

Cookie Cutter vs. Character: The Micro Structure of Small Business Lending by Large and Small Banks

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Abstract

The informational opacity of small businesses makes them an interesting area for the study of banks' lending practices and procedures. We use data from a survey of small businesses to analyze the micro level differences in the loan approval processes of large and small banks. We provide evidence that large banks (\$1 billion or more in assets) employ standard criteria obtained from financial statements in the loan decision process, whereas small banks rely to a greater extent on information about the character of the borrower. These cookie-cutter and character approaches are compatible with the incentives and environments facing large and small banks.

I. Introduction

Lending to small businesses constitutes an important area of research in finance. Small business borrowers tend to be more informationally opaque than their larger brethren and thus pose greater challenges for lenders. To be successful, lenders must overcome the asymmetric information problems—adverse selection and moral hazard—that are inherent in such borrowers.

In the past decade, small business lending has attracted a considerable amount of scholarly attention (see Berger and Udell (1998) and Berger, Saunders, Scalise, and Udell (1998) for recent surveys). The empirical research has been based largely on data collected in response to policy concerns about the availability of credit for small firms, especially in the wake of consolidation in the U.S. banking sector. From 1980 to 2001, the number of commercial banks in the U.S. declined by more than 40%, from 14,400 to 8,080. Accompanying this consolidation has been an increasing concentration of banking assets within the groups of money

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center and super regional banks. A number of recent studies have examined the effect of this consolidation as well as the effects of differences in borrower characteristics on the availability of credit to small firms (see Section II). It is well established that larger banks allocate smaller percentages of their assets to small business loans than do smaller banks.

Despite the outpouring of research on small business lending, little attention has been paid to the micro aspects of how banks make small business loans—e.g., are there systematic differences between the loan approval processes at large and small banks? Anecdotal evidence suggests that large banks use standardized quantitative criteria to assess loan applications from small firms, i.e., a cookie-cutter approach, whereas small banks favor qualitative criteria based upon their loan officers' personal interactions with loan applicants, i.e., a character approach. Recent surveys (e.g., Whiteman (1998)) support this distinction: Only 12% of small community banks but more than two-thirds of larger banks use credit-scoring models to evaluate small business loans.

A distinguishing feature of this study is that we analyze characteristics of both borrower *and* lender, enabling us to examine the micro structure of the decision to lend to small businesses. We explicitly test the hypothesis that formal financial data provided by an applicant better explain the lending decisions of large banks than of small banks. We find evidence that the lending decisions of large banks, but not of small banks, are more likely to be a function of financial variables, whereas the lending decisions of small banks, but not large banks, are more likely to be a function of variables indicating pre-existing relationships between the bank and loan applicant.

In Section II, we survey the relevant academic literature and show how our study ties together these different strands and contributes to the analysis of an important public policy question. In Section III, we discuss how the loan approval processes of large and small banks differ, with an emphasis on relationship banking. In Section IV, we specify our hypotheses and describe our small business sample and the variables we use to test our hypotheses. Section V presents the results from our empirical analysis. Section VI provides a summary, conclusions, and suggestions for further research.

II. Survey of the Literature

The first of several strands of literature that are directly relevant to this study deals with credit availability and bank consolidation. Of particular concern is credit availability to small businesses. The informational problems associated with loans to small business may be more easily solved by small banks that are headquartered geographically close to the borrower than by more distant large banks with centralized decision making (Berger, Saunders, Scalise, and Udell (1998)) and greater lending opportunities, although the borrower's distance to the nearest branch may also matter (Petersen and Rajan (2002)). Recent empirical evidence indicates that small banks lend proportionately more to small enterprises (Nakamura (1993), Keeton (1995), Berger, Kashyap, and Scalise (1995), Levonian and Soller (1995), Berger and Udell (1996), Peek and Rosengren (1996), Strahan and Weston (1996), (1998), Berger, Goldberg, and White (2001)). How-

ever, Berger, Rosen, and Udell (2001) find that the size of bank from which a small business obtains a line of credit is largely driven by the market-share presence of banks of varying sizes.

The rapid consolidation of the banking system raises concerns that lending to small business will be reduced as larger banks absorb small banks. Some studies find that mergers reduce lending to small business (Peek and Rosengren (1996), Berger, Saunders, Scalise, and Udell (1998), Berger, Goldberg, and White (2001)), while others do not (Whalen (1995), Strahan and Weston (1996), (1998)). Goldberg and White (1998) and DeYoung, Goldberg, and White (1999) provide evidence that this reduction in lending to small business can be mitigated by the creation of *de novo* banks that they find lend more to small business than do comparable older banks.

Six recent articles are especially relevant to this study. Petersen and Rajan (1994), (1995) and Berger and Udell (1995) use data from the 1987 National Survey of Small Business Finances (NSSBF), while Cole (1998) and Berger, Rosen, and Udell (2001) use data from the 1993 NSSBF to test a mixture of hypotheses concerning the importance of firm-lender relationships to the availability of small firm credit. In general, these studies find that relationships are important determinants of credit availability. Berger and Udell (1996) use data from the Federal Reserve Board's Survey of the Terms of Bank Lending to Business to analyze loan rates charged by large and small banks to small firms and find significant differences. In this study, we extend the literature by examining the small firm loan approval decisions of large and small banks.

III. Large Banks, Small Banks, and the Availability of Credit to Small Businesses

Previous research clearly indicates that firm-creditor relationships influence the availability of credit to small firms. In this study, we hypothesize that relationships are more important for small banks than for large banks because of organizational and operational differences.

The operational differences between small and large banks with respect to lending can be explained by the theory of hierarchical control (Williamson (1967)). As the size of an organization increases, it loses control between successive hierarchies. As managerial orders and directions are transmitted to successive hierarchical levels, distortions increase. Consequently, a large bank needs explicit rules in the lending process to avoid distortions. Because there are fewer intermediaries between top management and lending officers at small banks, management of small banks can grant loan officers more discretion in the lending process. Hence, small banks are more likely to deviate from the cookie-cutter approach to evaluating loan applications from small firms.

Similarly, large banks typically have more branches that are more geographically dispersed than do smaller banks. As an organization increases in size and geographic extent, it becomes more difficult for the top management to monitor the behavior of employees, and agency problems arise. To maintain control over the whole organization, large banks must establish procedures that will be followed throughout the whole organization.

To ensure that loans are evaluated in an appropriate manner, top management must establish standards that loan officers can easily follow and that supervisors can readily monitor and enforce. We expect large bank managers to develop loan approval systems that are homogeneous across branches and personnel. These systems must employ readily available and verifiable information about the borrowers, such as information derived from a firm's financial statements. This leads to a cookie-cutter approach for the loan approval process of large banks, where standard financial variables of potential borrowers significantly affect the credit allocation decision.

In contrast, small banks face agency and control problems that are less severe. Top management can more easily monitor the behavior of loan officers and coordinate operations. Small banks are more likely to have private information about potential borrowers because of proximity and personal relationships between bankers and customers. Furthermore, ownership and management are more likely to be the same or closely allied in the small bank, thus reducing owner-manager agency problems (Jensen and Meckling (1976)). Consequently, we expect small banks to evaluate small business loans using information about the borrower obtained through relationships and from other sources, i.e., using a character loan approach. To test this hypothesis, we investigate whether small banks' lending decisions adhere less strictly to standardized financial variables than do large banks' decisions.

IV. Data, Hypotheses, and Methodology

Our primary source of data for this study is the Federal Reserve Board's 1993 NSSBF (see Cole and Wolken (1995) for a detailed description). The firms surveyed constitute a nationally representative sample of 4,637 small businesses operating in the U.S. as of year-end 1992, where a small business is defined as a non-financial, non-farm enterprise employing fewer than 500 full-time equivalent employees. These data are broadly representative of approximately five million firms operating in the U.S. as of year-end 1992.

