Credit Cards | 60 |
| Receivables Financing | 88 |
| Equipment/Lease Improvement | 118 |
| Vehicle Loans | 110 |
| Loans Secured by Commercial Properties | 113 |
| Other | 19 |
| None | 6 |

11. For what size **small business loans** are credit scores used as part of the loan evaluation process for loans not automatically approved or rejected? *(Please check all that apply).*

| **Size of Loan for which Credit Scores Used** | **Banks** |
|---|---|
| Less than $50,000 | 62 |
| $50,000 to less than $100,000 | 58 |
| $100,000 to less than $250,000 | 63 |
| $250,000 to less than $1,000,000 | 58 |
| No dollar limit | 66 |
| None | 10 |

12. Please rank the importance of each of the following in the final loan approval decision when the credit score is only part of the loan evaluation process. *(1 = Most Important; if a factor is not important or not considered, leave blank)*

| **Ranked Importance of Factor in Loan Approval Decision** | **Mean Response** |
|---|---|
| Personal Guarantee(s) | 3.58 |
| Net Worth of Business | 3.18 |
| Credit Score | 3.98 |
| Quality of Collateral | 2.41 |
| Cash Flow of Business | 1.53 |
| Other | 2.53 |

13. For which other purposes besides loan underwriting does your bank use credit scores in **small business lending**? (*Please check all that apply).*

| **Alternate Uses of Credit Scores** | **Banks** |
|---|---|
| Marketing other small business loan products | 12 |
| Marketing other, non-loan small business products/services | 9 |
| Periodic evaluation of existing loans | 83 |
| Risk based loan pricing | 54 |
| Other | 14 |

14. For what types of **small business loans** have you used mailing lists with credit scores supplied by outside sources to promote your loan programs? *(Please check all that apply).*

| **Use of Targeted Mailing Lists for Loan Type Based on Credit Scores** | **Banks** |
|---|---|
| Lines of Credit | 4 |
| Small Business Credit Cards | 3 |
| Receivables Financing | 0 |
| Equipment/Lease Improvement | 4 |
| Vehicle Loans | 2 |
| Loans Secured by Commercial Properties | 0 |
| Other | 0 |
| None | 134 |

15. Please rank the reasons your institution adopted credit scoring for **small businesses.**
(1 = Most Important; if a factor is not important or not considered, leave blank)

| **Ranked Importance of Reason for Adopting SBCS** | **Mean Response** |
|---|---|
| Competitive Pressures | 3.9 |
| Regulatory Pressures | 2.8 |
| Simplification of loan application process | 2.1 |
| Reduction in underwriting costs | 3.2 |
| Quantification of credit evaluation | 1.8 |
| Inexpensive access to additional borrower information | 2.4 |
| Potential loan sales to secondary markets and/or other lenders | 6.0 |
| Other | 1.1[6] |

16. If a small business customer has an existing relationship with your bank, do you use credit scoring on credit extensions or new loan applications for this customer? *(Please circle only one response)*

| **Use of Credit Scores for Additional Business** | **Banks** |
|---|---|
| Yes | 118 |
| No – *go to Question 18* | 21 |

[6] A mean response of 1.1 in "other" does not necessarily indicate that this is the most important category. Rather, it indicates that of the total number of banks that responded to "other", these specific banks rate "other" as one of the most important factors.

17. Approximately how much weight is given to the existing customer relationship as opposed to the weight given to the new credit score in the credit extension or new loan? *(Please circle only one response)*

| **Weight Given to Existing Customer Relationship vs. Credit Score in Credit Extension or New Loan** | **Banks** |
|---|---|
| 0% - 10% | 1 |
| 11% - 20% | 5 |
| 21% - 30% | 2 |
| 31% - 40% | 2 |
| 41% - 50% | 15 |
| > 50% | 25 |
| Depends on Customer | 68 |
| Don't Know | 3 |

18. As a result of **small business** credit scoring, how has your geographical lending area expanded? *(Please circle only one response)*

| **Geographic Expansion as a Result of Credit Scoring** | **Banks** |
|---|---|
| Not at all | 117 |
| Expansion to new cities | 4 |
| Expansion to new counties within state | 9 |
| Expansion to new border states | 1 |
| National expansion | 5 |

19. What additional loan products are offered by your bank since the adoption of **small business** credit scoring? *(Please check all that apply)*.

| **Additional Loan Products Offered** | **Banks** |
|---|---|
| Lines of Credit | 17 |
| Small Business Credit Cards | 8 |
| Receivables Financing | 13 |
| Equipment/Lease Improvement | 12 |
| Vehicle Loans | 11 |
| Loans Secured by Commercial Property | 10 |
| Other | 9 |
| None | 40 |

20. As a result of **small business** credit scoring, how has the volume of loans to small businesses changed? *(Please circle only one response)*

| **Change in Volume of Loans to Small Businesses** | **Banks** |
|---|---|
| Decreased Significantly | 0 |
| Decreased Moderately | 5 |
| No Change | 96 |
| Increased Moderately | 14 |
| Increased Significantly | 8 |

