Cookie-Cutter versus Character: The Micro Structure of Small Business Lending by Large and Small Banks*

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Rebel A. Cole
Department of Accounting and Finance
University of Auckland
Auckland, NZ
Office: 64-9-373-7599 ext 5908
FAX: (435) 309-1372
E-mail: rebelcole@yahoo.com

Lawrence G. Goldberg (attend and present)
Department of Finance
University of Miami
P.O. Box 248094
Coral Gables FL 33124
Office: (305) 284-1869
FAX: (305) 284-4800
E-mail: lgoldberg@miami.edu

Lawrence J. White
Stern School of Business
New York University
New York, NY 10012-1126
Office: (212) 998-0880
FAX: (212) 995-4218
E-mail: lwhite@stern.nyu.edu

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Lending to small business constitutes an important and interesting 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. The latter, in order to be successful, must overcome the asymmetric information problems -- adverse selection and moral hazard -- that are inherent in such borrowers.

Small business lending has recently attracted a considerable amount of scholarly attention, much of it empirical (see the surveys that can be found in Berger and Udell (1998) and Berger et al. (1998)). The empirical research has been based largely on data that have been collected in response to public policy concerns about the adequacy of finance for the small business sector generally and especially its adequacy in the wake of the ongoing consolidation in the U.S. banking sector. In 1980, there were 14,400 commercial banks in the U.S.; by year-end 1999, there were fewer than 8,600. This consolidation has been accompanied by an increasing concentration of banking assets within the groups of money-center and super-regional banks. It is a well-established empirical regularity that larger banks allocate smaller percentages of their assets to small business loans than do smaller banks (see, for example, Berger and Udell (1996); Berger *et al.* (2000)).

Despite the outpouring of research on small business lending, there has been relatively little attention given to the "micro" aspects of how banks make small business loans. For example, what are the banks' criteria for accepting or rejecting the loan application of an enterprise, and, in particular, are there systematic differences between the loan approval/rejection processes at large and small banks? Anecdotal evidence, at least, suggests that large banks use standard quantitative sets of criteria for assessing whether small-business loans should be granted, i.e., a "cookie-cutter" approach, whereas small banks employ more 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, indicating that only 12% of small "community banks" use credit scoring models for small business loans, whereas more than two-thirds of larger banks use such models for their small business lending.

The effect of the consolidation in banking on the availability of credit to small-business borrowers has been examined in a number of recent studies (see, e.g., Peek and Rosengren (1998); Strahan and Weston (1998); Berger *et al*. (1997); and Walraven 1997)). Other studies have examined the importance of relationship banking and have explored the effects due to the differences in borrower characteristics (see, e.g., Cole (1998); Berger and Udell (1995, 1996); and Petersen and Rajan (1994, 1995)). A distinguishing feature of this study is that we focus simultaneously on characteristics of both the borrower *and* the lender, which enables us to examine the micro structure of the decision to lend to small businesses. In so doing, we find evidence indicating significant differences in the lending approaches of small and large banks.

The purpose of this study is to provide empirical evidence regarding any demonstrable differences in the way that large banks and small banks make small business loans. 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. Concomitant with this test, we simultaneously estimate a regression that explains the firm's decision to apply for credit at a large bank versus a small bank. Our results provide at least limited support for our primary hypothesis. The lending decision of large banks but not of small banks is more likely to be a function of financial variables, while the lending decision of small banks but not large banks is more likely to be a function of variables indicating pre-existing relationships between the bank and loan applicant. The coefficients for some of these variables, however, indicate contrary results.

Section I surveys the relevant academic literature and shows how the current study ties these different strands together and contributes to the analysis of an important public policy question. Section II discusses relationship banking and the expected differences in the loan approval processes of large

and small banks. Section III describes the small business finance survey that serves as our primary source of the data, and specifies the variables used and the hypotheses tested in the analysis. Section IV presents the empirical analysis testing our primary hypotheses. The final section offers a brief conclusion and suggestions for further research.

I. 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 *et al*. (1998)) and greater lending opportunities. Recent empirical evidence indicates that small banks lend proportionately more to small enterprises (Nakamura (1993); Keeton (1995); Berger *et al*. (1995); Levonian and Soller (1995); Berger and Udell (1996); Peek and Rosengren (1996); Strahan and Weston (1996, 1998); Berger *et al*. (2000)).

The rapid consolidation of the banking system raises concerns that lending to small business will be reduced as small banks are absorbed by larger banks. Some studies find that mergers reduce lending to small business (Peek and Rosengren (1996); Berger *et al*. (1998)), while others do not find this (Whalen (1995); Strahan and Weston (1996, 1998)). This reduction in lending to small business can be mitigated by the creation of new banks if the de novo banks lend more to small business than do comparable banks. Goldberg and White (1998) find that de novo banks (those in operation for less than three years) do make more small business loans. DeYoung *et al*. (1999) extend this study and find that as the de novo banks age they make proportionately fewer loans to small business while holding other factors constant. The formation of de novo banks appears to be important for small business lending in an era of bank consolidation.

Information about borrowers is vitally important to the lending process. Some suggest that

agency costs and information asymmetries have reduced the investment flow to profitable companies (see, e.g., Stiglitz and Weiss (1981)). Large lending institutions can produce substantial bodies of information about borrowing firms that can be very helpful in the credit decision process (see, e.g., Leland and Pyle (1977); Diamond (1984, 1991)). Because of scale economies and durable information, a firm having a longer pre-existing relationship with its bank should have greater availability of funds and/or lower cost of funds.

A substantial literature exists claiming that financial intermediaries have a comparative advantage in the production of information about borrowers (see e.g., Diamond (1984,1991); Ramakrishnan and Thakor (1984); Boyd and Prescott (1986)). The model of Boot and Thakor (1994) predicts that, as a relationship matures, interest rates decrease and collateral requirements decline. Other models predict that interest rates will increase as the relationship lengthens (see e.g., Greenbaum *et al*. (1989); Sharpe (1990); Wilson (1993); Rajan (1992). Finally, a number of studies measure the effect of a bank relationship on firm value, and find positive abnormal returns for events indicating renewals of the relationships (see e.g., James (1987); Billett *et al*. (1995)). In this study, we emphasize the differences between large and small banks in their use of information about borrowers.

Five recent studies provide the most relevant empirical evidence related to the current paper. Using data from the 1987 NSSBF (an earlier survey of small business finances conducted by the Federal Reserve Board and the U.S. Small Business Administration), Petersen and Rajan (1994) examine the value of lending relationships. They find that a relationship with an institutional lender increases the availability of financing to a small business. Relationships reduce the cost of borrowing, but this effect is smaller than the availability effect. If borrowers attempt to employ multiple lenders, the price of borrowing increases, and the availability of credit decreases.

In a second paper using data from the 1987 NSSBF, Petersen and Rajan (1995) explore the effect of credit market competition on lending relationships. Because a lender is more assured of a continuing relationship with a small-business borrower located in a more concentrated banking market,

lenders tend to provide more credit at lower rates in more concentrated markets. These results hold for young firms, but weaken as the borrowing firm ages.

Berger and Udell (1995) use data from the 1987 NSSBF to analyze the importance of relationship between banks and borrowers in the extension of lines of credit to small businesses. They find that lenders offered a firm with a longer relationship a lower loan rate and were less likely to require collateral. This provides additional evidence regarding the value of the information about the borrower obtained by the lender from a long-term relationship.

Berger and Udell (1996) is the only study of which we are aware that examines the differences in lending practices between large and small banks. Using loan data drawn primarily from the Federal Reserve's Survey of the Terms of Bank Lending to Business, they test several hypotheses concerning relationship lending and the availability of credit to small businesses. With respect to small-business loans, Berger and Udell find that large banks charge lower loan rates, require less collateral, and issue fewer loans than do small banks. These empirical results support their hypothesis that large banks supply relatively less credit to small "relationship borrowers" but do not reduce credit to small "ratio borrowers" whose creditworthiness can be judged by examining their financial ratios.