The 1993 NSSBF provides detailed information about each firm's most recent borrowing experience. This includes whether the firm applied for credit and, for firms that applied, the identity and characteristics of the potential lender to which the firm applied, other financial services (if any) that the firm obtained from that potential lender, whether the potential lender approved or denied the firm's credit application, and, if the lender extended credit, the terms of the loan. The survey data also provide information on each enterprise's balance sheet, its credit history, the firm's characteristics, including standard industrial classification (SIC), organizational form, and age, and demographic characteristics of each firm's primary owner, including age, education, experience, and credit history. Balance sheet and income statement data are derived from the enterprise's year-end 1992 financial statements. Credit history, firm characteristics, and demographic characteristics of each firm's primary owner are taken as of year-end 1993.

Of the 4,637 firms surveyed by the 1993 NSSBF, 2,011 indicated that they applied for credit during 1990-1994. Because our focus is on differences in the

loan approval decisions made by commercial banks of differing sizes, we eliminated loan applications to other types of financial institutions, such as finance companies and thrift institutions.¹ This restriction reduces our sample from 2,011 to 1,660. Analysis of survey information on firm size as measured by sales and assets revealed a number of firms that bankers typically would consider as middle market or larger, rather than small businesses. Consequently, we exclude 297 observations where the applying firm's sales, assets, or loan request exceeded \$10 million. Of the 1,660 firms applying for commercial bank credit during 1990–1994, 1,363 remain after this exclusion. Next, we limit our analysis to loan applications made during 1993 and 1994 to ensure that the financial and relationship data reported in the survey *precede* the loan application. This restriction reduced our sample by 215 firms to 1,148.

To classify the size of each bank to which a loan application was made, we match NSSBF data identifying that bank with Call Report data on consolidated banking assets, obtained from the Federal Reserve System's National Information Center, as of the year-end preceding the year in which the application was made. Hence, we match loan applications made during 1994 (1993) with year-end 1993 (1992) Call Report data. We are able to match all but 46 banks, leaving us with a final sample of 1,102 bank-firm pairs.

To control for potential bias that might arise with respect to a loan applicant's choice of a large or a small bank, we estimate a system of simultaneous equations where the firm's decision to apply at a large or small bank and the bank's decision to approve or deny credit with respect to that loan application are modeled by two separate equations that are estimated jointly.

Table 1 identifies the variables used in our analyses of the choice of bank and the approve/reject decisions, along with brief definitions, means, standard errors, and ranges. To make the results representative of the target population of small businesses that applied for commercial bank credit during 1993 or 1994, we calculate the reported means and standard errors, and subsequently reported regression results, using the NSSBF sampling weights.

The dependent variable that we use in our tests of the loan approval decision is Loan Approved, a 1,0 variable indicating whether the bank extended or denied credit to the small business applicant. Overall, banks approved 83.1% of the 1,102 sample loan applications.

We group our explanatory variables into four categories: i) the small firm's characteristics, including its (and its primary owner's) credit history and financial relationships, ii) characteristics of the requested loan, iii) characteristics of the relationship between the loan applicant and the bank, and iv) characteristics of the bank.

A. General Hypotheses Regarding the Loan Approval Decision

1. Firm and Owner Characteristics

Our general expectations follow those of Berger and Udell (1993) and Berlin (1996). Lenders will extend credit only when they have high expectations of being

¹For an analysis of differences in loans made by commercial banks, finance companies, and thrifts, see Carey, Post, and Sharpe (1998).

TABLE 1
Small Business Survey Sample Variable Definitions and Summary Characteristics

Variable	Definition	Mean	S.E.	Min.	Max.
(1)	(2)	(3)	(4)	(5)	(6)
<i>Firm and Owner Characteristics</i>					
Financial Records	Firm had financial records available for preparing survey responses	0.515	0.015	0	1
Firm Size	Annual sales (\$000)	997	47	0	9,909
Firm Age	Age of the firm (years)	13.15	0.31	1	103
ROA	Profit divided by assets	0.51	0.03	-1.00	3.00
Debt-to-Assets	Total debt divided by assets	0.60	0.01	0.00	1.60
Cash-to-Assets	Cash divided by assets	0.17	0.01	-0.48	1.00
Firm Delinquencies	Number of business delinquencies in last three years (3 maximum)	0.61	0.03	0	3
Owner's Delinquencies	Number of owner's delinquencies in last three years (3 maximum)	0.31	0.03	0	3
African-Am Owner	Firm's primary owner is self-identified as African-American	0.015	0.01	0	1
Female Owner	Firm's primary owner is female	0.173	0.01	0	1
Owner's Age	Age of the firm's primary owner (years)	48.1	0.30	25	83
<i>Loan Characteristics</i>					
Loan Approved	Loan request was approved by the bank to which the firm applied for credit	0.83	0.01	0	1
Loan Amount	Amount of the firm's loan request (\$000)	163	14	1	6,700
Loan-Size-to-Assets	Loan request divided by assets	0.89	0.05	0.003	10.0
Collateralized Loan	Collateral supported loan or loan request	0.66	0.01	0	1
<i>Relationship Characteristics</i>					
Deposit Relationship	Firm has deposit account with bank (checking or saving)	0.81	0.01	0	1
Loan Relationship	Firm has another loan from bank	0.42	0.01	0	1
Financial Service Relationship	Firm obtains financial management services from bank	0.31	0.01	0	1
Length of Relationship	Length of relationship with bank to which the firm applied for credit (years)	7.80	0.22	0	40
Number of Sources	Number of other sources for financial services	1.42	0.04	0	10
Distance	Distance from primary bank branch where firm conducts business (miles/100)	0.18	0.04	0	10
Bank in Person	Firm's primary method of doing business with bank is in person	0.818	0.012	0	1
<i>Bank Characteristics</i>					
Bank Assets	Assets (\$millions) of bank to which the firm applied for credit	6,519	535	11	175,720
<i>Additional Variables for Choice-of-Bank Regressions</i>					
MSA	Firm is located in a MSA	0.71	0.01	0	1
Line of Credit	Requested loan is for a line of credit	0.57	0.01	0	1
Equipment	Requested loan is for equipment	0.08	0.01	0	1
Mortgage	Requested loan is a mortgage	0.10	0.01	0	1
Motor Vehicle	Requested loan is for a motor vehicle	0.08	0.01	0	1
Lease	Requested loan is a lease	0.01	0.00	0	1

For each variable identified in column (1), column (2) presents the variable's definition and columns (3)-(6) present the variable's mean, standard error, minimum value, and maximum value, respectively, for all 1,102 firms in the sample that applied for a bank loan.

repaid and thus will favor borrowers with characteristics that reassure the bank as to the likelihood of being repaid. Financial Records is a dummy variable indicating whether the firm used financial records in preparing survey responses.² A firm that maintains good financial records should be able to provide more assurance to a bank that its loan will be repaid. We expect a positive coefficient.

Firm Size is the firm's annual sales. In our regressions, we use the natural logarithm of one plus annual sales $\ln(\text{Firm Size})$ to deal with the skewness of annual sales and to accommodate firms that report zero sales. A similar argument applies for using logs for some other variables. We expect that a larger firm can provide more reassurance to a bank that its loan would be repaid and thus would be more likely to be approved for a loan. Firm Age is the applicant firm's age.

²We are grateful to George Pennacchi, the referee, for suggesting that we include this variable in our analysis. Previously, this variable was used by Petersen and Rajan (2002).

An older firm, with a more established track record, would be more likely to be approved for a loan. We expect a positive coefficient. ROA is the applicant firm's profit return on its assets. To control for extreme values, we cap this ratio at its 1st and 99th percentile values, giving a range of -1.00 to 3.00 . Greater profitability should provide a bank with greater reassurance as to repayment. We expect a positive coefficient.

Debt-to-Assets is the ratio of the applicant firm's debt to its assets. To control for extreme values, we cap this variable at its 99th percentile, limiting its range from 0.0 to 1.6 . We expect that firms with lower debt ratios are less likely to encounter financial distress and thus are more likely to be approved for a loan. We expect a negative coefficient. Cash-to-Assets is the ratio of the applicant firm's cash to its total assets. A more liquid firm would likely provide stronger prospects for repayment. We expect a positive coefficient. Firm Delinquencies is the number of credit obligations on which the applicant firm was delinquent during the previous three years.³ More past delinquencies should discourage a bank from lending to a loan applicant. We expect a negative coefficient. Owner's Delinquencies is the number of credit obligations on which the primary owner of the applicant firm has been delinquent during the previous three years. More delinquencies should discourage the bank from lending. We expect a negative coefficient.

