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# Do Credit Market Barriers Exist for Minority and Women Entrepreneurs?

Lloyd Blanchard
*Syracuse University*

Bo Zhao
*Federal Reserve Bank of Boston*

John Yinger
*Syracuse University*, jyinger@maxwell.syr.edu

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## Abstract

This paper examines whether methodological deficiencies in the literature on discrimination in small business credit markets have a significant impact on the estimation of discrimination and provides a preliminary investigation into the causes of discrimination in these markets. We find substantial, statistically significant evidence of discrimination in loan approval against black-owned and Hispanic-owned businesses in 1998 with additional control variables, with a variety of different specifications, and with a simultaneous model of the application and loan-denial decisions. We also find that discrimination in small business lending may take the form of statistical discrimination, driven by lenders' stereotypes about the ability of black- and Hispanic-owned businesses to succeed under some circumstances. In addition, we find that neither adding additional control variables nor accounting for possible endogeneity alters the conclusion that there is no discrimination in interest rates on approved loans. We also find, however, that black-owned businesses do face discrimination in interest rates when they deal with some types of lenders, particularly finance companies. Because finance companies specialize in higher-risk borrowers, this finding might indicate that they are willing to consider group-membership as a risk predictor despite the illegality of this practice. These findings suggest that federal financial regulatory agencies should re-double their efforts to uncover and prosecute lenders who discriminate against black- and Hispanic-owned businesses.

## Introduction

Businesses owned by members of racial and ethnic minority groups and by women make up a growing share of the American economy (Olson 2005). These firms are younger and smaller than white- and male-owned firms, however, and may be more susceptible to swings in market conditions (Bates 1999).[1] To the extent that these firms face barriers accessing credit, their disadvantage in the marketplace is exacerbated. Several recent studies find evidence that minority- and women-owned businesses face discrimination in loan approval and interest rates (Blanchflower, Levine, and Zimmerman 2003; Bostic and Lampani 1999; Cavalluzzo, Cavalluzzo, and Wolken 2002; Cavalluzzo and Wolken 2002; Cavalluzzo and Cavalluzzo 1998; and Bates 1991, 1997). This paper reviews and extends this literature.

Studies of lending discrimination must address biases from four sources: omitting relevant explanatory variables, sample selection, endogeneity, and misspecification (Ross and Yinger 2002). Our contribution to the literature on discrimination in small-business lending is to improve existing methods for dealing with the first and last sources of bias and to address the endogeneity issue for the first time. Looking ahead, we find that addressing these methodological challenges has little impact on estimated discrimination using the 1998 and 1993 Surveys of Small Business Finances (SSBF). In addition, we provide some new evidence on the causes of discrimination in small business lending.

## Conceptual Framework

### Types of Discrimination

The Equal Credit Opportunity Act of 1974 (ECOA), as amended, prohibits discrimination "against any applicant, with respect to any aspect of a credit transaction." ECOA assigns enforcement authority to the federal financial institutions responsible for overseeing various sets

of lenders. A manual published by the Federal Financial Institutions Examination Council (FFIEC undated, p. i) explains that ECOA "applies to any extension of credit, including extensions of credit to small businesses."[2]

The FFIEC manual also explains the three methods that courts recognize as proof of discrimination. The first two, overt and comparative evidence, fall within the category of "disparate treatment." Disparate-treatment discrimination can be proven by statements revealing that a lender explicitly considers prohibited factors (overt evidence) or by across-group differences in treatment that are not fully explained by legitimate factors (comparative evidence). The third method is providing evidence of "disparate impact." If a lender applies a race/ethnicity-neutral or gender-neutral policy or practice that disproportionately excludes members of these protected classes, this policy or practice is said to have a "disparate impact." Whenever one of the federal financial regulatory agencies finds evidence of disparate impact, then the lender must show that the relevant lending policies or practices are justified by "business necessity," that is, whether they have a legitimate business purpose. If not, or if non-discriminatory alternatives for attaining the same business objectives are available, the policies or practices are said to involve disparate-impact discrimination and are illegal.