Cole (1998) examines the effect of relationships on the availability of credit by looking more carefully at the nature of the relationship. Like the current study, Cole uses data from the more recent 1993 NSSBF, which we describe in Section III. As do the studies already discussed, Cole finds that lenders are more likely to extend credit if they have a pre-existing relationship with a borrower, consistent with the generation of private information by such relationships. However, he finds no incremental effect from pre-existing relationships of longer duration than one year. Hence, his results suggest that banks generate the valuable private information about its customers quickly, and that this information can be regenerated by other banks if it is lost because of the merger or failure of the original bank. Using firm characteristics as proxies for reputation effects, he finds that the importance of firm-lender relationships is independent of reputation effects.

None of these studies except Berger and Udell (1996) have explored the differences in the micro-level behavior by different types of banks. In this study, we extend the previous literature by examining behavioral differences between large and small banks in the loan approval process.

II. Large Banks and Small Banks

The previous research clearly indicates that firm-lender relationships influence the availability of credit to the firm. We hypothesize that relationships are more important for small banks than for large banks. This is due to organizational and operational differences between large and small banks, which we explore in this section.

The operational differences between small and large banks with respect to lending can be explained by the theory of hierarchical control contained in Williamson (1967). As the size of an organization increases, loss of control occurs 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 in order to avoid distortions. Because there are fewer intermediaries between top management and lending officers in small banks, the small banks' loan officers can be granted more discretion in the lending process and thus are more likely to deviate from the "cookie-cutter" approach.

Similarly, large banks, which we define as those with $1 billion or more in consolidated assets, generally have more branches and are more geographically dispersed than are the small banks, which we define as those with less than $1 billion in consolidated assets. In order to keep control over the whole organization, large banks must establish procedures that will be followed throughout the whole organization. As an organization increases in size and geographic extent, it becomes more difficult for the top management to monitor the behavior of employees; agency problems arise. To ensure that loans are being granted in an appropriate manner, management must establish standards that can be followed easily by loan officers and that can be readily monitored and enforced by supervisors. Consequently,

we expect large-bank managers would develop a loan approval system that would lead to a consistent approach across branches and personnel. By necessity, the approach would have to employ easily obtained and verifiable information about the borrowers, such as financial ratios obtained from company financial statements. Consequently, we expect a "cookie-cutter" approach in the loan-approval process of large banks, with standard financial variables and ratios of potential borrowers significantly affecting the credit-allocation decisions of large banks.[1]

In contrast, small banks do not face agency and control problems that are as severe as those faced by large banks. Top management can more easily monitor the behavior of loan officers and coordinate the operation of various parts of the institution. There is less need to establish rigid standards for lending. More flexibility is possible and often is desirable. Small banks are likely to have more private information about potential borrowers because of proximity and a more personal relationship between banker and customer. Furthermore, ownership and management are more likely to be the same or closely allied in the small bank, thus reducing the agency problems between owners and managers described by Jensen and Meckling (1976). Consequently, we expect small banks to use information about the borrower obtained through relationships and from other sources and thus for small banks to employ more of a "character" approach. This would mean that small banks might grant loans to customers who do not meet the standardized requirements that larger banks would employ. To confirm this hypothesis, the empirical evidence should show that small banks' lending decisions adhere less strictly to standardized financial variables than do large banks' decisions.

The empirical evidence below tests these hypotheses about the differences between large and

[1] Our description of the loan-approval process that we expect to find in large banks has somewhat the flavor of credit scoring. Though the time period studied in the empirical section of this paper precedes the announced use of credit scoring methods for small-business loans by large banks, credit scoring had already been in widespread use for residential mortgage loans and household credit-card loans. It is a process for standardizing lending decisions in ways that would be especially appealing to the bureaucratic/managerial needs of large banks. For further discussions of credit scoring, see Mester (1997) and Frame *et al* (2000).

small banks in allocating credit to small businesses. Our evidence provides some support for the conclusion that large and small banks do behave differently.

III. Data, Hypotheses, and Methodology

The data used in this study are taken primarily from the 1993 National Survey of Small Business Finances (NSSBF), which was co-sponsored and co-funded by the Federal Reserve Board and the U.S. Small Business Administration.[2] 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 5.0 million firms operating in the U.S. as of year-end 1992.

The NSSBF provides detailed information about each enterprise's most recent borrowing experience during 1990-94, including whether the firm applied for credit, the identity and characteristics of the potential lender to which the firm applied, other financial services (if any) the firm obtained from that potential lender, whether the potential lender denied or extended credit to the firm, and, if the lender extended credit, what were 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) category, 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. It is for this reason that the survey is known as the "1993" NSSBF.

[2] For a detailed description of the 1993 NSSBF, which was used by Cole (1998), see Cole and Wolken (1995). For a description of the 1987 NSSBF, which was used by Petersen and Rajan (1994, 1995) and Berger and Udell (1995), see Elliehausen and Wolken (1989).

For the purposes of our study, we focus on the loan applications that were made by an enterprise to an identifiable commercial bank. To avoid potential endogeneity problems that might arise when the date of the loan application preceded the date of the firm's financial data, we have restricted our sample to those firms that applied for loans during 1993 or 1994, excluding applications made during 1990-92.[3] Finally, to ensure that the sample is applicable to small-business lending, we excluded observations where the applying small firm's sales, assets, or the loan request exceeded $10 million. This process produced a final sample of 1,102 loan applications. For 83.1% of these applications, the bank agreed to extend credit to the small firm.

To classify the bank to which the loan application was made by size, we matched NSSBF data identifying that bank with Call Report data obtained from the Federal Reserve System's National Information Center. Specifically, we matched NSSBF data with Call Report data on consolidated banking assets as of the year-end preceding the year in which the application was made. Hence, we matched loan applications made during 1994 (1993) with year-end 1993 (1992) Call Report data.

The loan applicants in this sample are a self-selected group. Presumably, only those enterprises whose owners believed that they had a high probability of obtaining a loan from the identified bank to which they applied would have bothered to have applied for the loan from that bank. Nevertheless, not all of them were in fact successful, and the characteristics of those who were successful and unsuccessful, as well as the characteristics of the bank that approved or rejected the application, provide us with the basis for testing our hypotheses. To try to control for the bias that might arise with

[3] We chose to limit our analysis to loan applications made during 1993 and 1994 in order to ensure that the financial and relationship data reported in the survey *precede* the loan application. Otherwise, we would have a serious endogeneity problem: the loan and relationship data reported in the survey would not have been observable by the loan officer evaluating the firm's loan application. For example, if we were to include loan applications from 1991, then we would be explaining a bank's decision to approve or deny the loan based upon the firm's financial condition as of year-end 1992, which would be inappropriate. Fortunately, almost 90% of the loan applications reported in the survey were made during 1993 and 1994, so we have eliminated only about 10% of the available sample.

respect to a loan applicant's choice of a large bank or a small bank, we have estimated a simultaneous model in which the loan applicant's choice of size of bank to which to apply and the bank's accept/reject decision with respect to that loan application are modeled by two separate equations that are estimated jointly.

Table I displays the variables extracted from the NSSBF and from the FDIC Call Reports that are used in our analyses of the credit allocation decision, along with brief definitions, means, standard errors, and ranges.[4] The remainder of this section will expand on those variable definitions and on how we will use the variables to test the hypotheses discussed in Section III.

The dependent variable that we use in all of our tests of the accept/reject decision is *Loan Approved*: a 1,0 variable indicating whether the bank approved or denied the enterprise's request for a loan. As noted above, the loan was approved 83.1% of the time.