African-Am Owner is a dummy variable indicating whether the applicant firm's owner was identified as a member of this minority. This variable may be the basis for indications as to whether the bank is practicing race-based discrimination. Alternatively, this variable may be playing a different role: the owner's personal assets and income are generally known by the bank, but were not reported in the survey data, and the owner's credit history is better known by the bank than is reported in the survey. Data from the Federal Reserve Board's Survey of Consumer Finances demonstrate that minority households have significantly lower asset and income levels and worse credit histories than do non-minority households. Hence, this variable may simply proxy for those asset, income, and credit history differences and thus proxy for an important component of the credit score of the firm's primary owner. Because greater owner assets and higher owner income should provide greater reassurance to the bank as to the prospects for repayment, we expect a negative coefficient for large banks. If this variable is instead an indicator of race-based discrimination, we expect a negative coefficient also for small banks, which are more likely to be located in highly concentrated banking markets.⁴

Female Owner is a 1,0 variable indicating whether the owner is female. As is true of African-Am Owner, this variable may be the basis for indications that the bank is practicing discrimination; or the variable may be a proxy for characteristics that are known by the bank but that are not reported in the NSSBF; consequently, we expect a negative coefficient. Owner's Age is the age of the firm's primary owner, which may be a proxy for experience in operating an en-

³The survey capped the magnitude of this variable (and of Owner's Delinquencies) at three.

⁴This follows from Becker (1971), who hypothesizes that racial discrimination should be more prevalent in less competitive credit markets.

terprise and provides the bank with more assurance as to repayment. We expect a positive coefficient.

SIC *X* is one of a set of nine 1,0 dummy variables that indicate the one-digit SIC code of the applicant firm.⁵ There may be some industry categories in which the borrowers are perceived to be less likely to fail and default and hence would be favored as loan applicants (or conversely). We have no strong expectations with respect to these variables.

2. Loan Characteristics⁶

Loan Amount is the amount of the requested loan. On the one hand, a larger loan is generally more profitable for a bank because there are fixed costs of applicant assessment and loan monitoring for a loan of any size; this would cause a bank to favor larger loans. On the other hand, there are loan portfolio diversification benefits from investing in a larger number of smaller loans, especially for a small bank. In addition, there are regulatory restrictions on the size of loan that a bank can make to one borrower,⁷ which may make banks (especially small banks) averse to approving requests for large loans. Accordingly, we cannot make a firm prediction as to the sign on this coefficient. Loan-Size-to-Assets is the ratio of the size of the requested loan to the firm's assets. The larger this ratio, the more concerned the bank should be about the firm's ability to repay the loan. Consequently, we expect a negative coefficient. Collateralized Loan is a 1,0 dummy variable indicating whether the requested loan was collateralized.⁸ In principle, a loan that is collateralized is (*ceteris paribus*) safer from the perspective of the lender. If the borrower fails to repay the loan, then the lender can seize the collateral, sell or liquidate it, and use the proceeds to repay the loan. However, banks may only require collateral from riskier applicants. Further, there are substantial transactions costs to seizing and liquidating collateral, and the collateral itself may be worth

⁵SIC 1, covering mining and construction, is the base case, so this variable is excluded from the explanatory variables included in the regressions. SIC 5 is separated into two variables, wholesale trade firms (SIC 50 and 51) and retail trade firms (SIC 52–SIC 59).

⁶In addition to the variables discussed below, we also tried dummy variables that indicated the use to which the loan would be put. The inclusion of these variables did not improve the estimated results reported below.

⁷These restrictions, often described as the loans-to-one-borrower regulations, generally restrict a bank to making loans that individually are no larger than 15% of the bank's capital (net worth). For a typical small bank with \$100 million in assets and an 8% net-worth ratio, this implies a maximum loan amount of \$1,200,000.

⁸The survey collected information on whether the loan was collateralized for loans that were approved, but not for loans that were rejected. We impute the presence or absence of collateral for rejected loans by estimating a probit regression model explaining the presence or absence of collateral for approved loans, and using the coefficient estimates from this model and the characteristics of the rejected loans to predict whether collateral was required of the rejected loans. This procedure, which produces a score between zero and one for each loan, is essentially the same as that used by Federal Reserve staff to impute missing values for this and other survey variables. We then must choose a value to split the loans into collateralized and uncollateralized. Because 68% of the approved loans were reported as collateralized, we choose a cutoff percentage that also resulted in 68% of the approved loans being classified as collateralized, and then used this cutoff to classify the presence or absence of collateral among the rejected loans. This process resulted in 60% of the rejected loans being classified as collateralized, significantly lower than the rate for approved loans, just as theory would predict. The collateral variable that we use in our analyses (the actual presence or absence of collateral for the approved loans, and the imputed presence or absence of collateral for the rejected loans) indicates an overall collateralization rate of 66% for our sample.

less than was originally claimed by the borrower, especially if the value of the collateral is highly correlated with the value of the firm. Consequently, the benefits to the lender from collateral may be modest. We expect a positive or insignificant coefficient.

3. Relationship Characteristics

Deposit Relationship is a 1,0 dummy variable indicating whether the applicant firm had a pre-existing deposit account (checking or savings) at the bank. This prior relationship should generally be favorable for a loan applicant because it provides more information about the applicant for the bank (Nakamura (1993)). In addition, because a prior deposit relationship is likely to be profitable for the bank, the bank may be more inclined to approve a loan to that customer rather than risk losing that customer because of the loan denial. We expect a positive coefficient. Loan Relationship is a 1,0 dummy variable indicating whether the applicant firm had a pre-existing loan at the bank. The potential effects of this relationship are ambiguous. The prior loan relationship gives the bank additional information about the applicant, but that information could cause the bank to form a negative impression of the applicant. Further, for a small bank, the combined size of the pre-existing and prospective loans might trigger concerns about diversification of the bank's portfolio and regulatory restrictions on loans to one borrower. Financial Mgt. Relationship is a 1,0 dummy variable indicating whether the applicant firm had one or more pre-existing financial management service relationships with the bank. Financial management services include transaction services, cash management services, credit-related services, and trust services.⁹ This type of relationship should generally be considered favorable for the applicant. Also, as was true for the deposit relationship, these other relationships are likely to be profitable for the bank so that the bank should be favorably inclined at the margin to approve a loan to that customer. We expect a positive coefficient.

Length of Relationship is the length of time of the longest relationship (if any) that the applicant has had with the bank. In general, a longer relationship should provide the bank with more information about the applicant, but the information may have a short half-life. We expect a positive or insignificant coefficient. Number of Sources is the number of different sources of financial services that are reported by the applicant firm. The greater are the number of sources of financial services, the greater may be the bank's worries that its ability to collect in the event of foreclosure may be impaired. We expect a negative coefficient. Distance is the linear distance between the address of the applicant firm and the address of the bank branch with which the applicant conducted its business.¹⁰ Physical proximity of the applicant to the bank should give the bank greater familiarity with the applicant's business and greater ease in monitoring the loan. We expect a negative coefficient (which implies a positive relationship with proximity). Bank in Person is a 1,0 dummy variable that indicates whether the applicant firm's primary method of doing business with the bank was in person (as opposed to by mail or by telephone). Personal contact should indicate more of a relation-

⁹See Cole and Wolken (1995) for a more detailed description of these variables.

¹⁰We cap this variable at 1,000 miles, the 99th percentile, to deal with extreme skewness. We also tested the natural log of this variable, but the capped variable provides superior explanatory power.

ship between the applicant and the bank and a greater ability of the bank to assess the applicant. We expect a positive coefficient.

4. Bank Characteristics

Bank Assets is the bank's total assets. As was noted in Section II, numerous studies have shown that larger banks tend to be less inclined to lend to small businesses than are smaller banks. We expect a negative coefficient.

B. How Does the Loan Approval Decision Differ between Large and Small Banks?

We expect formal financial data to be more important in explaining the loan approval decisions of large banks than in explaining the loan approval decisions of small banks. Conversely, we expect the relationship variables to be more important in explaining the loan approval decisions of small banks than in explaining the loan approval decisions of large banks.