**The Loan-Denial Decision**

A lender's objective is to approve loan applications that provide a higher return than other potential uses of the capital. In practice, however, a loan officer may have only a rough idea of a loan's contribution to his employer's profitability, and approve/deny decisions are often made using rule of thumb. Following Ross and Yinger (2002), we define $\pi$ as the profit contribution of a loan as determined by the best possible prediction using full information and the most appropriate statistical procedure, and $\pi^*$ as the lender's required level of profitability. A lender would like to select loans using the following rule:

$$\text{Approve if:} \quad \pi \geq \pi^*$$
$$\text{Deny if:} \quad \pi < \pi^* \qquad (1)$$

Because they typically have incomplete information and use a less-than-ideal statistical method or even a non-statistical rule of thumb, however, loan officers actually base their decisions on a rough prediction of profitability, labeled $\pi_E$, not on $\pi$. This rough prediction is based on the information available to the loan officer concerning the creditworthiness of the applicant and the business activity, including the owner's credit and resources ($C$), the firm's credit and financial health ($F$), and the environment in which the firm and lender operate ($N$). Thus, the lender's actual decision rule is:

$$\text{Approve if:} \quad \pi_E(C,F,N) \geq \pi^*$$
$$\text{Deny if:} \quad \pi_E(C,F,N) < \pi^* \qquad (2)$$

The parameters of equation (2) can be estimated using a probit model in which $D$ is a zero-one variable that indicates when a loan application is denied and $\Phi$ refers to the cumulative density function of a normal distribution. In symbols:

$$\Pr[D_i = 1] = \Phi(\alpha_0 + \alpha_C C_i + \alpha_F F_i + \alpha_N N_i) \qquad (3)$$

Discrimination exists when race/ethnicity or gender has an independent impact on the lender's approve/deny decision after controlling for the impact of $C$, $F$, and $N$ on loan profitability. Disparate-treatment discrimination exists when a lender uses different rules for different groups, that is, when group membership, $M$, is an argument in the $\pi_E$ function.[3] Disparate-treatment discrimination would exist, for example, if the net-worth threshold required for loan approval were higher for women applicants than for male applicants, all else equal. Disparate-impact discrimination exists when differences between the best-possible profitability

prediction, $\pi$, and the actual profitability prediction, $\pi_E$, place people in a legally protected class at a disadvantage. Suppose, for example, that the profitability of a loan is not related to the number of previous contacts a lender has had with an applicant, but that some lender considers this factor in approving a loan; that is, suppose the number of previous contacts is in $\pi_E$ but not in $\pi$. Now if applicants from minority groups have relatively infrequent contacts with this lender, they will, on average, be placed at a disadvantage for a reason unjustified by business necessity. This is disparate-impact discrimination.

The standard approach to estimating discrimination is to include the minority-status variable, $M$, in the equation (3), that is, to estimate

$$\Pr[D_i = 1] = \Phi(\alpha_0 + \alpha_C C_i + \alpha_F F_i + \alpha_N N_i + \beta M_i) \tag{4}$$

If all relevant credit variables are included in the regression, the regression is properly specified, and all lenders use the same underwriting standards, then $\beta$ provides an estimate of disparate-treatment discrimination. Even if these three conditions are met, this approach does not yield an estimate of disparate-impact discrimination. In fact, disparate-impact discrimination that is built into the average underwriting standards and therefore reflected in the estimated $\alpha$ coefficients cannot be detected by this method. This type of disparate-impact discrimination cannot be detected without data on loan performance (see Ross and Yinger 2002).

