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Cole, Rebel

DePaul University

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Availability of Credit to Small and Minority-Owned Businesses: Evidence from the 1993 National Survey of Small Business Finances *

Rebel A. Cole
Krahenbuhl Global Consulting
Alexandria, VA 22314
E-mail: rebel.cole@yahoo.com

Abstract: This article analyzes factors influencing the decisions of prospective lenders to extend credit to small and minority-owned businesses. Using data from a government survey of small businesses, the analysis reveals that prospective lenders (primarily commercial banks) are four times more likely to deny credit to firms owned by African-Americans than to firms owned by Non-Hispanic whites, and are twice as likely to deny credit to firms owned by Asian-Americans than to firms owned by Non-Hispanic whites. These differences in denial rates remain both statistically and economically significant, even after controlling for differences in the type and size of the prospective loan; in the age, experience, education, and creditworthiness of the firm's primary owner; in the age, size, capital structure, profitability, organizational form, creditworthiness, and industry of the firm; and in the types and length of pre-existing relationships between the firm and its prospective lender. Interestingly, these differences in denial rates are significant only when the prospective lender is a commercial bank.

Keywords: bank, credit, discrimination, race, small business, SSBF
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Availability of Credit to Small and Minority-Owned Businesses: Evidence from the 1993 National Survey of Small Business Finances

Much has been written about the access of minorities to the market for home-mortgage credit (e.g., Munnell *et al.* 1996; Hunter and Walker 1996; Berkovec, Canner, Gabriel, and Hannan 1994; Yezer, Phillips, and Trost 1994; Carr and Megbolugbe 1993; Duca and Rosenthal 1993; Horne 1993; Canner and Smith 1992; Black, Schweitzer, and Mandell 1978), but minority access to the market for small-business credit has been largely neglected by academics. There are two notable exceptions: Bates (1991), who examines , and Cavalluzzo and Cavalluzzo (1998), who examine data from the Federal Reserve Board's 1987 National Survey of Small Business Finances. In large measure, this relative silence has been attributable to the paucity of data on the availability of small-business credit. In 1993, however, the Federal Reserve Board authorized its staff to conduct a nationally representative survey of small and minority-owned businesses that would collect information about the availability of credit to such businesses. The results of that survey, known as the 1993 National Survey of Small Business Finances (NSSBF), were released to the public in 1997, and provided researchers with data that shed new light on the availability of credit to small and minority-owned firms. Since that time, several working papers that analyze the 1993 NSSBF have appeared (Cole 1997; Bostic and Lampani 1998; Cavalluzzo, Cavaluzzo, and Wolken, 1999; and Blanchflower, Levine, and Zimmerman, 1999). The consensus among these papers is that firms owned by African-Americans are denied credit at far greater rates than white-owned firms, and that this disparity cannot be explained by the data available from the survey.¹

1. The 1993 NSSBF does not provide information on the financial condition of the surveyed firms' owners—information that creditors rely upon in evaluating loan applications from small businesses. Hence, all of these studies are plagued by omitted-variable bias.

This study also uses data from the 1993 NSSBF to analyze whether race, ethnicity, or gender play a role in the small-business credit allocation decision of lenders. The analysis reveals that prospective lenders are significantly more likely to deny credit to firms owned by Asian-Americans or African-Americans than to firms owned by whites or Hispanic-Americans. Firms owned by African-Americans are rejected four times as often as white-owned firms, while Asian-American firms are rejected twice as often. However, unequal outcomes do not, in themselves, establish that prospective lenders treat minorities and non-minorities differently. Unequal outcomes may be attributable to differences in other loan, firm, or firm-owner characteristics that are correlated with race.

Consequently, this study also employs a large number of potential control variables to provide more direct evidence about whether lenders are more likely to deny credit to minority-owned small businesses. These variables include: the type of loan--working capital, motor vehicle, equipment, land/buildings, or inventory; the age, experience, education, and creditworthiness of the firm's primary owner; the size, capital structure, industry, organizational form (corporation, partnership, or proprietorship), and creditworthiness of the firm. Accounting for these control variables does, indeed, substantially reduce the disparity in loan denial rates between minority-owned and non-minority-owned firms. Yet the differences in rejection rates between firms owned by whites and firms owned by Asian-Americans and African-Americans remain both statistically and economically significant, even in the presence of these factors.

While compelling, these results cannot be interpreted as incontrovertible evidence of discrimination because the NSSBF data do not allow one to control for the wealth and income of the firm's owner(s)—variables that conventional wisdom suggests are important to the credit

allocation decision.² However, omitted variable bias may not be as big a problem as it first appears. First, it is well known that personal wealth and income are highly correlated with a person's education, age, and experience. These latter three variables *are* included in the analysis, and serve as proxies for personal income and wealth. Second, omitted variable bias should affect Hispanic-owned and Female-owned firms just as it should affect Asian-owned and Black-owned firms. Yet the analysis finds no significant differences in the denial rates of Hispanic-owned and Female-owned firms relative to the denial rate of Non-Hispanic white-owned firms. Third, the denial rates of Black-owned and Asian-owned firms are greater than the denial rate of Non-Hispanic white-owned firms when the prospective lender is a commercial bank, but not when the prospective lender is a non-bank. If omitted variable bias is driving the results, then minority-denial rates should be higher at both banks and non-banks.

The structure of the remainder of this article is as follows. Section I describes the source of the data (the Federal Reserve Board's 1993 National Survey of Small Business Finances) and the variables from that source that are used to explain loan approval rates. Section II describes the logistic regression methodology that is used to model loan approval rates. Section III presents the results first from univariate analysis and then from multivariate analysis of the data. And section IV presents a summary and conclusions.

2. Munnell *et al.* (1996) relied upon a very detailed survey by the Federal Reserve Bank of Boston, which collected the actual data and variables loan officers said they used in deciding whether or not to extend home mortgage credit. This study relies upon the data collected from borrowers rather than from the loan officers that allocate credit, and these data are not as comprehensive as the data used by loan officers. Moreover, the underwriting standards for home mortgages are fairly uniform, but are much more heterogeneous across small business loans.