We group our explanatory variables into four categories: (i) the applicant enterprise's characteristics, including its (and its primary owner's) credit history and financial relationships; (ii) the characteristics of the requested loan; (iii) the characteristics of the relationship between the loan applicant and the bank; and (iv) the bank's characteristics. We will first present our general expectations as to the relationships between these variables and our dependent variable (*Loan Approved*); we will then discuss our more specific expectations as to the differences that we would expect to find in the behavior of larger banks and smaller banks.

A. General Hypotheses for the Accept/Reject Decision

A1. Firm Characteristics

Our general expectations fundamentally follow those of Berger and Udell (1993) and Berlin (1996). Lenders will lend only when they have high expectations of being repaid and thus will strongly

[4] The reported means and standard errors are calculated using the NSSBF sample weights, so as to make the sample representative of the target population of small businesses that applied for bank credit during 1993 or 1994. Similarly, all of the reported regression results were calculated using the sample weights.

favor borrowers with characteristics that reassure the bank as to the likelihood of being repaid.

Firm Size is the applicant firm's sales in thousands of dollars, as of year-end 1992. We expect that larger applicant firms would be able to provide more reassurance to a bank that its loan would be repaid and thus would be more likely to be accepted for a loan. We expect a positive relationship between *Firm Size* and *Loan Approved*. The natural logarithm of firm size *ln*(*Firm Size*) is used in our regressions.[5]

Firm Age is the applicant firm's age in years as of year-end 1992. We expect that an older firm, with a more established track record, would be more likely to be accepted for a loan. We expect a positive relationship between *Firm Age* and *Loan Approved*. The natural logarithm of firm age *ln*(*Firm Age*) is used in our regressions.

ROA is the applicant firm's return on assets, its profits for 1992 divided by its assets as of year-end 1992. Greater profitability should provide a bank with greater reassurance as to repayment. We expect a positive relationship between *ROA* and *Loan Approved*.

Debt-to-Assets is the ratio of the applicant firm's debt to its assets, as of year-end 1992.[6] We expect that firms with lower debt ratios are less likely to become insolvent and thus would be more likely to be accepted for a loan. We expect a negative relationship between *Debt-to-Assets* and *Loan Approved*.

Cash-to-Assets is the ratio of the applicant firm's cash to its total assets. A more liquid firm would likely provide greater reassurance to a lender of the prospects for repayment. We expect a positive relationship between *Cash-to-Assets* and *Loan Approved*.

Firm Delinquencies is the number of credit obligations on which the applicant firm was

[5] For all variables that are used in log form, we have added 1.0 to all observations to allow us to deal with values of zero.

[6] To control for erroneous extreme values, this ratio was limited to values in the range of 0.0 to 1.6, the 99th percentile value.

delinquent during the previous three years.[7] More past delinquencies should discourage a bank from lending to a loan applicant. We expect a negative relationship between *Firm Delinquencies* and *Loan Approved*.

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 relationship between *Owner's Delinquencies* and *Loan Approved*.

African-Am Owner is a 1,0 dummy variable indicating whether the applicant firm's owner was identified as a member of a minority (African-American) group. 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 be a proxy for those asset, income, and credit-history differences. In essence, this variable is a proxy (albeit imperfect) 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 relationship between *African-Am Owner* and *Loan Approved* at large banks. If, however, this variable is an indicator of race-based discrimination, we expect a negative relationship between *African-Am Owner* and *Loan Approved* at small banks, which are more likely to be located in more highly concentrated banking markets. This follows from Becker (1971), who

[7] The survey capped the magnitude of this variable (and of *Owner's Delinquencies*, described below in the text) at three: The possible answers to the survey question were: zero, one, two, or three or more delinquencies.

hypothesizes that racial discrimination should be more prevalent in less-competitive credit markets.

SIC X is one of a set of nine 1,0 dummy variables that indicate the one-digit SIC code of the applicant firm.[8] 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.

A2. Loan Characteristics

Loan Amount is the amount of the requested loan in thousands of dollars. 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,[9] 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 the relationship between *Loan Amount* and *Loan Approved*. The natural logarithm of the loan amount *ln*(*Loan Amount*) is used in our regressions.

Collateralized Loan is a 1,0 dummy variable indicating whether the requested loan was collateralized.[10] In principle, a loan that is collateralized is (*ceteris paribus*) safer from the perspective

[8] SIC 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).

[9] These 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 a 5 percent net-worth ratio, this implies a maximum loan amount of $750,000.

[10] The survey asks whether the loan is collateralized only for those loans that were accepted, but not for those loans that were rejected. We employ the actual information as to the presence or absence of collateral for the accepted loans (which constitute 83% of our sample) as the collateral variable for those observations. We also use this information to estimate a probit regression model explaining the presence of absence of collateral, and use the coefficient estimates from this model and the

of the lender. If the borrower fails to repay the loan, the lender can seize the collateral, sell or liquidate it, and use the proceeds for the loan repayment. However, there may be substantial transactions costs to seizing and selling/liquidating, and the collateral itself may be worth less than was originally claimed by the borrower. Consequently, the benefits to the lender from collateral may be modest at best. Though we expect a positive relationship between *Collateralized Loan* and *Loan Approved*, this relationship may well be weak.

A3. Relationship Characteristics

Deposit Relationship is a 1,0 dummy variable indicating whether the applicant firm already had a deposit account (checking or savings) at the bank. This type of prior relationship should generally be favorable for a loan applicant because it provides more information about the applicant for the bank. We expect a positive relationship between *Deposit Relationship* and *Loan Approved*.

Loan Relationship is a 1,0 dummy variable indicating whether the applicant firm already had another loan at the bank. The potential effects of this relationship are ambiguous. The prior loan relationship does give the bank additional information about the applicant; but that information could cause the bank to form a negative impression of the applicant. Further, for small banks the combined size of the applied-for loan, plus the prior loan, might trigger concerns about diversification of their portfolio and the regulatory restrictions on loans to one borrower.

Financial Mgt. Relationship is a 1,0 dummy variable indicating whether the applicant firm

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characteristics of the rejected loans to impute whether collateral was required of the rejected loans. This procedure produces a score between zero and one for each loan. We must then choose a value to split the loans into collateralized and not collateralized. Because 68% of the accepted loans were reported as collateralized, we chose a cut-off percentage that also resulted in 68% of the accepted loans being classified as collateralized, and then used this cut-off 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 accepted loans, and the imputed presence or absence of collateral for the rejected loans) indicates an overall collateralization rate of 66% for our sample.

previously was obtaining financial management services from the bank. Financial management services include transaction services, cash management services, credit-related services, and trust services.[11] This type of relationship should generally be considered favorable for the applicant. We expect a positive relationship between *Financial Mgt. Relationship* and *Loan Approved*.

Length of Relationship is the length of time in years of the longest relationship (if any) that the applicant has had with the bank. A longer relationship should generally give the bank more information about the applicant. Both Petersen and Rajan (1994) and Berger and Udell (1995) examine the effects of the length of relationship. Petersen and Rajan find that their proxy for credit availability (the percentage of a firm's trade credits that are paid late) is negatively related to the length of the firm's longest relationship. Berger and Udell find that the loan rate premium is negatively related to the length of relationship and that the probability that collateral is necessary decreases with the length of relationship. On the other hand, Cole (1998) found that this variable was not significant for the loan approval process, implying that only the most recent information was important. We expect a positive or insignificant relationship between *Length of Relationship* and *Loan Approved*. The natural logarithm of (one plus) the length of relationship *ln*(*Length of Relationship*) is used in our regressions.

Number of Sources is the number of 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. Equivalently, the bank would prefer that the applicant firm have fewer sources of financial services and more of them with that bank. We expect a negative relationship between *Number of Sources* and *Loan Approved*.

A4. Bank Characteristics

[11] Transaction services encompass the provision of paper money and coins, the processing of credit card receipts, the collection of night deposits, and wire transfers. Cash management services include the provision of sweep accounts, zero-balance accounts, lockbox services, and other services designed to invest liquid funds in liquid, interest-bearing assets automatically. Credit-related services include the provision of bankers' acceptances, letters of credit, and factoring. Trust services include the provision of 401(k) plans, pension funds, business trusts, and securities safekeeping.