All three of the above conditions are critical. The omission of variables that are observed by the lender, predict profitability, and are correlated with minority status results in a biased estimate of $\beta$. One legacy of our nation's discriminatory past is that creditworthiness is negatively correlated with minority status, so omitted credit characteristics are likely to bias the estimate of $\beta$ upward. This may be a particularly severe problem in the case of small business lending. As the FFIEC manual (undated, p. 24) puts it: "Unlike consumer credit, where loan products and prices are generally homogenous and underwriting involves the evaluation of a

limited number of credit variables, commercial loans are generally unique and underwriting methods and loan pricing may vary depending on a large number of credit variables." Thus, a credible estimate of discrimination must include a wide range of underwriting variables in the loan-denial regression.

Second, the loan-denial equation must be correctly specified, that is, it must accurately describe a lender's underwriting standards. In the case of mortgage lending, for example, several studies find that the weights, i.e., estimated coefficients, for the underwriting variables depend on the applicant's debt-to-income ratio or on consumer credit history (Ross and Yinger 2002). A failure to recognize this type of interaction or other non-linearities in underwriting standards could lead to biased estimates of $\beta$.

Third, the estimate of $\beta$ also may be biased upward when all lenders do not use the same underwriting standards. As explained by Blackburn and Vermilyea (2001), Buist, Linneman, and Megbolugbe (1999), Courchane, Nebhut, and Nickerson (2000), and Stengel and Glennon (1999) for the case of mortgage loans, $\beta$ can reflect deviations from average underwriting standards that are correlated with $M$. If these deviations are justified on the basis of business necessity, then $\beta$ is likely to overstate discrimination.[4] If these deviations are not justified on the basis of business necessity, however, then they lead to disparate-impact discrimination which is, appropriately, included in $M$. The key, therefore, is to separate these two explanations.

Ross and Yinger (2002) argue that legitimate variation in underwriting standards, that is, variation associated with business necessity, must be linked with variation in the pool of businesses from which applications to a lender are drawn. If two lenders receive applications drawn from the same pool, then they face the same underlying $\pi$ function and have no justification for differences in underwriting standards—at least not for differences that lead to inter-group disparities in loan approval. According to this argument, a researcher can control for legitimate variation in underwriting standards by allowing the weights (i.e., estimated

coefficients) of underwriting variables to vary with loan and lender characteristics that are likely to be correlated with the type of applications a lender attracts.

This approach provides the most accurate estimate of discrimination that is possible without loan-performance data, but it does not eliminate all possible biases (Ross and Yinger 2002). If the variation in underwriting standards correlated with the type of lender and the purposes of the loan does not help to predict loan profitability, then this approach may understate discrimination. It is also true, however, that this approach may overstate discrimination if underwriting standards vary across lenders in ways that predict loan profitability but are not correlated with the type of lender or the purpose of the loan. Results based on this approach, including those presented below, must be interpreted with these possibilities in mind.

Finally, a full analysis of the loan-denial decision must also consider the demand side. A small firm must decide whether to apply for a loan and, if it does, how large it would like the loan to be. As pointed out by Cavalluzzo et al. (2002), this behavior complicates an analysis of the loan-denial decision because some small firms may decide not to apply in the belief that they will be turned down.[5] This is an example of a selection problem: the set of applications in the sample is self-selected partly on the basis of the dependent variable, or at least potential applicants' predictions about the dependent variable, so that the estimated coefficients may be biased. A method to deal with this problem, namely to estimate the application and denial decisions simultaneously, was developed by Bloom, Preiss, and Trussell (1983) for the mortgage market and has been applied to small business lending by Cavalluzzo et al.