I. Data

A. *The 1993 National Survey of Small Business Finances*

This study uses data 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. The firms surveyed constitute a nationally representative sample of 4,637 small businesses operating in the United States as of year-end 1992, where a small business is defined as a non-financial, non-farm business 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. For a detailed description of the 1993 NSSBF, see Cole and Wolken (1995).

The NSSBF provides detailed information about each firm's most recent borrowing experience during 1991-94,³ including whether or not the firm applied for credit, the type of credit, the identity and characteristics of the potential lender to which the firm applied, what other financial services (if any) the firm obtained from that potential lender, and whether the potential lender extended or denied credit to the firm. Survey data also provide information on each firm's balance sheet; income statement; credit history; firm characteristics, including Standard Industrial Classification (SIC) category, organizational form (i.e., proprietorship, partnership, S-corporation, or C-corporation), and age; and demographic characteristics of each firm's primary owner, including race, ethnicity, age, education, experience, and credit history.

3. The majority of these loan applications were made during 1994, and more than 90 percent of these applications were made in 1993 or 1994. The results of the analysis in this study are not qualitatively affected by the exclusion of loan applications made prior to 1993.

B. *Factors affecting the credit allocation decision*

In the literature on home mortgage lending, it is standard practice to model the lender as a profit-maximizing firm that borrows funds at a rate set by a perfectly competitive wholesale funds market and lends these funds at a rate set by a perfectly competitive retail funds market, i.e., the firm cannot affect either the rate at which it borrows in the wholesale market or the rate at which it lends in the retail market. To maximize its expected profits, the lender's primary decision variable is the amount of risk it is willing to incur when making a loan in the retail funds market. For home mortgage loans, there are two primary sources of risk—default risk and prepayment risk. But for small-business loans, which typically have much shorter durations than fixed-rate mortgage, the primary source of risk is limited to default risk. Hence, the lender's observable realization for its profit-maximizing level of risk is the default risk of the prospective borrowers to which the lender extends credit. In other words, the probability that the lender will extend credit to a prospective borrower is a function of the lender's assessment of the prospective borrower's default risk:

$$\Pr(\text{Extend Credit}) = f(\text{Prospective Borrower's Default Risk})$$

To make this model operational, one only needs to observe the lender's decision whether or not to extend credit to a prospective borrower and to observe the factors used by the lender to assess the prospective borrower's default risk.⁴

4. In practice, the lender's profit-maximizing level of risk also depends upon recovery rates in the event of default (Shaffer 1996). For the purposes of this study, it is assumed that the same factors that influence default also influence recovery rates.

The literature on residential mortgage lending provides a rich set of potential factors that the lender might use to assess a prospective borrower's default risk. A large number of these factors are represented in the NSSBF data base, including the credit history of the prospective borrower (hereafter, the "firm"); the age, size, capital structure, profitability, organizational form, and industry of the firm; the age, education, and experience, and credit history of the firm's primary owner; the size and proposed use of the prospective loan; and the firm's pre-existing relationships with its prospective lender. Conversations with bankers who make small business loans confirm that these variables are important to the credit allocation decision.⁵

The creditworthiness of the firm is proxied by the number of business delinquencies during the past three years, and creditworthiness of the primary owner is proxied by the number of personal delinquencies during the past three years. This is the first article to use such delinquency data to measure firm riskiness in the small-business credit allocation decision, even though these data are commonly used by lenders in assessing creditworthiness.⁶

The age of the firm is measured as (the natural logarithm of) the number of years the firm has been in business under current ownership. Size is proxied by (the natural logarithms of) annual sales. Capital structure is proxied by the ratio of total equity to total assets. Profitability is proxied by return on assets. Organizational form is proxied by a set of dummy variables

5. In preparations for the NSSBF, the author participated in interviews with loan officers of nine different banks that make small business loans. Information garnered from these interviews influenced the decision to include or exclude potential survey questions.

6. More specifically, survey respondents were asked the following two questions:

(1) Within the past three years, on how many different *personal* obligations has the *principal owner* been 60 or more days delinquent?

(2) Within the past three years, on how many different *business* obligations has the *firm* been 60 or more days delinquent?

indicating whether the firm is organized as a proprietorship, partnership, S-corporation, or (regular) C-corporation. Industrial classification is proxied by a set of dummy variables indicating the firm's one-digit SIC code. The age and experience of the primary owner are measured in years, and the education of the primary owner is measured by a set of dummy variables indicating whether the primary owner completed high school, attended college, completed college, or attended graduate school.

The proposed use of the loan proceeds is proxied by a set of dummy variables indicating whether the purpose was for working capital, to purchase a motor vehicle, to purchase equipment, or for some other purpose. The size of the prospective loan is measured by the dollar amount for which the firm applied divided by the dollar value of the firm's total assets.

The firm's pre-existing relationships with its prospective lender are measured by the length of the firm's pre-existing relationship and a set of dummy variables indicating whether the firm had a pre-existing relationship with the prospective lender and whether the firm previously obtained from the prospective lender a checking account, savings account, a loan, a line of credit, a lease, or any one or more of a series of financial management services.⁷ Table 1 summarizes these potential explanatory variables.

Because sample firms applied for credit at differing points in time across four years, it is important to make some allowances for differences in the business cycle. Table 2 shows the distribution of the 2,007 loan applications and acceptances/denials across time. Half of the

7. Cole (1998) finds that several of these relationship variables are important in determining whether or not a small business is denied credit. Following Cole and Wolken (1995), financial management services are defined as encompassing "transaction services, cash management services, credit related services, brokerage services, and trust and pension services." See Cole and Wolken (1995) p.633 footnote 8 for more detailed definitions of these categories.

applications were made during 1994, and more than another third during 1993. Even so, clearly apparent in this table is the trend toward easier credit in the later years. Denial rates rise from 20.6% in 1991 to a high of 28.3% in 1992 before declining to 17.2% in 1993 and 11.2% in 1994. To control for these differences in credit availability across time, a set of dummy variables indicating the year in which the firm applied for its most recent loan is included in the model.

II. Methodology

In examining the factors influencing the probability of loan denial, a single-equation binary logit model is an obvious choice, and has two desirable properties. First, it yields unbiased and consistent parameter estimates; second, it provides acceptable inferences about the firms that apply for a loan. The probability-of-denial equation is:

$$D_j^* = \beta' x_j + \mu_j$$

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 individual firm characteristics developed in the previous sections; β 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 σ_μ^2 ; and $j = 1, 2, \dots, M$; where M is the total number of firms applying for credit. Let D_j be an observable variable that is equal to one if $D_j^* > 0$ and zero if $D_j^* \leq 0$.