21. In general, how have the pricing terms of **small business loan**s changed since the adoption of credit scoring? *(Please check all that apply)*.

| **Change in Pricing Terms of Small Business Loans** | **Banks** |
|---|---|
| Increased maximum size of loans | 6 |
| Reduced cost of credit lines | 10 |
| Wider spread over cost of funds in loan pricing | 30 |
| Premiums charged on less credit-worthy loans | 47 |
| Increased collateralization requirements | 33 |
| Increased guarantee requirements | 20 |

22. Have you expanded your **small business** lending to include new industries as the result of your adoption of credit scoring? (*Please circle only one response*)

| **Lending to New Industries as a Result of Credit Scoring** | **Banks** |
|---|---|
| Yes | 7 |
| No – *go to Question 24* | 125 |

23. How many new industries are represented in your expanded lending to **small businesses**? *(Please circle only one response)*

| **New Industries as a Result of Credit Scoring** | **Banks** |
|---|---|
| None (zero) | 17 |
| 1-3 more industries | 1 |
| 3-6 more industries | 2 |
| 6-9 more industries | 0 |
| >10 more industries | 2 |

24. In general, what has been the impact of credit scoring on the quality of credit decisions for **small business loans**? *(Please circle only one)*

| **Change in Quality** | **Banks** |
|---|---|
| Significant decline in the quality of credit decisions | 0 |
| Moderate decline in the quality of credit decisions | 2 |
| No impact on the quality of credit decisions | 41 |
| Moderate improvement in the quality of credit decisions | 74 |
| Significant improvement in the quality of credit decisions | 13 |

25. In general, what has been the impact of credit scoring on the credit riskiness of the bank's **small business** loan portfolio? *(Please circle only one)*

| **Impact of Credit Scoring on Credit Riskiness** | **Banks** |
|---|---|
| Significant decline in the credit risk of the portfolio | 9 |
| Moderate decline in the credit risk of the portfolio | 61 |
| No impact on the credit risk of the portfolio | 50 |
| Moderate increase in the credit risk of the portfolio | 12 |
| Significant increase in the credit risk of the portfolio | 0 |

26. In general, what has been the impact of credit scoring on the quality of **small business** borrower information? *(Please circle only one)*

| **Change in Quality of Information** | **Banks** |
|---|---|
| Significant decline in the quality of borrower information | 0 |
| Moderate decline in the quality of borrower information | 3 |
| No impact on the quality of borrower information | 47 |
| Moderate improvement in the quality of borrower information | 71 |
| Significant improvement in the quality of borrower information | 9 |

27. Please rate the general importance of the following factors for deciding whether to originate a **small business loan**? *(1 = Most Important; if a factor is not important or not considered, leave blank)*

| **Ranked Importance of Decision Factor for Origination** | **Mean Response** |
|---|---|
| Size of the loan | 4.20 |
| 3rd party credit score | 4.64 |
| Internal (your own calculated) credit score | 3.87 |
| Type of small business | 3.26 |
| Location of business | 3.79 |
| Previous relationship with business owner | 2.27 |
| Purpose of loan | 2.56 |
| Other | 1.60[7] |

28. For each type of small business loan that your bank originates, please indicate the maximum loan amount that can be approved by an individual loan officer.

| **Credit Officer Size Approval Limits by Loan Type** | **Mean Amount** |
|---|---|
| Lines of Credit | $ 294,084 |
| Small Business Credit Cards | $ 41,281 |
| Receivables Financing | $ 254,314 |
| Equipment/Lease Improvement | $ 248,519 |
| Vehicle Loans | $ 226,063 |
| Loans Secured by Commercial Property | $ 303,705 |
| Other | N/A |

29. How many people sit on your credit review committee? __ __ Members

| **Mean Response** |
|---|
| 6 |

30. How often does this committee meet? *(Please circle only one response)*

| **Frequency of Credit Review Committee Meetings** | **Banks** |
|---|---|
| 0-3 times a month | 92 |
| 3-6 times a month | 112 |

[7] A mean response of 1.6 in "other" does not necessarily indicate that this is the most important category. Rather, it indicates that of the total number of banks that responded to "other", these specific banks rate "other" as one of the most important factors.

| | |
|---|---|
| 6-9 times a month | 14 |
| 9-12 times a month | 25 |
| Once per year | 3 |
| Other | 69 |

31. In general, what type of deposit account is required to be maintained at your bank by those firms that receive **small business loans**? *(Please check all that apply)*.

| **Type of Deposit Account Required** | **Banks** |
|---|---|
| No requirement to have a deposit account | 149 |
| Business Checking Account | 166 |
| Money Market Savings | 4 |
| Business Savings Account | 8 |
| Certificate of Deposit Account | 6 |
| Other | 34 |

32. Do you have a small business loan application form that you use for applicants?

| **Loan Application Form** | **Banks** |
|---|---|
| Yes – we use the Small Business Administration application form | 51 |
| Yes – we do not use the Small Business Administration application, but we have a different form that we use | 71 |
| No – we do not have a standard form for small business loan applications | 195 |