Banks clearly do differ in their proclivities with respect to small business lending (Berger and Udell (1996); Goldberg and White (1998); DeYoung (1998); DeYoung *et al*. (1999); Berger *et al*. (2000)). We have selected a single bank characteristic, bank size, that other studies have shown to be important.[12]

Bank Assets is the bank's total assets (in millions of dollars), as of the year-end preceding the loan application. 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 relationship between *Bank Assets* and *Loan Approved*. The natural logarithm of bank assets *ln*(*Bank Assets*) is used in our regressions.

B. Specific Hypotheses for Large and Small Bank Differences.

The specific motivation for this paper is to test whether big banks and small banks differ in the way that they approach the loan application approval/rejection decision for small business loans. Big banks are likely to be more bureaucratic, and their loan officers are more likely to make decisions "by the numbers." Loan approval/rejection decisions are likely to be based on the loan applicant's easily verified financial data: a "cookie-cutter" process. Smaller banks may be less bureaucratic, and their loan officers may be able to use less formal and more subjective criteria in their decisions; "character" or relationship lending may be more important. Accordingly, we expect the formal financial data to be quantitatively and statistically more significant in explaining the lending decisions of large banks. Conversely, we expect the formal financial variables to provide a less satisfactory fit for a regression that

[12] In an earlier version of this study, we examined two additional bank variables. One was the ratio of the bank's "tier 1" capital to its risk adjusted assets, in the expectation that capital-constrained banks would be less inclined to approve loans. However, virtually none of the banks were at or below the regulatory capital minimum levels, and the variable consistently showed no effect. The other variable was the age of the bank, because DeYoung *et al*. (1999) have shown that de novo banks tend to lend less to small business as they grow older. However, almost all of the banks in our sample were older than 20 years, the cut-off point for an age effect in the DeYoung *et al*. study. Consequently, we do not discuss these variables in this version of the study.

tries to explain the lending decisions of small banks, since these variables are likely to fail to capture the subjective criteria that small banks employ in their decisions.

In Table II, we divide our sample into 517 loan application observations involving "large" banks (those with consolidated assets of $1 billion or more, as of year-end prior to the loan application), and 585 loan application observations involving "small" banks (those with consolidated assets of less than $1 billion). For each group, we present means and standard errors for all of our variables, along with the differences between the means of the large and small banks, and t-tests on those differences. As can be seen, there are significant differences with respect to *Loan Approved* (small banks approve more of their applicants), *ln*(*Firm Size*) (large banks tend to receive loan applications from larger firms), *Cash-to-Assets* (large banks receive loan applications from more liquid firms), *ln*(*Loan Amount*) (large banks receive larger loan requests), *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), and *ln*(*Bank Assets*) (large banks are, indeed, larger), and *SIC 7* and *SIC 8* (small banks are more likely to receive loan applications from business services firms, while large banks are more likely to receive loan applications from professional services firms). It is noteworthy that pre-existing relationships do seem to matter more for the applicants to small banks.

These differences in the applicant pools may well influence the overall pattern of accept/reject decisions observed for the two groups of banks. Consequently, not only must we control for the usual possibility of confounding influences through regression analysis, but we must also control for the potential bias that might be introduced by the applicant firm's choice of a large bank or a small bank. We accomplish this by estimating a system of two disturbance-related equations, where the first equation explains the firm's decision to apply at a large bank or a small bank, and the second equation explains the bank's decision to approve or deny the firm's credit application, conditional upon the size of

bank to which the firm chose to apply.

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 bank versus a small bank. Given this vacuum, we hypothesize that the characteristics of the enterprise, its owner, and the loan being sought (which we describe above) influence the enterprise's choice of a large bank versus 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. In essence, the firm should choose its bank on something approximating its subjective estimate of the regression coefficients that we report in Section IV. 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 do include nine additional explanatory variables in our model of the choice-of-bank- size decision. Because larger banks tend to have their offices in metropolitan statistical areas (MSAs), while smaller banks tend to have their office in rural areas,[13] we expect that an applicant located in an MSA will tend to choose a larger bank. We attempt to capture this effect by including the dummy variable *MSA*, which takes the value 1 if the applicant firm is located in an MSA and 0 otherwise. Finally, we include a set of eight regional dummy variables *REGION X*, where X = 2, 3, . . , 9, indicating the

[13] This tends to be true, even though large banks may have branch offices in rural areas. See Gilbert (2000).

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 firm's choice of bank size, such as historical limitations on bank branching.[15]

D. The Bivariate Probit Methodology

To account for the nonrandom selection of firms choosing to apply at large banks versus small banks, we use a bivariate probit model with sample selection as proposed by Van de Ven and van Praag (1981). This model involves the simultaneous estimation of two disturbance-related equations -- a probit application equation, which is the basis for selection, and a probit denial equation.

The probability-of-application equation is:

$$A^*_i = \gamma' Z_i + \varepsilon_i \qquad (1)$$

where A^*_i is an unobservable index of the probability that a firm applies for credit at a large (small) bank; Z_i is a vector of enterprise, owner, and loan characteristics developed in the previous sections; γ is a vector of parameter estimates for the independent variables; ε_i is a normally distributed random disturbance term with zero mean and unknown constant variance σ_ε^2; and $i = 1, 2, \ldots, N$, where N is the total number of firms.

Let A_i be an observable variable equal to one if $A^*_i > 0$ and zero if $A^*_i \leq 0$. In this particular application, A_i is equal to one when a firm applies for credit at a large (small) bank and equal to zero when a firm applies for credit at a small (large) bank. Since $\gamma' z_i$ is $E(A^*_i \mid Z_i)$, one can write the probability that A_i is equal to one as the probability that ε_i is greater than $-\gamma' Z_i$, or, equivalently, is

[14] Census Region 1, the Northeastern United States, is our base case and does not appear in the choice-of-bank regressions. We use Census region rather than state location because the public version of the NSSBF does not identify the state in which the firm is located.

[15] It should be noted that since the *MSA* and *REG X* 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*, etc.) appear only in the bank's approval/rejection decision regression, both sets of regressions are identified in a simultaneous system.

greater than 1- $F(-?' Z_i)$, where F is the cumulative distribution function of e, here assumed to be normal. The probability that A_i is equal to zero is then simply $F(-?' Z_i)$.

The probability-of-denial equation is:

$$D^*_j = ß' X_j + \mu_j \tag{2}$$

where D^*_j is an unobservable index of the probability that a firm's loan application will be denied; X_j is a vector of enterprise, owner, and loan characteristics developed in the previous sections; $ß$ is a vector of parameter estimates for the independent variables; μ_j is a normally distributed random disturbance term with zero mean and unknown constant variance s_μ^2; and $j = 1, 2, \ldots, M$, where M is the total number of firms applying for credit and $M < N$. Let D_j be an observable variable equal to one if $D^*_j > 0$ and zero if $D^*_j \le 0$.

If there are unobserved or otherwise omitted variables that affect whether the firm applies at a large bank versus a small bank *and* that affect whether or not a firm's application is denied, then the error terms e_i in eq. (1) and μ_j in eq. (2) will be correlated because the equations omit the same variables. Estimation procedures that ignore the correlation between error terms will produce biased and inconsistent coefficients for eq. (2). To compensate for this correlation, we use an asymptotically efficient procedure: the joint estimation of eq. (1) and eq. (2) by the method of full-information maximum-likelihood, assuming that e and μ come from a bivariate normal distribution with correlation coefficient $?$. Since s_e cannot be estimated within this framework, it is normalized to one. As specified in Meng and Schmidt (1986), the log- likelihood for this model is:

$$\ln L_i (Z_i, X_i, ?) = \sum_{i=1}^{N} A_t D_t \ln F(?' Z_i , ß' X_i ; ?)$$

$$+ A_t (1 - D_t) \ln[f(?' Z_i) - F(?' Z_i , ß' X_i ; ?)]$$

$$+ (1 - A_t) \ln [1 - \Phi (\beta' Z_i)]$$

where Φ is the bivariate standard normal cumulative distribution function and ϕ is the univariate standard normal cumulative distribution function. Estimates obtained by maximizing this log-likelihood account for the potential correlation between error terms; hence, they are unbiased, consistent, and asymptotically efficient.[16]

In presenting our probit regression results, we report the marginal effects of a change in each variable when all variables are evaluated at their means, rather than presenting the actual coefficient estimates, which reflect an arbitrary normalization. The marginal effects provide an intuitive way of describing the effects on probabilities, as well as providing the normalization that permits comparisons across similar equations.