In this particular application, D_j is equal to one if a firm is denied credit and zero otherwise. Since D_j^* is equal to $\beta' x_j + \mu_j$, the probability that $D_j^* > 0$ is equal to the probability

that $\beta - x_j > 0$, or, equivalently, the probability that $(\mu_j > -\beta - x_j)$. Therefore, one can write the probability that D_j is equal to one as the probability that $(\mu_j > -\beta - x_j)$, or, equivalently, that $\text{Prob}(D_j = 1) = 1 - \Phi(-\beta - x_j)$, where Φ is the cumulative distribution function of ε , here assumed to be logistic. The probability that D_j is equal to zero is then simply $\Phi(-\beta - x_j)$. The likelihood function L for this model is:

$$L = \prod_{D_j = 0} [\Phi(-\beta - x_j)] \prod_{D_j = 1} [1 - \Phi(-\beta - x_j)]$$

III. Results

A. Univariate Results

Column 2 of Table 3 indicates how many sample firms applied for credit, while columns 3 and 4 show how many firms were denied and extended credit, respectively. Of the 2,007 firms that applied for credit during 1991-94, 1,695 or 84.4% were extended credit while 315 or 15.6% were denied credit. For minority firms, 33.5% were denied credit, whereas, for non-minority firms, only 11.8% were denied credit. Of the minority firms, 16.3% of the Hispanic firms, 26.8% of the Asian firms, and 47.0% of the Black firms were denied credit. By sex, 21.4% of the Female-owned firms but only 14.5% of the Male-owned firms were denied credit. Thus, the outcomes of the firms' most recent credit application were more negative for each of the four minority groups examined, especially for the group of Black-owned firms. However, unequal outcomes do not constitute evidence of disparate treatment. If minority status is correlated with

economic variables important to the credit allocation decision, then one would expect to find unequal outcomes by minority status.

Table 4 presents univariate statistics for demographic characteristics of the sample when categorized by whether the firm was extended or denied credit. Column 2 present the means for all of the firms applying for credit, while columns 3 and present the means for firms that were denied credit and that were extended credit, respectively. Column 5 present the results of a *t*-test for differences in the means in columns 2 and 3. These statistics show that firms denied credit were significantly more likely to be owned by Asians, Blacks, and Females, but less likely to be owned by Non-Hispanic Whites or Males. Firms denied credit were not more likely to be owned by Hispanics.

B. *Multivariate Results*

In this section, tests are conducted to determine whether the differences in credit availability revealed by univariate analysis hold up after controlling for differences in firm, firm owner, and loan characteristics. If Asian firms, Black firms, and Female firms differ systematically from other firms along one or more of these characteristics, then the observed univariate differences in credit availability may disappear after controlling for these firm, owner, and loan characteristics. If differences remain, then the evidence would be consistent with disparate treatment of minorities by lenders.

Table 5 presents descriptive statistics for the control variables. Statistics are presented for all 2,007 firms (column 2) and for groups of firms as defined by race, ethnicity, and sex.

Columns 3, 4, 5, 6, and 7 show statistics for Non-Minority, Asian, Black, Hispanic, and Female-owned firms, respectively.

These statistics show that Non-Minority firms were older and larger (as measured by both assets and sales); and had primary owners that were older, more experienced, and reported fewer delinquencies on personal obligations.⁸ Hispanic firms were the most profitable, or more accurately, the least unprofitable, as each of the four sub-groups of firms had negative return on assets. Asian firms reported the fewest while Black firms reported the most business delinquencies. In fact, Black firms reported twice the number of business delinquencies and non-minority firms. Non-minority firms were much less likely to be organized as proprietorships than minority firms. Minority firms were much more likely to be classified as business-services (SIC 7000-7999) firms than non-minority firms. Overall, the statistics in Table 6 suggest that at least some of the univariate differences in credit availability to non-minority and minority firms observed in Tables 3 through 5 can be attributed to differences in owner and firm characteristics, particularly with respect to the age, experience, and creditworthiness of the firm's primary owner and to the size and creditworthiness of the firm itself.

Table 6 presents the results from estimating the probability that a small business would be extended credit as a function of four race, ethnicity, and sex indicator variables—*Asian*, *Black*, *Hispanic*, and *Female* (column 2); and as a function of these race, ethnicity, and sex variables plus seven variables pertaining to the characteristics of the firm's primary owner—*Owner's age*, *Owner's experience*, *Completed high school*, *Attended college*, *Completed college*,

8. The creditworthiness of a firm's primary owner is one of the key variables used in credit-scoring models for small-business loans, such as the model marketed by Fair-Isaac.

Attended graduate school, and *Owner's personal delinquencies*—(column 3). The results in column 2 are presented as a benchmark for evaluating results obtained for specifications that also include control variables. In column 2, the coefficients of the indicator variables for Asian-, Black-, and Female-owned firms are negative and statistically significant, with associated *t*-statistics of -3.79, -10.88, and -2.53, respectively.

The results in column 3 demonstrate that the size and statistical significance of the indicator variables for Asian-, Black-, and Female-owned firms are attenuated the inclusion of control variables for owner characteristics. Four of the seven control variables—*Completed high school*, *Completed College*, *Attended graduate school*, and *Owner's Personal Delinquencies*, are statistically significant at least at the 0.05 level; and a fifth, *Owner's experience*, is significant at the 0.10 level. As hypothesized, lenders are more likely to extend credit to firms whose owners have more experience and education, and less likely to extend credit to firms whose owners have more delinquencies on personal obligations. After controlling for the characteristics of the firm's primary owner, the indicator variables for Asian- and Black-owned firms, but not for Female-owned firms, remain statistically significant at the 0.05 level.