Because bank size is a continuous variable, we must select a cutoff value for use in classifying banks as large or small. For a number of reasons, we choose \$1 billion in consolidated bank assets as the dividing line. First, this is a commonly used dividing line in industry discussions (see *American Banker*, November 7, 2002) and in previous empirical investigations (e.g., Berger, Goldberg, and White (2001) and Berger, Rosen, and Udell (2001)). Second, this is a major regulatory and reporting dividing line by the bank regulatory agencies. The U.S. Federal Financial Institutions Examination Council (FFIEC), which collects and disseminates Call Report information on commercial banks, uses \$1 billion as the dividing line between the largest and second largest of four categories of banks. Third, this value provides us with subsamples of large and small banks that are roughly comparable and that have loan approval rates that are sufficiently different from 1.0 to permit statistical analysis. Fourth, we obtain the maximum difference between the large and small bank sample with respect to the Distance variable when the dividing line is \$1 billion.

As a robustness check, we also used alternative dividing lines, including \$300 million, \$600 million, and \$1.2 billion. The results using these alternatives are qualitatively similar to those that we report but provide less sharp contrasts between large and small samples. These alternative results are available from the authors.¹¹

In Table 2, we divide our sample into 517 loan application observations involving large banks, and 585 loan application observations involving small banks. For each group, we present means and standard errors for our variables, along with the differences between the means of the large and small banks, and *t*-tests on those differences. The table shows that there are significant differences with respect to $\ln(\text{Firm Size})$ (larger firms tend to apply to larger banks), Cash-to-Assets

¹¹We also identified whether a bank was part of a bank holding company (BHC), and used holding company size to split the sample into large and small banks. If loan policies are set at the holding company level, then the approval/rejection decisions of small banks that are part of a large holding company may resemble those of large banks rather than those of small banks. When bank size was determined by BHC size (greater or less than \$1 billion), the differences in marginal effects were qualitatively similar, but less sharp than those obtained based upon bank size.

(more liquid firms tend to apply to larger banks), Loan Approved (small banks approve more of their applicants), $\ln(\text{Loan Amount})$ (applicants make larger loan requests of larger banks), Collateralized Loan (applicants with collateral tend to apply to smaller banks), Deposit Relationship (applicants to small banks are more likely to have a pre-existing deposit account at that bank), Loan Relationship (applicants to small banks are more likely to have a pre-existing loan at that bank), Length of Relationship (applicants to small banks tend to have had longer prior relationships with the bank),¹² Distance (large banks tend to be farther from their loan applicants than are small banks), Bank in Person (applicants are more likely to bank in person at small banks), and $\ln(\text{Bank Assets})$ (large banks are, indeed, larger).¹³

C. Hypotheses for the Applicant Firm's Choice of Bank

We are unaware of a prior literature—theoretical or empirical—that can guide us in trying to explain the applicant firm's decision to apply for credit at a large vs. a small bank. Given this vacuum, we hypothesize that the characteristics of the enterprise, its owner, and the loan being sought influence the enterprise's choice of a large vs. a small bank.

In principle, the applicant should seek the bank most likely to be sympathetic to the firm's specific mix of enterprise, owner, and loan characteristics. If she believes that our cookie-cutter hypothesis is correct, then the firm should choose its bank on the basis of whether the firm's formal numbers are stronger (in which case it should select a larger bank) or whether its character and relationship features are stronger (in which case it should select a smaller bank); or perhaps it might modify its choice criteria modestly based on its subjective estimates of the empirical regression coefficients that we report in Section V.

In practice, however, we are unsure exactly how these various characteristics would affect the applicant firm's choice with respect to a large or small bank. For example, would a small firm with a large loan request fear that its request might exceed the loans-to-one-borrower limitations of a small bank and therefore seek out a large bank? Or would the firm fear that it might get lost in the bureaucracy of a large bank and therefore seek out a smaller bank, where it might stand out and receive preferential treatment? In the absence of theory or prior empirical research to guide us, we take an agnostic position: these characteristics may well influence an applicant firm's choice of bank, but we are unable to specify predicted signs.

We include additional explanatory variables in our model of the choice-of-bank-size decision. According to Gilbert (2000), larger banks tend to have their offices in metropolitan statistical areas (MSAs), while smaller banks tend to have their offices in rural areas. Hence, we expect that an applicant located in an MSA

¹²It should be noted, however, that only with the easing of restrictions on branching in the 1980s and 1990s could larger banks establish or buy branches in many areas—often those where smaller banks were predominant—that were previously off limits. Consequently, the longer relationship of borrowers with small banks may be (at least partly) a result of these prior limitations.

¹³In addition, though not shown explicitly in Table 2, there are significant differences with respect to SIC 7 and SIC 8 (business and consumer services applicants are more likely to apply to a small bank, while professional services applicants are more likely to apply to a large bank) and all of the regional variables (discussed in the text) except REGION 4 and REGION 5.

TABLE 2
Descriptive Statistics for the Large and Small Bank Subsamples

Variable	Large Bank Subsample (n = 517)		Small Bank Subsample (n = 585)		Diff. in Large and Small Bank Means	
	Mean	S.E.	Mean	S.E.	Diff.	t-Stat.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Firm and Owner Characteristics</i>						
Financial Records	0.54	0.02	0.50	0.02	0.04	1.41
Firm Size (annual sales, \$000)	1,181	78	861	58	321	3.31***
Firm Age (years)	13.06	0.42	13.22	0.44	-0.16	-0.26
ROA	0.71	0.07	0.60	0.05	0.11	1.07
Debt-to-Assets	0.58	0.02	0.61	0.02	-0.03	-1.19
Cash-to-Assets	0.19	0.01	0.15	0.01	0.04	2.53**
Firm Delinquencies	0.62	0.05	0.61	0.05	0.01	0.07
Owner's Delinquencies	0.31	0.04	0.30	0.04	0.01	0.13
African-Am Owner	0.01	0.01	0.02	0.01	-0.01	-1.39
Female Owner	0.21	0.02	0.15	0.01	0.06	2.65**
Owner's Age	47.50	0.44	48.49	0.41	-0.99	-1.65*
<i>Loan Characteristics</i>						
Loan Approved	0.76	0.02	0.89	0.01	-0.13	-5.59***
Loan Amount (\$000)	244	28	104	10	140	4.67***
Loan-Size-to-Assets	1.05	0.08	0.77	0.06	0.28	2.65***
Collateralized Loan	0.64	0.02	0.68	0.02	-0.05	-3.32***
<i>Relationship Characteristics</i>						
Deposit Relationship	0.79	0.02	0.84	0.02	-0.05	-2.08**
Loan Relationship	0.33	0.02	0.49	0.02	-0.16	-5.47***
Financial Service Relationship	0.33	0.02	0.29	0.02	0.04	1.34
Length of Relationship (years)	7.00	0.30	8.40	0.32	-1.40	-3.19***
Number of Sources	1.48	0.06	1.38	0.06	0.10	1.17
Distance (miles/100)	0.28	0.05	0.11	0.02	0.17	3.00***
Bank in Person	0.78	0.02	0.84	0.01	-0.06	-2.53**
<i>Bank Characteristics</i>						
Bank Assets (\$millions)	15,027	1,091	225	9	14,802	13.57**
SIC Dummy Variables	Yes		Yes			
<i>Additional Variables for Choice-of-Bank Regressions</i>						
<i>Regional Dummy Variables</i>						
MSA	0.85	0.02	0.61	0.02	0.24	9.56***
Line of Credit	0.60	0.02	0.55	0.02	0.04	1.37
Equipment	0.07	0.01	0.08	0.01	-0.01	-0.86
Mortgage	0.08	0.01	0.11	0.01	-0.03	-1.59
Motor Vehicle	0.07	0.01	0.08	0.01	0.00	-0.24
Lease	0.01	0.01	0.01	0.00	0.00	-0.15

For each variable in column (1), columns (2) and (3) ((4) and (5)) present the mean and standard error based upon the large (small) bank subsamples. In column (6) are the differences in the large bank and small bank means and in column (7) are the results of *t*-tests for statistically significant differences in the large and small bank means. *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

will tend to choose a larger bank. We attempt to capture this effect by including the dummy variable MSA, which takes the value of one if the applicant firm is located in an MSA and zero otherwise. In addition, we include a set of eight regional dummy variables REGION *X*, where *X* = 2, 3, . . . , 9, indicating the Census Region in which the applicant firm is located.¹⁴ The regional dummy variables are included to help control for regional variations in potential influences on the applicant firm's choice of bank size, such as historical limitations on bank branching. Finally, we include the intended use of the loan, represented by a set of dummy variables (Line of Credit, Equipment, Mortgage, Motor Vehicle, Lease) because

¹⁴Census Region 1, the Northeastern U.S., is our omitted base case.

an applicant may perceive some types of banks as more favorably disposed toward some uses of loans.¹⁵

V. Empirical Results

The formal empirical tests of the hypotheses developed in Sections III and IV consist of regressions in which Loan Approved, the 1,0 variable indicating whether a specific bank extended or denied credit to a specific firm, is the dependent variable and the remaining variables described in Section IV are the right-hand side independent variables. We are especially interested in differences in loan approval decisions of large and small banks.