IV. Empirical Results

The formal empirical tests of the hypotheses developed in Sections II and III consist of regressions in which *Loan Approved* -- the 1,0 variable indicating whether a specific small business's loan application at a specific bank was approved or rejected by that bank -- is the dependent variable and the remaining variables described in Section III are the right-hand-side independent variables. We are especially interested in differences in loan approve/reject behavior displayed by large and small banks.

As was discussed in the previous section, however, 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, as discussed in Section III-D. This full information

[16] Estimation was carried out using version 7.0 of the LIMDEP statistical package developed by Greene (1995). The particular estimator used here first calculates maximum-likelihood probit estimates for use as starting values, and then uses a modification of the Davidon, Fletcher, and Powell algorithm (see Fletcher 1980) to obtain the final parameter estimates.

maximum likelihood (FIML) procedure involves the simultaneous estimation of two probit equations: (i) the firm's decision to apply at a large bank or a small bank; and (ii) the bank's decision to accept 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 (with assets of $1 billion or more), and once to select the sample of 585 observations involving "small" banks (with assets less than $1 billion). First, we will discuss the results for the equation explaining the firm's decision to apply at a large bank versus a small bank. These results do not differ qualitatively in any of the three separate systems that we estimate. Then we will discuss the results for the equation explaining the bank's decision to approve or reject the firm's loan request based upon (i) the full sample of 1,102 large and small banks, (ii) the selected sample of 517 large banks, and (iii) the selected sample of 585 small banks.

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

Table III presents results from the probit regression model explaining the applicant's decision to apply for credit at a large bank versus a small bank, which was estimated simultaneously with an equation explaining the bank's accept/reject decision. The estimated coefficients 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 equals 1 if the firm applied at a large bank and zero if the firm applied at a small bank.[17]

As shown in Table III, the characteristics of the enterprise, owner, and loan have virtually no explanatory power with respect to the applicant's choice of bank size. Only one variable is statistically significant. Firms with a larger number of sources for financial services are less likely to apply at large banks than at small banks. If applicants believe our cookie-cutter hypothesis, then we would expect

[17] Results for the other two systems are available from the authors upon request.

firms with multiple banking relationships to be more, rather than less, likely to apply at large banks. We also would expect significant positive coefficients on collateral, ROA, and Cash-to-Assets, and Owner's Delinquencies, and significant negative coefficients on Debt-to-Assets Firm Delinquencies and Length of Relationship. This suggests that loan applicants do not believe that small banks reward relationships or that large banks favor collateral over character. The signs of each of these variables are consistent with the cookie-cutter hypothesis; however, none are statistically significant at even the 10 percent level.

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 III 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 a large bank than are firms located in the omitted Census Region, the Northeast. These latter results are somewhat surprising, in that few large banks are headquartered in the Midwest. Of course, these results hold only after controlling for MSA location and the set of enterprise, owner, and loan characteristics.

B. The Bank's Accept/Reject Decision Regressions: All Banks

Table IV presents results from the probit regression model that explain the bank's accept/reject

decision, estimated simultaneously with the applicant's decision to apply for credit at a large bank versus a small bank. The dependent variable is coded as 1 for loan applications granted and 0 for loan applications denied.

As shown in Panel A of Table IV, we find that, for the full sample, the 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.

B1. Firm and owner characteristics

With respect to the characteristics of the applicant firm, the coefficients of *ln*(*Firm Size*) and *ln*(*Firm Age*) are positive and significant at better than the 0.01 level, indicating that banks are more likely to approve the loan applications of larger firms and older firms. These findings are consistent with our hypotheses that banks perceive larger firms as better equipped and older firms as having established a track record of their ability to meet their financial obligations. The coefficients of *ROA* and the ratio of *Cash-to-Assets* are positive and the coefficient of the ratio of *Debt-to-Assets* is negative, as hypothesized. Banks are more likely to approve loan applications from firms with healthier balance sheets. However, none of these three coefficients is statistically significant. The coefficients of the number of delinquencies by the firm (*Firm Delinquencies*) and by the firm's primary owner (*Owner's Delinquencies*) are negative and significant. This supports our hypothesis that banks are less likely to approve loan applications from firms with poor credit histories. The coefficient for firms owned by African-Americans is negative as hypothesized, but is not statistically significant. Coefficients for the dummy variables indicating applicant firms in *SIC 3* (light manufacturing), *SIC 6* (insurance and real estate), and *SIC 8* (professional services) are positive and significant at better than the 0.10 level, indicating that banks are more likely to extend credit to firms in those industries. While we did not state specific hypotheses about these industry indicator variables, these positive coefficients may well reflect the perceived relative healths of those industries during the 1993-94 period when these firms applied for bank credit.

B2. Loan characteristics

With respect to the characteristics of the requested loan, the coefficient on *ln*(*Loan Amount)* is negative and significant, while the coefficient on *Collateralized Loan* is positive, though not quite significant at the 0.10 level. The negative coefficient for *ln(Loan Amount)* indicates that regulatory limitations on loans to one borrower and/or the diversification benefits of smaller loans are more important to the bank than the ability to spread fixed loan costs across more dollars. The positive coefficient on *Collateralized Loan* supports our hypothesis that banks favor loan applications that are collateralized, although this preference is not strong.

B3. Relationship characteristics

With respect to the relationship variables, 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]

The coefficient on the number of sources of financial services (*Number of Sources*) is negative and significant at better than the 0.01 level. This finding indicates that banks are less likely to extend credit to firms with multiple firm-creditor relationships, 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).

B4. Bank characteristics

The coefficient on *ln*(*Bank Assets*) is negative and significant at better than the 0.01 level.

[18] We also estimated this model without the three pre-existing relationship variables and still found the length of relationship variable to be insignificant.

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 (Nakamura (1993); Keeton (1995); Berger *et al*. (1995); Levonian and Soller (1995); Berger and Udell (1996); Peek and Rosengren (1996); Strahan and Weston (1996, 1998); Berger *et al*. (2000)).

B5. A summation

Overall, the general hypotheses developed in Sections II and III 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 Appendix Table I the identical specification of the loan approve/reject decision estimated using a single-equation probit model rather than using the bivariate probit model. It is worth noting that the coefficient magnitudes and *t*-statistics for the simultaneous FIML probit equation of Table IV and the single-equation probit of Appendix Table I are quite similar; and the latter equation easily passes a chi-squared test for significance.

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

Panels B and C of Table IV present the results from estimating the accept/reject decisions of

[19] Some (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-bank and small-bank 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 accepted (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 to the reader upon request.

large banks (with assets greater than $1 billion) and of small banks (with assets less than $1 billion), respectively. Each set of results was obtained by estimating a bivariate probit model with selection, where either large banks (Panel B) or small banks (Panel C) were selected from the full sample of 1,107 firms.

Rather than discuss the results for the large-bank and small-bank regressions separately, we discuss each variable and compare the marginal-effect coefficients[20] obtained from the large-bank and small-bank regressions. Panel D of Table IV presents the results of t-tests for significant differences in the large-bank and small-bank coefficients.