Tables 7-9 are similar to Table 6, in that each shows how different sets of control variables attenuates the significance of the race, ethnicity, and sex indicator variables. Table 7 introduces six variables to control for differences in loan characteristics—five dummy variables indicating the intended use of the loan (*Working Capital*, *Motor Vehicle*, *Equipment*, *Land and Buildings*, and *Inventory*) and one variable indicating the amount for which the firm applied as a portion of the firm's asset size. The five intended-use dummies identify loans that typically would be collateralized by assets purchased with loan proceeds. Such collateral should enhance

the prospects that a prospective lender would extend credit. Indeed, all five dummies have positive coefficients, and four (*Working Capital*, *Motor Vehicle*, *Equipment*, and *Land and Buildings*) are statistically significant at the 0.01 level—strong evidence that lenders are more likely to extend credit to purchase hard assets. Also significant at the 0.01 level and with the hypothesized negative coefficient is the amount for which the firm applied as a portion of firm asset size. The larger was the size of the loan relative to the size of the firm, the less likely was the potential lender to extend credit. After controlling for loan characteristics, the indicator variables for Asian-, Black-, and Female-owned firms remain negative and statistically significant at the 0.05 level.

Table 8 introduces nine variables to control for differences in firm characteristics—*ln(Firm Age)*, *Equity to assets*, *Income to assets*, *ln(Total sales)*, *Business delinquencies*, *Urban location*, and three dummy variables indicating organizational form—*C-Corporation*, *S-Corporation*, and *Partnership* (proprietorship is the omitted category.) While none of the organizational-form variables are significant, four of the remaining six firm-characteristics variables are significant at the 0.01 level. Prospective lenders are more likely to extend credit to older firms. Typically, this is attributable to reputational effects (Diamond 1991). Potential creditors also are more likely to extend credit to larger firms (as measured by the natural logarithms of annual sales) and to firm with fewer business delinquencies. Lenders are less likely to lend to urban firms. This may reflect the greater competitiveness of banking markets in urban areas. Petersen and Rajan (1995) theorize that lenders are more likely to grant credit to small businesses located in less concentrated banking markets because profitable customers are less likely to take their business to other lenders. After controlling for the firm’s characteristics,

the indicator variables for Asian- and Black-owned firms, but not for Female-owned firms, remain significant at the 0.05 level.

Table 9 introduces seven variables to control for differences in the pre-existing relationships between the firm and its prospective lender—five dummy variables indicating financial services obtained from the lender prior to the loan application (*Checking, Savings, Loan, Line of credit, and Financial management service*), one dummy variable indicating any sort of pre-existing relationship, and a continuous variable indicating the *Length of relationship*.

Petersen and Rajan (1994) and Berger and Udell (1995) establish that pre-existing relationships between a firm and its lender affect the terms upon which lenders grant credit, so it is likely that these relationships also affect the likelihood that the lender will grant credit. Indeed, Cole (1998) provides strong evidence that pre-existing relationships increase the probability that a prospective lender will extend credit to a firm.

As shown in column 3 of Table 10, four of the seven relationship variables are significant at the 0.01 level, and three have the hypothesized sign. Prospective lenders are more likely to extend credit to firms that already obtain saving accounts or financial management services from the lender. Such services enable the prospective lender to generate valuable private information about the firm's financial prospects, information that is important to the credit allocation decision. The coefficient for checking accounts is counter-intuitively negative and significant at the 0.05 level. One potential explanation is that firms obtaining checking services but no other services of the lender are viewed negatively by the lender.⁹ The length of the firm's pre-existing

9. Indeed, one loan officer from a large money-center bank stated that small-business loans, by themselves, are not a profitable product for the bank to offer. According to this source, only when the bank obtains all of a small firm's business, including deposit accounts, is the small business relationship profitable.

relationship with its prospective lender is positive and significant at the 0.10 level, while the indicator variable for firms with no pre-existing relationships is negative and significant at the 0.01 level. Longer relationships provide more time over which the prospective lender can observe the firm and generate private information. After controlling for pre-existing firm-creditor relationships, the indicator variables for Asian-, Black-, and Female-owned firms remain negative and significant at least at the 0.05 level.

In Table 10, the effects of race and ethnicity on the likelihood of receiving credit are analyzed in the presence of each of the control variables introduced in Tables 7-10. In addition, three dummy variables indicating the year in which the firm applied are included to control for differences in the business cycle that were evident in Table 2.¹⁰ The most striking result in Table 11 is the finding that the influences of race are qualitatively unchanged by the inclusion of the relationship variables—the indicator variables for Asian- and Black-owned firms remain both significantly and economically significant even in the presence of the multitude of control variables. Neither ethnicity or sex, however, are significant in explaining loan denials.

Farber (1987) develops an econometric technique for using binary-choice models that can be used to decompose the differences in denial rates of minority and non-minority firms into ‘explained’ and ‘unexplained’ changes. The ‘explained’ component represents the difference in denial rates that can be attributed to observed differences in the characteristics of the two groups of firms; the ‘unexplained’ component represents the difference in denial rates resulting from minority status:

10. Also estimated were specifications that included a series of dummy variables indicating the nine Census regions and two-digit Standard Industrial Classification categories, in addition to the variables represented in columns 3 and 4 of Table 6. The results from estimating those specification are not qualitatively different from those here, in that each of the variables

$$\text{Denial Rate}_{\text{white}} - \text{Denial Rate}_{\text{black}} = \text{Explained} + \text{Unexplained}.$$

The explained component is calculated by estimating the denial model (omitting the minority indicator variables) for non-minority firms and using the coefficients β_{white} from this model to predict the denial rates of both minority $\Phi(X_{\text{nonwhite}} \beta_{\text{white}})$ and non-minority firms $\Phi(\beta_{\text{white}} X_{\text{white}})$, where Φ is the logistic cumulative density function:

$$\text{Explained} = \Phi(X_{\text{nonwhite}} \beta_{\text{white}}) - \Phi(X_{\text{white}} \beta_{\text{white}}).$$

The unexplained component is calculated by estimating the denial model (omitting the minority indicator variables) for both minority and non-minority firms, and using the coefficients of these models to predict the denial rates for minority firms:

$$\text{Unexplained} = \Phi(X_{\text{white}} \beta_{\text{white}}) - \Phi(\beta_{\text{nonwhite}} X_{\text{nonwhite}}).$$

Using this approach, the difference in the denial rates of Non-Hispanic white-owned firms and Black-owned firms is 45.4% - 6.9% = 38.5 percentage points; the explained component is

significant in column 3 and 4 also are significant in the expanded model.