The loan applicant's choice of bank may influence the observed patterns of banks' behavior. To correct for this potential sample selection bias, we estimate a bivariate probit model with selection (see Greene (1997)). This is a full information maximum-likelihood (FIML) procedure that involves the simultaneous estimation of two probit equations: i) the firm's decision to apply at a large or a small bank, and ii) the bank's decision to approve or reject the firm's loan application, conditional on the type of bank to which the firm applied. We estimate this system three times: once for the full sample of 1,102 banks (using a bivariate probit *without* selection), once to select the sample of 517 observations involving large banks, and once to select the sample of 585 observations involving small banks.¹⁶

A. The Loan Applicant's Choice-of-Bank-Size Regressions

Table 3 presents results from the probit regression model explaining a small firm's decision to apply for credit at a large vs. a small bank, which was estimated simultaneously with an equation explaining the bank's loan approval decision. The estimated marginal effects and standard errors are virtually identical across the three systems estimated; consequently, we only present and discuss results for the first system (bivariate probit without selection). The dependent variable in the first stage of this system is equal to one when the firm applied for credit at a large bank and zero if the firm applied at a small bank.¹⁷

In principle, if loan applicants believe the cookie-cutter hypothesis advanced in this paper, they should choose their banks on the basis of the variables that would appear to be most favorable to their applications. Thus, applicants who are stronger with respect to formal criteria, such as Financial Records, Firm Size, Firm Age, and ROA would tend to apply for loans at large banks.

As Table 3 shows, there is modest support for this view. $\ln(\text{Firm Size})$ (+), $\ln(\text{Firm Age})$ (+), Debt-to-Assets (-), and Loan-Size-to-Assets (+) have the expected signs and are significant at the 0.10 level. In addition, Financial Records

¹⁵Because the MSA, REGION X, and use-of-loan variables appear only in the applicant's choice-of-bank regressions, while the variables that capture the applicant's relationship with its bank (i.e., Deposit Relationship) appear only in the bank's approval/rejection decision regression, both sets of regressions are identified in a simultaneous system.

¹⁶In presenting all of our probit regression results, we report the marginal effects of a change in each variable when all variables are evaluated at their means

¹⁷Results for the other two systems are available from the authors.

TABLE 3
 Results from Binary Probit Model to Explain the Decision of Firms to Apply for Credit at a Large or Small Bank

(1)	Marginal Effect (2)	t-Stat. (3)
Constant	-0.727	-4.07***
<i>Firm Characteristics</i>		
MSA	0.255	6.40***
Financial Records	0.029	0.86
ln(Firm Size)	0.027	1.86*
ln(Firm Age)	0.049	1.72*
ROA	-0.005	-0.26
Debt-to-Assets	-0.063	-1.70*
Cash-to-Assets	0.047	0.63
Firm Delinquencies	-0.017	-0.99
Owner's Delinquencies	0.029	1.27
African-Am Owner	-0.128	-0.93
Female Owner	0.111	2.57**
Owner's Age	-0.005	-2.53**
<i>Loan Characteristics</i>		
ln(Loan Amount)	0.010	0.66
Loan-Size-to-Assets	0.024	1.92*
Line of credit	-0.048	1.06
Equipment	0.046	0.66
Mortgage	-0.110	-1.66*
Motor Vehicle	-0.057	-0.79
Lease	0.057	0.36
<i>Standard Industrial Classification</i>		
SIC 2 Manufacturing (1)	0.132	1.45
SIC 3 Manufacturing (2)	-0.077	-0.88
SIC 4 Transportation	0.052	0.51
SIC 5a Wholesale Trade	-0.023	-0.36
SIC 5b Retail Trade	0.005	0.08
SIC 6 Financial Services and Real Estate	0.085	1.09
SIC 7 Business and Consumer Services	0.011	0.20
SIC 8 Professional Service	0.094	1.63
<i>Census Region</i>		
2 Middle Atlantic	-0.032	-0.41
3 Southeast	0.333	5.50***
4 East North Central	0.220	3.34***
5 East South Central	0.231	3.06***
6 West North Central	0.236	4.05***
7 West South Central	0.255	4.67***
8 Mountain	-0.135	-2.06**
9 Pacific	-0.131	-1.95*
Log-Likelihood	-630.80	
χ^2 Statistic	261.90	

The full sample of 1,102 observations is used in estimation of a firm's decision to apply for credit at a large or a small bank. A positive (negative) marginal effect indicates a greater likelihood of applying to a large (small) bank. For each variable identified in column (1), the table presents the variable's estimated marginal effect and *t*-statistic. *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

(+), Cash-to-Assets (+), Firm Delinquencies (-), and Loan Size (+) have the expected signs, but their explanatory power is weak, failing to reach even the 0.10 significance level. Also, Female Owner (+), Owner's Age (-), and Mortgage (-) are statistically significant. Overall, however, our results provide little evidence that loan applicants believe our cookie-cutter hypothesis that small banks reward character and relationships while large banks favor formal numbers over character.

In contrast, the MSA and REGION X variables are powerful forces in explaining the applicant's choice of bank size. As expected, the location of an applicant firm in an MSA has a strong positive and significant effect on the firm's

tendency to choose a large bank. This is consistent with our hypothesis that firms located in rural areas will be more likely to apply at small banks than at large banks because most banks located in rural areas are small banks. However, an alternative explanation is that relationships are more important in rural areas, where the loan officer and borrower are likely to know each other in capacities other than borrower and lender. To take advantage of these relationships, the rural borrower applies at a small bank, where the loan officer can make use of his private information about the borrower, rather than at a large bank, where loan decisions are often made at regional or central offices by loan officers unfamiliar with the borrower.

The results in Table 3 also show that firms located in Census Regions 3 through 7 (the Southeast, East North Central, East South Central, West North Central, West South Central regions, respectively) are more likely to apply at large banks than are firms located in the omitted Census Region, the Northeast.

B. The Banks' Loan Approval Decision: All Banks

Table 4 presents results from the probit regression model that explain the bank's loan approval decision, estimated simultaneously with the applicant's decision to apply for credit at a large vs. a small bank. The dependent variable is coded as one when the bank extends credit and zero when the bank denies credit to the applicant.

As panel A of Table 4 shows, we find that, for the full sample, the broad hypotheses of Section III are generally supported by the empirical results. There is no selection in this variation of the bivariate probit model, so that both equations are estimated with the full sample of 1,107 firms.

1. Firm and Owner Characteristics

With respect to the characteristics of the applicant firm and its owner, the marginal effects of Financial Records, $\ln(\text{Firm Size})$, $\ln(\text{Firm Age})$, and Cash-to-Assets are positive and significant, and the effects on Firm Delinquencies and Owner Delinquencies are negative and significant, at better than the 0.05 level. These findings are consistent with our hypotheses that banks generally perceive stronger firms as better able to meet their financial obligations. The effect of ROA is positive, and the effect of the ratio of Debt-to-Assets is negative, as hypothesized. However, neither of these effects is statistically significant. The effect for African-Am Owner is negative as hypothesized, but is not statistically significant. The effect for Female Owner is positive but insignificant, and the effect for Owner's Age is negative but insignificant.