C1. Firm and owner characteristics

The coefficient of *ln(Firm Size)* is positive and significant at better than the 0.01 level in both the large-bank and small-bank regressions, indicating that both large banks and small banks are more likely to approve loan requests from larger firms. However, the coefficient for large banks is more than three times that for small banks, and the difference between the two is significant. This difference is consistent with our framework.

The coefficient of *ln(Firm Age)* is positive and significant at better than the 0.10 level in both regressions, indicating that both large and small banks are more likely to extend credit to older firms. The coefficient for large banks is twice that for small banks, suggesting that observed longevity of the applicant is more important for large banks. However, the difference in coefficients is insignificant.

The coefficient of *ROA* is small and insignificant in both regressions. There are at least three explanations for this. First, both large and small banks may place little faith in the historical profitability data as an indication of the credit-worthiness of a prospective borrower. The owners of small firms seek to take maximum advantage of the tax deductibility of business expenses, which often masks the true profitability of such firms. Second, owners of small firms may well be financially unsophisticated

[20] As was noted above, we report and can compare the marginal effects of each variable across equations.

and may report the profitability with such error as to render this measure useless to the lender. Third, historical profitability may be a poor indicator of future performance for small firms.

The coefficient of *Debt-to-Assets* is negative and significant at better than the 0.10 level for large banks, but is positive and insignificant for small banks. The difference in the two coefficients is significant at better than the 0.10 level. The significant negative relationship that holds at large banks is consistent with our hypothesis that large banks rely more heavily than do small banks on standard financial information. The insignificance of this variable for smaller banks may reflect the superior non-formal and non-financial information that a smaller bank is likely to possess about its loan applicants.

The coefficient of *Cash-to-Assets* is positive and significant at better than the 0.05 level for large banks, but is negative and insignificant for small banks. The difference in the two coefficients is significant at better than the 0.05 level. The significant positive relationship that holds at large banks is consistent with our hypothesis that large banks rely upon standard financial ratios while small banks make use of superior non-financial and informal information about the borrowers.

The coefficient 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 imply that small banks are quite sensitive to the applicant firm's credit history while large banks are not, which is contrary to our hypothesis that large banks rely upon standardized requirements more heavily than do small banks. However, the difference between the two coefficients is not significant.

The coefficient of *Owner's Delinquencies* is negative for both groups of banks, but only the coefficient for the small banks is significant at better than the 0.10 level. While the difference in the coefficients is not statistically significant, these findings are consistent with the hypothesis that small banks rely upon the "character" of the borrower more heavily than do large banks.

The coefficient of *African-Am Owner* is negative and significant for large banks but positive and insignificant for small banks, and this difference is significant at better than the 0.10 level. These results could be interpreted as evidence of racial discrimination by large banks, but the bureaucratized

environment of the large banks seems unlikely to support such behavior. Moreover, it is at odds with theory, which suggests that discrimination would be more likely at small banks because they are more likely than large banks to enjoy some degree of monopoly power (e.g., in rural areas). A more plausible interpretation is that this variable is a proxy for the owner's personal wealth, income, and credit history, which are known to the bank by way of commercially available credit reports. If we accept this interpretation, then these results suggest that large banks are sensitive to these numbers, while small banks are more concerned with the "character" of the borrower and look past them.

C2. Loan characteristics

The coefficient for *ln* (*Loan Amount*) is negative and significant at better than the 0.01 level for small banks and is negative but insignificant for large banks. This evidence supports the hypothesis that small bank lending is constrained by diversification and regulatory requirements (such as limitations on the amount of lending to one borrower). The difference in the magnitudes of the coefficients, however, is insignificant.

The coefficient for *Collateralized Loan* is positive but insignificant for both groups. The coefficient for large banks is twice the size of the coefficient for small banks, which is consistent with our expectation that the loan officers of larger banks would be more receptive to the "tangible" feature that collateral brings to a loan application. But the difference in the magnitudes of the coefficients is not statistically significant.[21]

C3. Relationship characteristics

The coefficient for *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 that had a pre-existing deposit relationship with the bank.

[21] We 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.

These results strongly 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. The difference in the magnitudes in the coefficients is not statistically significant.

The coefficient for *Loan Relationship* is positive and insignificant for large banks but is negative and significant at better than the 0.01 level for small banks. The difference in coefficients is significant at better than the 0.05 level. To the extent that a pre-existing loan places a small bank close to the regulatory constraints on credit to one borrower, these results are consistent with our "cookie-cutter versus 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.

The coefficient of *Financial Mgt. Relationship* is positive for small banks and negative for large banks. This is consistent with our hypothesis that such pre-existing relationships are important to small banks but not to large banks. However, the difference in coefficients is not statistically significant for either group.

The coefficient of *Length of Relationship* is positive for small banks and negative for large banks. The signs on these coefficients are consistent with our hypothesis that longer relationships are important to small banks but not large banks, but neither coefficient nor the difference in coefficients is statistically significant. These results also run contrary to previous studies of relationship lending, which find the length of relationship to be a positive and significant influence on credit availability as measured by the use of trade credit (Petersen and Rajan, 1994) and on the terms of lending -- i.e., the loan rate and collateral requirements imposed by the lender (Berger and Udell, 1995). However, those studies examined data from a different survey conducted during a less favorable economic environment, and did not include the three addition measures of the firm-creditor relationship examined here, i.e., the dummies for pre-existing deposit, loan, and financial management relationships.

The coefficient of *Number of Sources* is negative for both groups and is significant at better than the 0.05 level for large banks. The coefficient for large banks is more than three times the size of

the coefficient for small banks, but the difference in coefficients is insignificant. These findings are consistent with the theory that banks prefer to be a firm's sole source of financial services, but are inconsistent with our hypothesis that this preference is more important to small banks than to large banks.

C4. Bank characteristics

The coefficient of *ln* (*Bank Assets*) is negative and significant at better than the 0.01 level for both groups of banks, but the difference in coefficients is insignificant. Hence, the tendency of larger banks to be less interested in making loans to small business applies not only to the entire sample, but also to the variation in size within each sub-sample.

C5. Firm's standard industrial classification

Large banks are significantly more likely to approve loan applications from firms in the retail trade (*SIC 5b*), insurance and real estate (*SIC 6*), business 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 retail trade (*SIC 5b*) and professional services (*SIC 8*) industries. The differences in the coefficients of the two groups of banks are significant at better than the 0.05 level for the retail trade (*SIC 5b*), insurance and real estate (*SIC 6*), business 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-bank and small-bank regressions come from the same common model. However, in Appendix Table I, we present single-equation probit regressions for the large banks and small banks that use the same explanatory variables as are found in Table IV. As can be seen, the coefficients and *t*-statistics in Appendix Table I and in Table IV are quite similar. For the single-equation probit regressions shown in Appendix Table I, an F-test can be performed on the separate large-bank and small-bank probit regressions and the full-sample probit regression. The results of such a test indicate that the null hypothesis -- that the large-bank 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 bivariate probit model and shown in Table IV.

D. A Summing Up

Our model of the loan accept/reject decisions for the full sample of banks does a respectable job of explaining the banks' decisions to extend or deny credit in terms of our general hypotheses. However, the results for the full sample mask important differences between large banks and small banks in the criteria used to approve or reject loan applications. The two separate regressions for large banks and for small banks (which are estimated simultaneously with regressions that explain the loan applicant's decision to apply at a large or a small bank) demonstrate a number of significant and important differences. These regressions show that large banks, but not small banks, are less likely to extend credit to firms with greater leverage and to minority-owned firms (a likely proxy for the owner's wealth, income, and credit history) and are more likely to extend credit to firms with greater cash reserves. Small banks appear to look past the potential problems of leverage, cash reserves, and the owner's financial condition (as proxied by minority status). On the other hand, small banks are more sensitive to past delinquencies by the applicant firm or its owners. Further, 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. Finally, large banks and small banks have different proclivities toward approving loan applications from firms in various industry categories.