27.5% - 6.9% = 20.6 percentage points, and the unexplained component is 45.4% - 27.5% = 17.9 percentage points. In other words, just over half of the difference in denial rates of Black- and White-owned firms is attributable to differences in observable characteristics and slightly under half is unexplained. (Unfortunately, the small sample size of the Asian-owned firms, 82 observations, precludes a similar analysis of the difference in the denial rates Asian- and White-owned firms.)

Overall, these findings are consistent with the results of Munnell *et al.* 1996 and Duca and Rosenthal 1993, who also find that controlling for creditworthiness variables that are correlated with race account for much, but not all, of the observed disparities in loan approval rates across racial lines.

C. Loan Denial Rates at Banks and Non-banks

Because commercial banks are the primary source of small-business loans (see Cole and Wolken, 1996) and because the Community Reinvestment Act requires bank regulators to assess whether banks are meeting the credit needs of their communities, including minority-owned small businesses, it is of interest to examine loan denial rates broken down by whether the prospective lender is a commercial bank or a nonbank. Nonbanks include finance and insurance companies as well as thrift institutions. Table 11 shows such a breakdown. As shown in column 3, the loan denial rates for each of the four minority groups are higher at commercial banks than at nonbanks. For Black-owned firms, the difference is especially large. Banks rejected 52.3% whereas nonbanks rejected only 30.9% of the applications by Black-owned firms.

Table 12 presents the results of a multivariate analysis of the loan denial decision and is similar to Table 10, differing only by the fact that the four indicator variables for minority status are split into eight bank and nonbank indicator variables, four bank and four non-bank. This test enables us to ascertain whether the differences in denial rates observed in Table 11 hold up after controlling for differences in observable characteristics. Indeed, they do. Of the eight bank-nonbank indicators of minority status only the bank indicators for Asian- and Black-owned firms are statistically significant at the 0.05 level. These findings suggest that Asian- and Black-owned firms are receiving disparate treatment from commercial banks but not non-banks. Moreover, the difference in the denial rates of minorities at banks and nonbanks argues strongly that omitted variable bias is not responsible for this finding. Otherwise, one would expect to find that nonbanks, as well as banks, disproportionately reject minority borrowers.

D. A Test for Sample-Selection Bias and Other Robustness Checks

While the single-equation probit methodology employed thus far enables one to make unbiased inferences about the population of firms that applied for credit, it does not allow us to make unbiased inferences about the set of firms that chose, for whatever reason, not to apply for credit. Hence, I re-estimated each of the models presented in Tables 6-12 using a bivariate probit model that enables me to test for sample-selection bias. In this model, an application equation is estimated jointly with the denial equation. The application equation included the xxx variables that appear in the denial equation plus the log of the firm's longest relationship with any financial institution and three variables indicating alternative sources of financing that might affect the firm's demand for credit: whether the firm used trade credit for financing, whether the firm used credit

cards for business financing, and whether the firm had obtained additional equity during the previous three years.

IV. Summary and Conclusions

This article analyzes factors influencing the decisions of prospective lenders to extend credit to small and minority-owned businesses. Using data from a government survey of small businesses, the analysis reveals that prospective lenders are four times more likely to deny credit to firms owned by African-Americans than to firms owned by non-Hispanic whites and are twice as likely to deny credit to Asian-American firms than to firms owned by non-Hispanic whites. Differences in rejection rates between firms owned by whites and firms owned by Asian-Americans or African-Americans are both statistically and economically significant after controlling for differences in the type and size of the prospective loan; in the age, experience, education, and creditworthiness of the firm's primary owner; in the age, size, leverage, profitability, organizational form, creditworthiness, and industry of the firm; and in the types and length of pre-existing relationships between the firm and prospective lender.

While compelling, these results cannot be interpreted as incontrovertible evidence of discrimination because the NSSBF data do not allow one to control for unobservable variables such as the wealth and income of the firm's owner(s)—variables that conventional wisdom suggests are important to the credit allocation decision. However, the importance of omitted variable bias to these results is mitigated by at least three factors. First, it is well known that personal wealth and income are highly correlated with a person's education, age, and experience, and these latter three variables *are* included in the analysis, serving as proxies for personal income and wealth. Second, omitted variable bias should affect Hispanic-owned and Female-

owned firms just as it should affect Asian-owned and Black-owned firms, yet the analysis finds no significant differences in the denial rates of Hispanic-owned and Female-owned firms relative to the denial rate of Non-Hispanic white-owned firms. Third, the denial rates of Black-owned and Asian-owned firms are greater than the denial rate of Non-Hispanic white-owned firms when the prospective lender is a commercial bank, but not when the prospective lender is a non-bank. If omitted variable bias is driving the results, then minority-denial rates should be higher at both banks and non-banks.

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Table 1: Variable Definitions and Their Expected Relationship with the Probability that the Firm will be Extended Credit.

Variable	Definition	Expected Sign
Business Delinquencies	Number of different business obligations on which the firm has been 60 or more days delinquent within last three years.	Negative
Personal Delinquencies	Number of different personal obligations on which the firm's primary owner has been 60 or more days delinquent within last three years.	Negative
Firm Age	Natural logarithm of the number of years the firm has been in business under current ownership.	Positive
Firm Industry	Dummy variables indicating the firm's two-digit Standard Industrial Classification (SIC) category	Mixed
Firm Capital Structure	Ratio of total shareholder equity to total assets	Positive
Firm Organizational Form	Dummy variables indicating proprietorship, partnership, S-corporation, or C-Corporation	Mixed
Firm Profitability	Ratio of net income to total assets	Positive
Firm Size	Natural logarithm of total sales	Positive
Owner Age	Years	Positive
Owner Education	Dummy variables indicating whether the owner completed high school, attended college, completed college, or attended graduate school.	Positive
Owner Experience	Years of experience in managing or owning a business	Positive
Loan Size	Ratio of amount of loan for which the firm applied to total assets	Negative
Loan Type	Dummy variables indicating the intended primary use of loan proceeds. Working capital, motor vehicle, equipment, real estate, inventory, or other use.	Mixed
Firm's Pre-Existing Relationships with Lender	Dummy variables indicating the firm obtained checking accounts, savings accounts, lines of credit, loans, or financial management services prior to applying for the loan.	Positive
Length of Pre-Existing Relationships with Lender	Number of years the firm has conducted business with the prospective lender.	Positive