The coefficient for the dummy variable indicating applicant firms in SIC 6 (financial services and real estate) is positive and significant at better than the 0.10 level, indicating that banks are more likely to extend credit to firms in that category.

Overall, the firm and owner characteristics perform quite well in terms of sign and significance in explaining banks' approve/reject decisions.

TABLE 4
 Results from Bivariate Probit Selection Model to Explain the Small Business Credit
 Approve/Deny Decision of Large and Small Banks

Variable	Panel A. All Banks		Panel B. Large Banks		Panel C. Small Banks		Panel D. Large-Small Difference	
	Marginal Effect	<i>t</i> -Stat.	Marginal Effect	<i>t</i> -Stat.	Marginal Effect	<i>t</i> -Stat.	Marginal Effect	<i>t</i> -Test
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	0.162	1.16	-0.209	-0.54	0.369	2.32**	-0.577	-1.39
<i>Firm Characteristics</i>								
Financial Records	0.041	2.09**	0.097	2.15**	0.013	0.67	0.085	1.73*
ln(Firm Size)	0.051	3.84***	0.093	3.74***	0.027	2.39**	0.066	2.43**
ln(Firm Age)	0.070	2.85***	0.115	2.25**	0.038	1.80*	0.077	1.39
ROA	0.008	0.77	-0.003	-0.13	0.017	1.47	-0.020	-0.78
Debt-to-Assets	-0.014	-0.71	-0.060	-1.38	0.017	0.68	-0.077	-1.53
Cash-to-Assets	0.089	1.98**	0.295	2.95***	-0.018	-0.44	0.313	2.91***
Firm Delinquencies	-0.021	-2.17**	-0.013	-0.58	-0.025	-2.42**	0.012	0.52
Owner's Delinquencies	-0.032	-2.79***	-0.031	-1.11	-0.020	-2.04**	-0.011	-0.36
African-Am Owner	-0.046	-0.66	-0.432	-2.18**	0.001	0.01	-0.433	-2.12**
Female Owner	0.010	0.35	0.008	0.13	0.002	0.05	0.006	0.09
Owner's Age	-0.001	-0.90	-0.004	-1.32	-0.000	-0.25	-0.003	-1.10
<i>Loan Characteristics</i>								
ln(Loan Amount)	-0.016	-1.66*	-0.002	-0.08	-0.022	-2.18**	0.020	0.81
Loan-Size-to-Assets	-0.014	-2.23**	-0.030	-2.37**	-0.010	-1.43	-0.020	-1.41
Collateralized Loan	0.020	0.84	0.040	0.64	0.018	0.83	0.022	0.33
<i>Relationship Characteristics</i>								
Deposit Relationship	0.015	0.60	-0.050	-0.70	0.067	2.50**	-0.118	-1.54
Loan Relationship	-0.032	-1.59	0.014	0.28	-0.063	-2.62***	0.077	1.36
Fin Mgt Relationship	0.030	1.32	0.006	0.13	0.036	1.37	-0.028	-0.51
ln(Length of Relationship)	-0.001	-0.74	-0.005	-1.01	-0.000	-0.11	-0.004	0.86
Number of Sources	-0.026	-3.05***	-0.037	-2.06**	-0.011	-1.51	-0.025	-1.32
Distance	-0.017	-1.22	-0.032	-1.21	0.011	0.59	-0.043	-1.32
Bank in Person	-0.064	-2.16**	-0.157	-2.58***	-0.022	-0.80	-0.136	-2.03**
<i>Bank Characteristics</i>								
ln(Bank Assets)	-0.036	-8.01***	-0.050	-2.46**	-0.029	-2.72***	-0.021	-0.92
<i>SIC Dummies</i>								
Log-Likelihood	Yes		Yes		Yes			
	-999.879		-813.476		-770.579			

In panel A, the full sample of 1,102 observations is used in estimation of a bank's decision to extend or deny credit, simultaneous with the firm's decision to apply for credit at a large or a small bank. In panel B (panel C), the selected sample of 517 observations for large banks (585 observations for small banks) is used in estimation of the bank's decision to extend or deny credit, simultaneous with the firm's decision to apply for credit at a large bank (small bank). Results for the firm's decision to apply for credit at a large or small bank appear in Table 3. For each variable identified in column (1), the panels present the variable's estimated marginal effect and *t*-statistic. Not shown are eight one-digit SIC dummy variables. In panel D is the result of a *t*-test for significant differences in the large and small bank marginal effects. *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

2. Loan Characteristics

With respect to the characteristics of the requested loan, the marginal effect of ln(Loan Amount) is negative and significant, as is the effect of Loan-Size-to-Assets Ratio, indicating that regulatory limitations on loans to one borrower, the diversification benefits of smaller loans, and concerns about the size of the loan compared to the size of the firm are more important to the bank than the ability to spread fixed loan costs across more dollars. The marginal effect on Collateralized Loan is positive but insignificant, weakly supporting our hypothesis that banks favor loan applications that are collateralized.

3. Relationship Characteristics

With respect to the relationship variables, the marginal effect on Number of Sources is negative and significant at better than the 0.01 level. This finding is

consistent with our hypothesis that banks prefer to capture all aspects of the firm's business, and consistent with the findings of Petersen and Rajan (1994), Berger and Udell (1995), and Cole (1998). The marginal effect on Bank in Person is negative and significant, contrary to our expectations. None of the variables indicating pre-existing deposit, loan, or financial management services relationships or the length of the pre-existing relationship is significant at even the 0.10 level. This is in contrast to most previous studies, such as Petersen and Rajan (1994), who find that the length of relationship had a positive influence on credit availability, and Berger and Udell (1995), who find that the length of relationship has a positive influence on the terms of credit offered. However, those studies analyzed different dependent variables from an earlier survey of small businesses and did not include the three variables indicating pre-existing relationships.¹⁸

4. Bank Characteristics

The marginal effect on $\ln(\text{Bank Assets})$ is negative and significant at better than the 0.01 level. Hence, our results based upon micro level data confirm the results of many other studies based upon more macro level data: large banks are less inclined to make loans to small businesses than are small banks.

5. A Summation

Overall, the general hypotheses developed in Sections III and IV hold up quite well when we use the full sample to analyze the bank's decision to approve or reject a small firm's loan application.¹⁹ While we are unaware of any straightforward way of showing the overall significance of this regression, which was estimated jointly with an equation explaining the firm's decision to apply at a large or small bank, we have included in panel A of Table 5 the identical specification of the loan approval decision estimated using a single-equation probit model rather than using the simultaneous bivariate probit model. It is worth noting that the magnitudes and t -statistics of the marginal effects for the simultaneous FIML probit equation of Table 4 and the single-equation probit of Table 5 are quite similar, and the latter equation easily passes a χ^2 test for significance. It is also worth noting that the correlation between the error terms of the FIML probit equation of Table 4 and the FIML probit selection equation in Table 3 is insignificant. This correlation coefficient can be viewed as a test statistic for the presence of selection bias; if it is not significantly different from zero, then the two probit equations can be estimated separately without bias (Greene (1997), p. 909). We will return to

¹⁸We also estimate this model without the three pre-existing relationship variables and still find the length of relationship variable to be insignificant.

¹⁹Some (primarily large) banks appear more than once in the sample because they received loan applications from more than one sample firm. To test whether this panel aspect of the sample has a qualitative effect on our results, we estimate a fixed-effects linear-probability model for the full sample and for the large and small subsamples, where a separate 1,0 dummy variable is included to identify each bank that appears more than once in the sample. We are forced to use the linear-probability model because, in many cases, a bank with multiple loan applications either approved (or rejected) all of the sample applications. Under these circumstances, neither the probit or logit model will converge to a maximum of the likelihood function. When we estimate the fixed-effects linear-probability model, our results regarding the financial and relationship variables are qualitatively unchanged both for the full sample and for the large and small bank subsamples, even though a number of the fixed-effects dummies are statistically significant. These results are available from the authors.

this important implication in our discussion of the separate results for large and small banks (for which this same implication holds).