Overall, these differences in results for the large bank and small bank loan accept/reject decision regressions generally support the belief that a small bank tends to be more sensitive to its "relationship" with the borrower, to be more inclined to rely on "character" and less reliant on just "going by the numbers." However, there are inconsistencies to this pattern, such as the greater sensitivity of small

banks to the past delinquencies of the applicant firm and the irrelevance for small banks of the length of the relationship with the applicant firm.

V. Conclusions

Anecdotal evidence suggests that large banks use standard quantitative sets of criteria in their decision to approve or deny small-business loan applications, whereas small banks employ more qualitative criteria based upon their loan officers' personal interactions with and assessments of loan applicants. We provide empirical evidence that large banks and small banks differ in their approach to making small-business loans. In general, this evidence suggests that large banks employ more of a "cookie-cutter" approach to small-business lending in order to control for agency problems and to maintain consistent loan standards throughout the banks offices. Small banks, in contrast, appear to rely more heavily upon "character" and pre-existing relationships, paying less attention to formal financial variables. Small banks often face less of an agency problem and are likely to have superior knowledge about their small-business borrowers. Thus, small banks have a greater tendency than do large banks to use a more discretionary approach.

This 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 the interest rates or collateral requirements. If large banks are less likely to extend credit to small businesses than are small banks, as we find, then small firms must expect to receive more favorable terms from large banks than from small banks. To obtain a full picture of differences in the lending process, these factors need to be examined with respect to the different approaches between large and small banks in small business lending. We leave the analysis of these factors as a fruitful area of future research.

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Table I

Small Business Survey Sample Variable Definitions and Summary Characteristics

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.

Variable	Label	Mean	Std. Error	Minimum	Maximum
(1)	(2)	(3)	(4)	(5)	(6)
Firm Characteristics					
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	0.65	0.04	-1.00	5.00
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
Loan Characteristics					
Loan Approved	Loan request was approved by the bank to which it applied for credit	0.83	0.01	0	1
Loan Amount	Amount of the firm's loan request ($000)	163	14	1	6,700
Collateralized Loan	Collateral supported loan or loan request	0.66	0.01	0	1
Relationship Characteristics					
Deposit Relationship	Firm has deposit account with bank (checking or saving)	0.81	0.01	0	1
Loan Relationship	Firm has another loan from bank	0.42	0.01	0	1
Financial Service Relationship	Firm obtains financial management services from bank	0.31	0.01	0	1
Length of Relationship	Length of relationship with bank to which the firm applied for credit (Years)	7.80	0.22	0	40
Number of Sources	Number of other sources for financial services	1.42	0.04	0	10
Bank Characteristics					
Bank Assets	Assets ($Millions) of bank to which the firm applied for credit	6,519	535	11	175,720
Standard Industrial Classification					
SIC 1	Firm's primary SIC is Construction and Mining	0.16	0.01	0	1
SIC 2	Firm's primary SIC is Heavy Manufacturing	0.04	0.01	0	1
SIC 3	Firm's primary SIC is Light Manufacturing	0.05	0.01	0	1
SIC 4	Firm's primary SIC is Transportation	0.03	0.01	0	1
SIC 5a	Firm's primary SIC is Wholesale Trade	0.12	0.01	0	1
SIC 5b	Firm's primary SIC is Retail Trade	0.23	0.01	0	1
SIC 6	Firm's primary SIC is Insurance and Real Estate	0.06	0.01	0	1
SIC 7	Firm's primary SIC is Business Services	0.16	0.01	0	1
SIC 8	Firm's primary SIC is Professional Services	0.16	0.01	0	1

Table II

Descriptive Statistics for the Large-Bank and Small-Bank Sub-Samples

For each variable in column 1, columns 2 and 3 (4 and 5) present the mean and standard error based upon the large-bank (small-bank) sub-samples. 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-bank and small-bank means. a, b, and c indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Large-Bank Sub-Sample (n = 517)		Small-Bank Sub-Sample (n = 585)		Difference in Large-Bank and Small-Bank Means	
Variable	Mean	Std. Err.	Mean	Std. Err.	Difference	t-statistic
Firm Characteristics						
Firm Size (Annual Sales, $000)	1,181	78	861	58	321	3.31 **a**
Firm's 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	1.30
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 **b**
Business 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
Loan Characteristics						
Loan Approved	0.76	0.02	0.89	0.01	-0.13	-5.59 **a**
Loan Amount ($000)	244	28	104	10	140	4.67 **a**
Collateralized Loan	0.64	0.02	0.68	0.02	-0.05	-1.65 **c**
Relationship Characteristics						
Deposit Relationship	0.79	0.02	0.84	0.02	-0.05	-2.08 **b**
Loan Relationship	0.33	0.02	0.49	0.02	-0.16	-5.47 **a**
Financial Service Relationship	0.33	0.02	0.29	0.02	0.04	1.34
Length of Relationship (Years)	7.00	0.30	8.40	0.32	-1.40	-3.19 **a**
Number of Sources	1.48	0.06	1.38	0.06	0.10	1.17
Bank Characteristics						
Bank Assets ($Millions)	15,027	1,091	225	9	14,802	13.57 **a**
Standard Industrial Classification						
SIC 1 Construction and Mining	0.17	0.01	0.16	0.01	0.01	0.56
SIC 2 Heavy Manufacturing	0.04	0.01	0.03	0.01	0.01	1.10
SIC 3 Light Manufacturing	0.04	0.01	0.05	0.01	-0.01	-0.72
SIC 4 Transportation	0.03	0.01	0.03	0.01	0.01	0.48
SIC 5a Wholesale Trade	0.11	0.01	0.12	0.01	-0.02	-0.80
SIC 5b Retail Trade	0.21	0.01	0.24	0.01	-0.02	-0.96
SIC 6 Insurance and Real Estate	0.06	0.01	0.06	0.01	0.01	0.46
SIC 7 Business Services	0.14	0.01	0.18	0.01	-0.04	-1.88 **c**
SIC 8 Professional Services	0.19	0.01	0.13	0.01	0.06	2.82 **a**

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

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

(1)	(2)	(3)
	Marginal Effect	t-stat
Constant	-0.736	-4.42 **a**
Firm Characteristics		
MSA	0.265	6.66 **a**
ln (Firm Size)	0.019	1.42
ln (Firm Age)	0.010	0.26
ROA	0.008	0.64
Debt-to-Assets	-0.054	-1.51
Cash-to-Assets	0.073	1.01
Firm Delinquencies	-0.005	-0.31
Owner's Delinquencies	0.033	1.42
African-Am.	-0.158	-1.14
Loan Characteristics		
ln (Loan Amount)	0.016	1.17
Collateralized Loan	-0.024	-0.67
Relationship Characteristics		
ln (Length of Relationship)	-0.013	-0.34
Number of Sources	-0.026	-2.27 **b**
Standard Industrial Classification		
SIC 2 Heavy Manufacturing	0.118	1.30
SIC 3 Light Manufacturing	-0.095	-1.09
SIC 4 Transportation	0.044	0.45
SIC 5a Wholesale Trade	-0.061	-0.98
SIC 5b Retail Trade	0.002	0.03
SIC 6 Insurance and Real Estate	0.069	0.90
SIC 7 Business Services	0.003	0.06
SIC 8 Professional Service	0.074	1.30
Census Region		
2 Middle Atlantic	-0.041	-0.53
3 Southeast	0.330	5.47 **a**
4 East North Central	0.210	3.19 **a**
5 East South Central	0.233	3.12 **a**
6 West North Central	0.247	4.26 **a**
7 West South Central	0.242	4.50 **a**
8 Mountain	-0.144	-2.20 **b**
9 Pacific	-0.135	-2.01 **b**