Table 2
Credit denials and approvals
for a sample of 2,007 firms applying for credit during 1991-94

	Number of firms applying for credit (column percentage)	Number of firms denied credit (row percentage)	Number of firms extended credit (row percentage)
All firms applying for credit	2,007 (100%)	312 (15.6%)	1,695 (84.4%)
Firms applying during 1991	68 (3.4%)	14 (20.6%)	54 (79.4%)
Firms applying during 1992	223 (11.1%)	63 (28.3%)	160 (71.7%)
Firms applying during 1993	716 (35.7%)	123 (17.2%)	593 (82.8%)
Firms applying during 1994	1,000 (49.8%)	112 (11.2%)	888 (88.8%)

Table 3
 Credit denials and approvals
 for a sample of 2,007 small businesses applying for credit during 1991-94

	Number of firms applying for credit (column percentage)	Number of firms denied credit (row percentage)	Number of firms extended credit (row percentage)
All firms applying for credit	2,007 (100%)	312 (15.6%)	1,695 (84.4%)
Non-minority	1,661 (82.8%)	196 (11.8%)	1,465 (88.2%)
Minority	346 (17.2%)	116 (33.5%)	230 (66.5%)
Asian	82 (4.1%)	22 (26.8%)	60 (73.2%)
Black	168 (8.4%)	79 (47.0%)	89 (53.0%)
Hispanic	98 (4.9%)	16 (16.3%)	82 (83.7%)
Male	1,713 (85.4%)	249 (14.5%)	1,464 (85.5%)
Female	312 (15.6%)	63 (21.4%)	231 (78.6%)

Note: Two firms applying for credit identified themselves as both Black and Hispanic.

Table 4

Univariate statistics for demographic characteristics of 2,007 small businesses that applied for credit. For each variable identified in column 1, the mean appears in the first row and the standard error appears in parentheses in the second row. Results for all firms that applied for a loan appear in column 2. Results for firms denied credit and extended credit appear in columns 3 and 4, respectively. Column 5 presents the results of *t*-tests for differences in the proportions of the firms denied credit and extended credit.

(1) Variable	(2) Firm applied for credit.	(3) Firm denied credit	(4) Firm extended credit	(5) <i>t</i> -test
Number of firms	2,007	312	1,695	
<i>Demographic characteristic</i>				
White	82.76 (0.84)	63.17 (2.72)	86.39 (0.83)	-8.16 **
Asian	4.092 (0.44)	7.05 (1.45)	3.54 (0.45)	2.31 *
Black	8.37 (0.62)	25.32 (2.47)	5.25 (0.54)	7.95 **
Hispanic	4.88 (0.48)	5.13 (1.25)	4.84 (0.52)	0.21
Male	85.35 (0.79)	79.81 (2.28)	86.37 (0.83)	-2.71 **
Female	14.65 (0.79)	20.19 (2.27)	13.63 (0.83)	2.71 **

* Indicates statistical significance at the 0.05 level.

** Indicates statistical significance at the 0.01 level.

Table 5

Univariate statistics for characteristics of a sample of 2,007 small businesses applying for credit during 1991-94. For each variable identified in column 1, the mean appears in the first row and the standard error appears in parentheses in the second row. Results for all firms appear in column 2, while results for Non-minority, Asian, Black, Hispanic and Female firms appear in columns 3, 4, 5, 6, and 7, respectively.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	All firms	Non-minority firms	Asian firms	Black firms	Hispanic firms	Female firms
Number of firms	2,007	1,661	82	168	98	294
<i>Owner Characteristics</i>						
Owner's age	49.63 (0.24)	50.07 (0.26)	46.96 (0.89)	47.67 (0.79)	47.93 (1.03)	47.69 (0.63)
Owner's experience	20.02 (0.24)	20.92 (0.26)	15.32 (0.80)	15.36 (0.78)	16.96 (0.97)	16.27 (0.64)
Owner's education	15.20 (0.05)	15.21 (0.05)	15.83 (0.23)	15.17 (0.16)	14.67 (0.23)	14.95 (0.12)
Personal delinquencies	0.32 (0.02)	0.23 (0.02)	0.45 (0.11)	1.00 (0.10)	0.43 (0.10)	0.42 (0.06)
<i>Firm Characteristics</i>						
Business delinquencies	0.64 (0.03)	0.59 (0.03)	0.54 (0.12)	1.19 (0.10)	0.63 (0.12)	0.71 (0.07)
Firm age	15.50 (0.31)	16.26 (0.35)	10.22 (0.79)	11.47 (0.72)	14.21 (1.31)	12.87 (0.74)
ln(Total assets)	12.89 (0.05)	13.14 (0.05)	12.57 (0.20)	11.25 (0.14)	11.87 (0.19)	11.87 (0.13)
Equity to assets	0.34 (0.01)	0.35 (0.02)	0.34 (0.05)	0.27 (0.06)	0.27 (0.08)	0.26 (0.04)
Income to assets	0.37 (0.02)	0.35 (0.02)	0.35 (0.10)	0.40 (0.09)	0.70 (0.10)	0.46 (0.06)
ln(Total sales)	13.95 (0.05)	14.20 (0.05)	13.35 (0.18)	12.45 (0.14)	12.90 (0.19)	13.03 (0.12)
<i>Organizational form</i>						
C-corporation	0.44 (0.01)	0.45 (0.01)	0.41 (0.05)	0.39 (0.04)	0.41 (0.05)	0.35 (0.03)
S-corporation	0.29 (0.01)	0.30 (0.01)	0.23 (0.05)	0.21 (0.03)	0.16 (0.04)	0.30 (0.03)
Partnership	0.07 (0.01)	0.07 (0.01)	0.07 (0.03)	0.07 (0.02)	0.08 (0.03)	0.07 (0.01)
Proprietorship	0.19 (0.01)	0.18 (0.01)	0.29 (0.05)	0.33 (0.04)	0.35 (0.05)	0.28 (0.01)

Continued

Table 5 (Continued)