TABLE 5
Results from Binary Probit Model to Explain the Small Business Credit Approve/Deny Decision of Large and Small Banks

(1)	Panel A. All Banks		Panel B. Large Banks		Panel C. Small Banks		Panel D. Large-Small Diff.	
	Marginal Effect	t-Stat.	Marginal Effect	t-Stat.	Marginal Effect	t-Stat.	Marginal Effect	t-Test
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	0.080	0.64	-0.132	-0.39	0.348	2.81***	-0.481	-1.33
<i>Firm Characteristics</i>								
Financial Records	0.048	2.32**	0.105	2.61**	0.011	0.76	0.094	2.19**
ln(Firm Size)	0.062	6.18***	0.106	5.16**	0.027	3.33***	0.079	3.60***
ln(Firm Age)	0.086	4.11***	0.129	3.12***	0.037	2.32**	0.093	2.09**
ROA	0.009	0.88	-0.005	-0.26	0.017	1.86*	-0.022	-1.04
Debt-to-Assets	-0.018	-0.81	-0.072	-1.75*	0.017	1.05	-0.089	-2.01**
Cash-to-Assets	0.106	2.28**	0.313	3.70***	-0.021	-0.62	0.334	3.66***
Firm Delinquencies	-0.027	-2.75**	-0.015	-0.75	-0.024	-3.06***	0.009	0.44
Owner's Delinquencies	-0.036	-2.95***	-0.030	-1.19	-0.020	-2.21**	-0.011	-0.39
African Am Owner	-0.060	-0.86	-0.455	-2.14**	0.001	0.07	-0.458	-2.11**
Female Owner	0.015	0.56	0.015	0.32	0.000	0.00	0.015	0.30
Owner's Age	-0.001	-1.15	-0.004	-1.80*	-0.000	-0.38	-0.004	-1.54
<i>Loan Characteristics</i>								
ln(Loan Amount)	-0.020	-2.06**	-0.006	-0.32	-0.022	-2.81***	0.016	0.76
Loan-Size-to-Assets	-0.016	-2.46**	-0.029	-2.65***	-0.009	-1.53	-0.020	-1.63
Collateralized Loan	0.026	1.03	0.053	1.24	0.019	0.85	0.030	0.59
<i>Relationship Characteristics</i>								
Deposit Relationship	0.017	0.60	-0.055	-0.93	0.063	3.04***	-0.118	-1.89*
Loan Relationship	-0.038	-1.75*	0.029	0.67	-0.061	-3.43***	0.090	1.92*
Financial Mgt. Relationship	0.037	1.55	0.004	0.10	0.034	1.83*	-0.030	-0.62
ln(Length of Relationship)	-0.002	-0.79	-0.005	-1.26	0.000	0.05	-0.005	-1.19
Number of Sources	-0.032	-4.42***	-0.043	-2.90***	-0.012	-2.18**	-0.031	-1.95*
Distance	-0.019	-1.80*	-0.035	-2.19**	0.010	0.57	-0.044	-1.92*
Bank in Person	-0.078	-2.69***	-0.175	-3.32***	-0.019	-0.89	-0.156	-2.74***
<i>Bank Characteristics</i>								
ln(Bank Assets)	-0.036	-7.68***	-0.062	-3.52***	-0.030	-3.45***	-0.031	-1.60
<i>SIC Dummies</i>								
	Yes		Yes		Yes			
Log-Likelihood	-369.92		-202.58		-129.68			
Restricted Log-Likelihood	-490.57		-270.19		-210.23			
χ^2 Stat.	241.31		135.22		161.10			

In panel A, the full sample of 1,102 observations is used in estimation of a bank's decision to extend or deny credit. In panel B (panel C), the selected sample of 517 observations for large banks (585 observations for small banks) is used in estimation of the bank's decision to extend or deny credit. For each variable identified in column (1), the panels present the variable's estimated marginal effect and t-statistic. Not shown are eight one-digit SIC dummy variables. In panel D is the result of a t-test for significant differences in the large and small bank marginal effects. *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

C. The Bank's Approve/Reject Decision Regressions: Comparing Large and Small Banks

Panels B and C of Table 4 present the results from estimating the loan approval decisions of large and small banks, respectively. We obtain each set of results by estimating a bivariate probit model with selection, where either large banks (panel B) or small banks (panel C) are selected from the full sample of 1,107 firm-bank pairs.

Rather than discuss the results for the large and small bank regressions separately, we discuss each variable and compare the marginal effects obtained from the large and small bank regressions. Panel D of Table 4 presents the results of *t*-tests for significant differences in the large and small bank marginal effects.

1. Firm and Owner Characteristics

The marginal effect of Financial Records is positive for both large and small banks, but it is significant and seven times larger for large banks. The difference between the two groups of banks is significant, which is consistent with our expectations that large banks favor applications from firms that can provide accurate financial information.

The marginal effect of $\ln(\text{Firm Size})$ is positive and significant at better than the 0.01 level in both the large and small bank regressions. However, the effect for large banks is more than three times that for small banks, and the difference between the two is significant, which is consistent with our expectations.

The marginal effect of $\ln(\text{Firm Age})$ is positive and significant at better than the 0.10 level in both regressions. The effect for large banks is three times that for small banks, suggesting that observed longevity of the firm, which proxies for public reputation, is more important for large than small banks. These findings are consistent with our expectations. Though the difference in coefficients is insignificant for the FIML results of Table 4, this difference is significant for the single-equation results of Table 5.

The marginal effect of ROA is small and insignificant in both regressions. There are at least two explanations for this. First, banks both large and small may place little faith in historical profitability as an indication of current credit-worthiness. The owners of small firms seek to take maximum advantage of the tax deductibility of business expenses (including salary expense), which often masks the true profitability of such firms, especially the smallest of firms. Second, owners of many small firms are financially unsophisticated and do not have their financials prepared by accountants. Such firms may report the profitability with such error as to render this measure useless to the lender.

The marginal effect of Debt-to-Assets is negative (as expected) for large banks but is insignificant; it is positive and insignificant for small banks. This difference in signs is consistent with our hypothesis that large banks are more reliant upon standard financial ratios. Although the difference in the two effects is insignificant for the FIML results in Table 4, this difference is significant for the single-equation results of Table 5.

The marginal effect of Cash-to-Assets is positive and significant at better than the 0.01 level for large banks, but is negative and insignificant for small banks. The difference in the two effects is significant at better than the 0.01 level, which is consistent with our expectations that large banks are more reliant upon financial ratios.

The marginal effect of Firm Delinquencies is negative and significant at better than the 0.05 level for small banks, but is negative and insignificant for large banks. These results appear contrary to our hypothesis that large banks rely more heavily upon standardized requirements than do small banks. If, however, small banks can more easily obtain accurate information about small firms through their

interactions with a firm's suppliers within the community, then these results would be consistent with our hypothesis. The difference between the two effects is not significant.

The marginal effect of Owner's Delinquencies is negative for both groups of banks, but only the effect for the small banks is significant at better than the 0.05 level. While the difference in the effects is not statistically significant, these findings are consistent with our hypothesis that small banks are more concerned than large banks with the borrower's character.

The marginal effect of African-Am Owner is negative and significant for large banks but positive and insignificant for small banks, and the difference in effects is significant at better than the 0.10 level. While these results might be interpreted as evidence of racial discrimination by large banks, the bureaucratized environment of the large banks seems unlikely to support such behavior. Moreover, it is at odds with the theory discussed in Section IV, which suggests that we would be more likely to expect discrimination by small than by large banks. Instead, small banks appear to favor minority-owned firms. An interpretation consistent with theory is that this variable proxies for the owner's personal wealth, income, and credit history, which are known to the bank by way of commercially available credit reports. If such is the case, then these results support our cookie-cutter hypothesis that large banks are sensitive to the numbers while small banks are more concerned with the borrower's character and look past them.

The marginal effect of Female Owner is positive but insignificant for both large and small banks, while the marginal effect of Owner's Age is negative but insignificant for both large and small banks. For neither variable are the differences in effects significant.

2. Loan Characteristics²⁰

The marginal effect of $\ln(\text{Loan Amount})$ is negative and significant at better than the 0.05 level for small banks and is negative but insignificant for large banks. This supports our hypothesis that lending by small banks is constrained by diversification and regulatory requirements. The difference in the magnitudes of the effects, however, is insignificant.