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

In Panel A, the full sample of 1,102 observations is used in estimation of bank's decision to extend or deny credit, simultaneous with the firm's decision to apply for credit at a large bank 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 III. For each variable identified in column 1, the panels present the variable's estimated marginal effect and t-statistic. In panel D is the result of a t-test for significant differences in the large-bank and small-bank marginal effects. a, b, and c indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

	Panel A: All Banks		Panel B: Large Banks		Panel C: Small Banks		Panel D: Large-Small Difference	
Variable	Marginal Effect	t-stat	Marginal Effect	t-stat	Marginal Effect	t-stat	Marginal Effect	t-test
Constant	0.032	0.21	-0.468	-1.19	0.333	1.98 **b**	-0.800	-1.88 **c**
Firm Characteristics								
ln (Firm Size)	0.063	4.77 **a**	0.111	5.00 **a**	0.034	3.31 **a**	0.077	3.16 **a**
ln (Firm Age)	0.065	2.95 **a**	0.079	1.83 **c**	0.039	2.36 **b**	0.040	0.86
ROA	0.002	0.24	-0.012	-0.66	0.008	0.89	-0.020	-0.98
Debt-to-Assets	-0.023	-1.06	-0.087	-1.79 **c**	0.016	0.73	-0.103	-1.94 **c**
Cash-to-Assets	0.052	1.20	0.196	2.22 **b**	-0.042	-1.00	0.239	2.43 **b**
Firm Delinquencies	-0.021	-2.07 **b**	-0.003	-0.14	-0.024	-2.47 **b**	0.021	0.89
Owner's Delinquencies	-0.039	-3.19 **a**	-0.048	-1.56	-0.023	-2.30 **b**	-0.025	-0.78
African-Am.	-0.044	-0.53	-0.403	-1.76 **c**	0.019	0.36	-0.421	-1.80 **c**
Loan Characteristics								
ln (Loan Amount)	-0.026	-2.91 **a**	-0.022	-1.17	-0.027	-3.21 **a**	0.005	0.24
Collateralized Loan	0.038	1.61	0.049	0.92	0.025	1.26	0.024	0.42
Relationship Characteristics								
Deposit Relationship	0.012	0.45	-0.061	-0.94	0.059	2.31 **b**	-0.120	-1.73 **c**
Loan Relationship	-0.036	-1.60	0.022	0.41	-0.062	-2.67 **a**	0.083	1.43
Fin Mgt Relationship	0.030	1.28	-0.005	-0.11	0.036	1.54	-0.042	-0.76
ln (Length of Relationship)	0.002	0.11	0.004	0.13	-0.001	-0.05	0.005	0.14
Number of Sources	-0.027	-3.11 **a**	-0.038	-2.07 **b**	-0.011	-1.38	-0.027	-1.37

Bank Characteristics								
ln (Bank Assets)	-0.037	-8.23 **a**	-0.047	-2.21 **b**	-0.033	-3.06 **a**	-0.014	-0.59

Table IV (cont.)

Standard Industrial Classification								
SIC 2 Heavy Manufacturing	-0.009	-0.18	0.039	0.42	-0.038	-0.59	0.077	0.68
SIC 3 Light Manufacturing	0.091	1.79 **c**	0.103	0.90	-0.013	-0.28	0.116	0.93
SIC 4 Transportation	0.052	0.76	0.074	0.60	0.031	0.43	0.043	0.30
SIC 5a Wholesale Trade	0.002	0.06	-0.027	-0.34	-0.049	-0.95	0.022	0.24
SIC 5b Retail Trade	0.008	0.22	0.142	1.95 **c**	-0.067	-1.57	0.209	2.47 **b**
SIC 6 Insurance and Real Estate	0.109	2.14 **b**	0.222	2.09 **b**	0.007	0.15	0.215	1.84 **c**
SIC 7 Business Service	0.059	1.55	0.207	2.49 **b**	-0.035	-0.94	0.243	2.66 **a**
SIC 8 Professional Services	0.065	1.66 **c**	0.295	3.60 **a**	-0.082	-1.87 **c**	0.377	4.06 **a**

Appendix Table I

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

In Panel A, the full sample of 1,102 observations is used in estimation of 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. In panel D is the result of a t-test for significant differences in the large-bank and small-bank marginal effects. a, b, and c indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

	Panel A: All Banks		Panel B: Large Banks		Panel C: Small Banks		Panel D: Large-Small Difference	
	Marginal Effect	t-statistic	Marginal Effect	t-statistic	Marginal Effect	t-statistic	Marginal Effect	t-test
Constant	-0.023	-0.20	-0.433	-1.27	0.320	2.71 **a**	-0.753	-2.09 **b**
Firm Characteristics								
ln (Firm Size)	0.069	7.51 **a**	0.116	5.98 **a**	0.033	4.21 **a**	0.083	3.94 **a**
ln (Firm Age)	0.071	3.93 **a**	0.084	2.35 **b**	0.038	2.69 **a**	0.046	1.20
ROA	0.002	0.25	-0.012	-0.85	0.008	1.13	-0.020	-1.27
Debt-to-Assets	-0.025	-1.17	-0.094	-2.21 **b**	0.017	1.00	-0.111	-2.42 **b**
Cash-to-Assets	0.057	1.27	0.200	2.47 **b**	-0.044	-1.25	0.244	2.77 **a**
Firm Delinquencies	-0.023	-2.39 **b**	-0.003	-0.17	-0.023	-2.98 **a**	0.020	0.96
Owner's Delinquencies	-0.041	-3.37 **a**	-0.048	-1.81 **c**	-0.022	-2.44 **b**	-0.026	-0.93
African Am. Owner	-0.049	-0.67	-0.408	-1.85 **c**	0.019	0.42	-0.428	-1.89 **c**
Loan Characteristics								
ln (Loan Amount)	-0.029	-3.55 **a**	-0.024	-1.45	-0.027	-3.69 **a**	0.003	0.15
Collateralized Loan	0.042	1.86 **c**	0.053	1.24	0.025	1.49	0.028	0.60
Relationship Characteristics								
Deposit Relationship	0.012	0.44	-0.062	-1.08	0.057	2.76 **a**	-0.119	-1.95 **c**
Loan Relationship	-0.039	-1.80 **c**	0.026	0.60	-0.060	-3.39 **a**	0.087	1.82 **c**
Financial Mgt. Relationship	0.033	1.39	-0.007	-0.15	0.036	1.93 **c**	-0.043	-0.89
ln (Length of Relationship)	0.002	0.13	0.005	0.16	0.001	0.06	0.004	0.13
Number of Sources	-0.031	-4.19 **a**	-0.041	-2.68 **a**	-0.011	-2.02 **b**	-0.030	-1.82 **c**

Bank Characteristics								
ln (Bank Assets)	-0.036	-7.86 **a**	-0.052	-2.94 **a**	-0.033	-3.69 **a**	-0.018	-0.93
Standard Industrial Classification								
SIC 2 Heavy Manufacturing	-0.007	-0.14	0.046	0.49	-0.035	-0.75	0.082	0.77
			App. Table I	(cont.)				
SIC 3 Light Manufacturing	0.097	1.73 **c**	0.096	0.88	-0.012	-0.29	0.108	0.93
SIC 4 Transportation	0.056	0.91	0.085	0.77	0.028	0.52	0.057	0.47
SIC 5a Wholesale Trade	0.002	0.05	-0.031	-0.44	-0.047	-1.42	0.016	0.20
SIC 5b Retail Trade	0.008	0.24	0.149	2.37 **b**	-0.064	-2.26 **b**	0.213	3.10 **a**
SIC 6 Insurance and Real Estate	0.119	2.41 **b**	0.239	2.69 **a**	0.008	0.18	0.231	2.33 **b**
SIC 7 Business Services	0.064	1.80 **c**	0.220	3.13 **a**	-0.033	-1.16	0.253	3.34 **a**
SIC 8 Professional Services	0.071	1.99 **b**	0.309	4.55 **a**	-0.079	-2.61 **a**	0.388	5.22 **a**