Univariate statistics for characteristics of a sample of 2,007 small businesses applying for credit during 1991-94. For each variable identified in column 1, the mean appears in the first row and the standard error appears in parentheses in the second row. Results for all firms appear in column, while results for Non-minority, Asian, Black, and Hispanic firms appear in columns 3, 4, 5, and 6, respectively.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	All firms	Non-minority firms	Asian firms	Black firms	Hispanic firms	Female firms
Number of firms	2,007	1,661	82	168	98	294
<i>Standard Industrial Classification</i>						
Construction and mining (10-19)	12.32 (0.70)	12.30 (0.77)	5.49 (2.40)	13.68 (2.50)	16.36 (3.54)	8.16 (1.60)
Primary manufacturing (20-29)	7.18 (0.55)	7.82 (0.63)	7.69 (2.81)	4.21 (1.46)	0.90 (0.01)	5.10 (1.29)
Other manufacturing (30-39)	9.21 (0.61)	10.33 (0.71)	6.59 (2.62)	3.68 (1.37)	2.73 (1.56)	5.78 (1.36)
Transportation (40-49)	4.96 (0.46)	4.98 (0.51)	2.20 (1.55)	6.32 (1.77)	4.55 (2.00)	5.10 (1.29)
Wholesale trade (50-51)	10.65 (0.66)	10.33 (0.71)	14.29 (3.69)	12.11 (2.37)	10.00 (2.87)	8.16 (1.60)
Retail trade (52-59)	19.99 (0.85)	20.78 (0.95)	25.27 (4.58)	8.95 (2.08)	22.73 (4.01)	24.49 (2.51)
Insurance and real estate (60-69)	5.82 (0.50)	6.34 (0.57)	2.20 (1.54)	2.63 (1.16)	5.45 (2.18)	5.44 (1.33)
Business services (70-79)	15.97 (0.78)	13.18 (0.79)	23.08 (4.44)	34.21 (3.45)	24.55 (4.12)	22.79 (2.45)
Professional services (80-89)	13.90 (0.74)	13.94 (0.81)	13.19 (3.57)	14.21 (2.54)	12.73 (3.19)	14.97 (2.08)

Table 6

Multivariate logistic regression results for variables used to explain the importance of race, ethnicity, gender, and characteristics of the firm's primary owner in the extension of credit to a sample of 2,007 small businesses that applied for credit during 1991-94. For each variable identified in column 1, the coefficient appears in the first row and its associated *t*-statistic appears in parentheses in the second row.

(1)	(2)	(3)
Variable		
Intercept	2.08 ** (25.43)	2.27 ** (4.07)
<i>Race and ethnicity</i>		
Asian	-0.99 ** (-3.79)	-0.88 ** (-3.21)
Black	-1.87 ** (-10.88)	-1.48 ** (-7.95)
Hispanic	-0.31 (1.08)	-0.09 (-0.32)
Female	-0.42* (-2.53)	-0.28 (-1.61)
<i>Firm owner's characteristics</i>		
Owner age		0.01 (1.01)
Owner's experience		0.02 (1.68)
Completed high school		-0.80* (-2.36)
Attended college		0.63 (1.67)
Completed college		1.04 ** (3.24)
Attended graduate school		0.98 ** (2.95)
Owner's personal delinquencies		-0.47** (-7.82)
Pseudo R-square	0.071	0.123

* Indicates statistical significance at the 0.05 level.

** Indicates statistical significance at the 0.01 level.

Table 7

Multivariate logistic regression results for variables used to explain the importance of race, ethnicity, and characteristics of the loan for which the firm applied in the extension of credit to a sample of 2,007 small businesses that applied for credit during 1991-94. For each variable identified in column 1, the coefficient appears in the first row and its associated *t*-statistic appears in parentheses in the second row.

(1)	(2)	(3)
Variable		
Intercept	2.08 ** (25.43)	1.62 ** (9.26)
<i>Race and ethnicity</i>		
Asian	-0.99 ** (-3.79)	-1.00 ** (-3.78)
Black	-1.87 ** (-10.88)	-1.78 ** (-9.97)
Hispanic	-0.31 (1.08)	-0.35 (-1.20)
Female	-0.42 * (-2.53)	-0.41 * (-2.44)
<i>Loan Characteristics</i>		
Intended use:		
Working capital		0.64 ** (3.36)
Motor vehicle		1.02 ** (3.06)
Equipment		0.78 ** (3.20)
Land and Buildings		0.77 ** (2.84)
Inventory		0.67 (1.55)
Amount for which the firm applied as a portion of assets		-0.21 ** (-4.14)
Pseudo R-square	0.071	0.111

* Indicates statistical significance at the 0.05 level.

** Indicates statistical significance at the 0.01 level.

Table 8

Multivariate logistic regression results for variables used to explain the importance of race, ethnicity, firm characteristics in the extension of credit to a nationally representative sample of 2,012 small businesses that applied for credit during 1991-94. For each variable identified in column 1, the coefficient appears in the first row and its associated *t*-statistic appears in parentheses in the second row.

(1)	(2)	(3)
Variable		
Intercept	2.08 ** (25.43)	-3.12 ** (-5.62)
<i>Race and ethnicity</i>		
Asian	-0.99 ** (-3.79)	-0.69 ** (-2.43)
Black	-1.87 ** (-10.88)	-1.16 ** (-6.10)
Hispanic	-0.31 (1.08)	0.04 (0.14)
Female	-0.42* (-2.53)	-0.00 (-0.00)
<i>Firm characteristics</i>		
Firm age		0.34 ** (3.27)
Equity to assets		0.12 (1.29)
Income to assets		0.09 (1.20)
ln(Total sales)		0.37 ** (8.33)
Business delinquencies		-0.39 ** (-7.42)
Urban location		-0.62 ** (-3.24)
<i>Organizational form</i>		
C-corporation		0.04 (0.19)
S-corporation		-0.21 (-1.53)
Partnership		0.48 (1.53)
Pseudo R-Square	0.071	0.184

* Indicates statistical significance at the 0.05 level.

** Indicates statistical significance at the 0.01 level.

Table 9

Multivariate logistic regression results for variables used to explain the importance of race, ethnicity, and firm-lender relationships in the extension of credit to a sample of 2,007 small businesses that applied for credit during 1991-94. For each variable identified in column 1, the coefficient appears in the first row and its associated *t*-statistic appears in parentheses in the second row.