The marginal effect of Loan-Size-to-Assets is negative and significant at better than the 0.05 level for large banks, and is negative but insignificant for small banks. Again, large banks are more sensitive to the numbers indicating that a borrower might have difficulty repaying the loan, whereas small banks are undeterred by this information and instead rely upon other information. The difference in the magnitudes of the effects, however, is insignificant.

The marginal effect of Collateralized Loan is positive but insignificant for both groups of banks. The effect for large banks is twice the size of the effect for small banks, consistent with our expectation that the loan officers of larger

²⁰We also estimate models that include the uses to which the loan would be put (i.e., Line of Credit, Equipment, Mortgage, Motor Vehicle, Lease) as additional explanatory variables but find that they have little explanatory power. There are too few observations to estimate separate models for each type of use, except for Line of Credit. When we estimate the model for credit-line applications, there are so few loan rejections in the small bank sample that we get very little explanatory power from that model. We still get significant differences in the large and small bank marginal effects, but they are less clear than results using the full sample.

banks would be more receptive to the tangible feature that collateral brings to a loan application. However, the difference in the magnitudes of the effect is not statistically significant.²¹

3. Relationship Characteristics

The marginal effect of Deposit Relationship is negative and insignificant for large banks but is positive and significant at better than the 0.05 level for small banks. These findings suggest that small banks, but not large banks, favor an applicant with which it has a pre-existing deposit relationship. These results support Nakamura (1993), who argues that small banks are best able to use the information that is yielded by a borrower's deposit account for monitoring purposes. They also may indicate that small banks, which are more likely to be located in rural areas with less competition from other banks, find the deposit relationship more profitable and are less likely to endanger it by rejecting the applicant's loan request. Though the difference in the magnitudes in the coefficients is not statistically significant for the FIML results in Table 4, this difference is significant for the single-equation results in Table 5.

The marginal effect of Loan Relationship is positive and insignificant for large banks but is negative and significant at better than the 0.01 level for small banks. To the extent that a pre-existing loan places a small bank close to the regulatory constraint on credit extended to one borrower, these results are consistent with our cookie-cutter vs. character hypothesis. However, if we interpret this variable solely as a measure of the strength of the firm-creditor relationship, these results run counter to our hypothesis. Though the difference in the magnitudes in the effects is not statistically significant for the FIML regressions of Table 4, this difference is significant for the single-equation results in Table 5.

The marginal effect of Financial Mgt. Relationship is positive for both large and small banks, and the effect for the latter group is five times that of the former, which is consistent with our hypothesis that such pre-existing relationships are more important to small banks than to large banks. However, neither effect is statistically significant, nor is the difference in effects.

The marginal effect of Length of Relationship is negative but insignificant for both groups of banks. These results appear to run contrary to those of Petersen and Rajan (1994) and Berger and Udell (1995). However, those studies examine data from an earlier survey conducted during a less favorable economic environment and did not include the three additional dimensions of the firm-creditor relationship examined here, i.e., the dummy variables indicating pre-existing deposit, loan, and financial management relationships.

The marginal effect of Number of Sources is negative for both groups and is significant at better than the 0.05 level for large banks. The effect for large banks is more than three times the size of the effect for small banks. These findings are consistent with the theory that a bank prefers to be a firm's sole source of financial services, but they are also consistent with the hypothesis that fewer sources mean

²¹We also split the sample into collateralized and uncollateralized loan applications. We found that banks continue to be concerned about the characteristics of the borrower when the loan can be collateralized, which is consistent with the notion that the transactions costs of foreclosing and liquidating collateral are sufficiently high to make banks wary of relying solely on collateral for repayment.

that a bank is providing other profitable services that it is reluctant to endanger by denying the loan. Large banks are more likely to supply multiple services to a firm and thus will be more sensitive. Although the difference in magnitudes is not statistically significant for the FIML regressions of Table 4, this difference is significant for the single-equation results in Table 5.

The marginal effect of Distance is negative for large banks and positive for small banks, but is insignificant for both groups. This is consistent with the findings of Petersen and Rajan (2002).²²

The marginal effect of Bank in Person is negative and significant at better than the 0.05 level for large banks and negative but insignificant for small banks. The difference is significant at better than the 0.05 level. Though the signs are a surprise, the significant difference in the magnitudes of the effects is consistent with our hypothesis that personal relationships with the borrowers are relatively more important for small banks than for large banks.

D. Bank Characteristics

The marginal effect of bank size $\ln(\text{Bank Assets})$ is negative and significant at better than the 0.01 level for both groups of banks, but the difference in effects is insignificant. Hence, the tendency of smaller banks to look more favorably upon loan applications from small firms than larger banks applies not only to the entire sample, but also to both of the subsamples.

E. Firm's Standard Industrial Classification

Not shown in Tables 4 and 5 (but available from the authors) are results for the one-digit SIC dummy variables. These statistics show that large banks are significantly more likely to approve loan applications from firms in the retail trade (SIC 52), in financial services and real estate (SIC 6), business and consumer services (SIC 7), and professional services (SIC 8) industries. By contrast, small banks are significantly less likely to approve loan applications from firms in the professional services (SIC 8) industries. The differences in the coefficients of the two groups of banks are significant for the retail trade (SIC 52), financial services and real estate (SIC 6), business and consumer services (SIC 7), and professional services (SIC 8) industries.

We are unaware of a straightforward way to perform the equivalent of a Chow test for results from these bivariate probit regressions, which could indicate whether the large and small bank regressions come from the same common model. However, Table 5 presents results from estimating single-equation probit regressions for large and small banks that use the same explanatory variables that are found in Table 4. As can be seen, the marginal effects and *t*-statistics in Tables 5 and 4 are quite similar. For the single-equation results shown in Table 5, an *F*-test can be performed on the separate large and small bank probit regressions and the full-sample probit regression. The results of such a test indicate that the null

²²For the single-equation results in Table 5, distance has a significant negative effect for large banks, and the difference in coefficients between large and small banks is statistically significant.

hypothesis—that the large and small bank regressions came from the same common model—can be rejected at a 95% confidence level. Given the similarity of coefficients and *t*-statistics, it seems likely that the same would be true for results obtained using the simultaneous bivariate probit model shown in Table 4.

VI. Conclusions

Anecdotal evidence suggests that, in their decisions to extend or deny credit to small businesses, large banks use standard quantitative criteria whereas small banks are more reliant upon qualitative criteria based upon their loan officers' personal interactions with and assessments of loan applicants. In this study, we provide empirical evidence supportive of the hypothesis that large and small banks differ in their approaches to evaluating small business loan applications. Our evidence suggests that large banks employ a cookie-cutter approach to small business lending to control for agency problems and to maintain consistent loan standards. In contrast, small banks face less severe agency problems and are likely to have superior knowledge about their customers. Consistent with this, our evidence suggests that small banks use a more discretionary approach; they rely more heavily upon pre-existing relationships that provide insights into the character of a borrower and assign less weight than do large banks to formal financial variables.

Our model of the loan approval decisions for the full sample of banks provides support for our hypotheses regarding banks' decisions to extend or deny credit to small firms. More important is our finding that the results for the full sample mask important differences between the criteria that large and small banks use to evaluate loan applications from small businesses.

Results obtained by estimating separate probit models for large and small banks demonstrate a number of significant and important differences. These results show that large banks are significantly more likely to use formal numbers-based criteria than are small banks. Large banks are more likely to extend small business credit when the firm keeps formal financial records, is larger, has a longer track record, and has greater cash reserves; large banks are less likely to extend credit to small firms that have greater leverage or minority ownership, a likely proxy for the owner's wealth, income, and credit history.

Our results suggest that small banks look past these quantitative indicators when making their loan approval decisions. Instead, small banks, but not large banks, are more likely to extend credit to firms with which they had pre-existing deposit relationships and are less likely to extend credit to firms with which they had pre-existing loan relationships. Small banks also are less likely to extend credit to firms asking for larger loan amounts and to firms with past delinquencies of the firm or its primary owner. Finally, both large and small banks appear to favor loan applications from firms in different lines of business as indicated by SIC.

Our study deals only with the extension or denial of small business loan requests; it does not address determinants of the terms on which the loans are extended, such as interest rates or collateral requirements. These additional factors surely deserve attention in future research on the lending processes of large and small banks.

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