(1)	(2)	(3)
Variable		
Intercept	2.08 ** (25.43)	2.01 ** (12.46)
<i>Race and ethnicity</i>		
Asian	-0.99 ** (-3.79)	-0.89 ** (-3.25)
Black	-1.87 ** (-10.88)	-1.62 ** (-8.86)
Hispanic	-0.31 (1.08)	-0.26 (-0.88)
Female	-0.42* (-2.53)	-0.34* (-1.99)
<i>Pre-existing relationships</i>		
Checking		-0.42 * (-2.55)
Savings		0.90 ** (4.21)
Loan		0.11 (0.66)
Line of credit		-0.33 (-1.71)
Financial management service		0.56 ** (3.44)
Length of relationship with prospective lender		0.02 (1.77)
No pre-existing relationship with prospective lender		-1.39 ** (-5.89)
Pseudo-R ²	0.071	0.124
* Indicates statistical significance at the 0.05 level.		
** Indicates statistical significance at the 0.01 level.		

Table 10

Multivariate logistic regression results for variables used to explain the importance of race, ethnicity, and gender in the extension of credit to a sample of 2,007 small businesses that applied for credit during 1991-94. For each variable identified in column 1, the coefficient appears in column 2 and its associated *t*-statistic appears in column 3.

(1) Variable	(2) Coefficient	(3) <i>t</i> -statistic
Intercept	-1.91**	-3.28
<i>Race and ethnicity</i>		
Asian	-0.67*	-2.23
Black	-0.89**	-4.20
Hispanic	0.08	0.26
Female	-0.03	-0.15
<i>Firm owner's characteristics</i>		
Owner age	-0.001	-0.09
Owner's experience	-0.01	-0.75
Owner's personal delinquencies	-0.20*	-2.55
<i>Loan Characteristics</i>		
Intended use:		
Working capital	0.47*	2.17
Motor vehicle	1.43**	3.82
Equipment	0.85**	3.04
Land and Buildings	0.78*	2.54
Inventory	0.84	1.82
Amount for which the firm applied / Total assets	-0.12*	-1.96
<i>Firm characteristics</i>		
Firm age	0.50**	3.48
Equity to assets	0.003	0.03
Income to assets	0.09	1.08
ln(Total sales)	0.34**	6.67
Business delinquencies	-0.34**	-5.26
Urban location	-0.68**	-3.32
<i>No pre-existing relationship</i>	-1.63**	-6.07
<i>Owner's education dummy variables</i>	Yes	
<i>Organizational form dummy variables</i>	Yes	
<i>One-digit SIC dummy variables</i>	Yes	
<i>Financial services dummy variables</i>	Yes	
<i>Year of Most Recent Loan Dummies</i>	Yes	
Pseudo-R ²	0.246	

* Indicates statistical significance at the 0.05 level.

** Indicates statistical significance at the 0.01 level.

Table 11
 Credit denials and extensions
 to a sample of 2,007 firms applying for credit at banks and nonbanks during 1991-94

	Number of firms applying for credit	Number of firms denied credit (row percentage)	Number of firms extended credit (row percentage)
All firms applying	2,007	346 (17.2%)	1,661 (82.8%)
Non-minority	1,661	196 (11.8%)	1,465 (88.2%)
Minority	346	116 (33.5%)	230 (66.5%)
Asian-Bank	65	18 (27.7%)	47 (72.3%)
Asian-Nonbank	17	4 (23.5%)	13 (76.5%)
Black-Bank	126	66 (52.3%)	60 (47.6%)
Black-Nonbank	42	13 (30.9%)	29 (69.1%)
Hispanic-Bank	78	13 (16.7%)	65 (83.3%)
Hispanic-Nonbank	20	3 (15.0%)	17 (85.0%)
Female-Bank	238	52 (21.8%)	186 (78.2%)
Female-Nonbank	56	11 (19.6%)	45 (80.4%)

Note: Two firms applying for credit identified themselves as both Black and Hispanic.
 "Bank" indicates that the firm applied for credit at a commercial bank while "Nonbank"
 indicates that the firm applied for credit at a potential lender other than a commercial bank.

Table 12

Multivariate logistic regression results for variables used to explain the importance of race, ethnicity, and gender in the extension of credit to a sample of 2,007 small businesses that applied at banks and nonbanks for credit during 1991-94. For each variable identified in column 1, the coefficient appears in column 2 and its associated *t*-statistic appears in column 3.

(1) Variable	(2) Coefficient	(3) <i>t</i> -statistic
Intercept	-1.74**	-1.90
Bank is source of loan	-0.39	-1.46
<i>Race and ethnicity</i>		
Asian-Bank	-0.76*	-2.28
Black-Bank	-1.20**	-5.01
Hispanic-Bank	0.19	0.52
Female-Bank	-0.09	-0.44
Asian-Nonbank	-0.40	-0.57
Black-Nonbank	0.16	0.35
Hispanic-Nonbank	-0.46	-0.63
Female-Nonbank	0.16	0.36
<i>Firm owner's characteristics</i>		
Owner age	-0.001	-0.069
Owner's experience	-0.01	-0.85
Owner's personal delinquencies	-0.20**	-2.58
<i>Loan Characteristics</i>		
Intended use:		
Working capital	0.51*	2.35
Motor vehicle	1.42**	3.76
Equipment	0.76**	2.73
Land and Buildings	0.83**	2.67
Inventory	0.87	1.86
Amount for which the firm applied / Total assets	-0.13*	-2.10
<i>Firm characteristics</i>		
Firm age	0.47**	3.22
Equity to assets	0.02	0.18
Income to assets	0.10	1.30
ln(Total sales)	0.35**	6.85
Business delinquencies	-0.35**	-5.29
Urban location	-0.68**	-3.50
<i>No pre-existing relationship</i>	-1.69**	-6.21
<i>Owner's education dummy variables</i>	Yes	
<i>Organizational form dummy variables</i>	Yes	
<i>One-digit SIC dummy variables</i>	Yes	
<i>Financial services dummy variables</i>	Yes	
<i>Year of Most Recent Loan Dummies</i>	Yes	
Pseudo-R ²	0.256	

* Indicates statistical significance at the 0.05 level.

** Indicates statistical significance at the 0.01 level.