**The Interest-Rate Decision**

No analysis of discrimination in small business lending would be complete without examining lenders' decisions about interest rates. After all, a lender might accept loans on a non-discriminatory basis but then set higher interest rates for small businesses owned by minorities or women than for equivalent small businesses owned by white men.[6] We test for discrimination by

determining whether interest rates differ by group membership after controlling for $C$, $F$, $N$, and other loan characteristics, $L$. These other loan characteristics, which include whether the interest rate is fixed or variable, whether collateral is required and the type of collateral, are determined at the same time as the interest rate and therefore may be endogenous.[7] In symbols, our interest-rate model is

$$I = I(C, F, N, L, M) \tag{5}$$

## Literature Review

One well-known study based on Boston area data for 1990, Munnell et al. (1996), estimates that the mortgage loan applications of black and Hispanic home seekers are 82 percent more likely to be rejected than are the applications of equally qualified whites. Several subsequent studies have examined the same data, and the finding of discrimination is remarkably robust (Ladd 1998; Ross and Yinger 2002). Other studies find discrimination in mortgage lenders' pre-approval behavior (Turner et al. 2003). In this section we review the related literature on discrimination in small business lending, with a focus on existing approaches to the methodological problems identified in section II.

In small-business lending, black-owned firms consistently have been found to be 26 to 36 percentage points more likely to be denied access to credit (Blanchflower et al. 2003; Cavalluzzo and Wolken 2002; Cavalluzzo et al. 2002; Bostic and Lampani 1999), while Hispanic- and Asian-owned firms in 1998 have been found to be 22 and 13 percentage points more likely to be denied credit, respectively (Blanchflower et al. 2003; Cavalluzzo and Wolken 2002). These studies also find inter-group differences in interest rates in some cases.

### Omitted Variables

Existing studies have identified a large number of credit variables in the SSBF data sets and included them in their loan-denial and interest-rate regressions. Blanchflower et al. (2003),

for example, analyze loan denial and 1998 SSBF data controlling for credit history; credit score; the firm's market scale, age, number of employees, and legal status; characteristics of the loan; the owner's education and wealth; and industry, region, and year. They use a similar set of variables without credit score in their analysis of the 1993 data. Cavalluzzo et al. (2002) examine loan denial in the 1993 SSBF using an extensive set of explanatory variables similar to the ones in Blanchflower et al. Cavalluzzo et al. also control for the level of concentration in the banking industry using the well-known Herfindahl-Hirschman Index (HHI).

Bostic and Lampani (1999) argue that omitting local geographic characteristics, which are often correlated with race and ethnicity, may bias discrimination estimates. By appending data from the 1990 Census and annual Call Reports to the 1993 SSBF, they control for the poverty rate, median housing value, unemployment rate, housing vacancy rate, median household size, population, median household income, average education, and racial/ethnic mix by ZIP Codes. One of their local geography variables, a dummy variable indicating whether the ratio of the median housing value in the ZIP code to the MSA was less than 0.80, was statistically significant. Including these extra controls does not have a significant impact on estimates of discrimination, but it does raise the standard errors and results in a discrimination estimate that is significant only at the 10 percent threshold.

**Specification**

Existing studies of discrimination in small-business lending explore several possible non-linearities in underwriting standards. Blanchflower et al. (2003), for example, recognize that it may be inappropriate to assume linearity in the impact of previous credit problems; "one might suspect," they say, "that the marginal impact would rise as credit problems rise" (p. 939).[8] Thus, they estimate separate loan-denial models for (a) proprietorships and partnerships versus corporations, (b) young firms and old firms, (c) small firms and large firms, (d) loans for working capital and other loans (1993 only), (e) firms selling in a local market and a regional,

national, or international market, (f) applicants with and without past credit problems, and (g) firms with a high or low credit rating (1998 only).

The estimate of discrimination against blacks is statistically significant in every case except one (large firms in 1998) and the estimated magnitude of discrimination against blacks is similar in the two subsamples in almost every case. The results for Hispanics are more mixed, but the estimates of discrimination against Hispanics are similar in the two samples in many cases. Both blacks and Hispanics, for example, face discrimination even if they do not have any previous credit problems.

**Self-Selection**

As noted earlier, Cavalluzzo et al. (2002) address the issue of self-selection using the 1993 SSBF and the technique developed by Bloom et al. (1983). They add observations for firms that did not apply for a loan and therefore do not appear in the denial models. Then they use a bivariate probit model to estimate the application and denial equations simultaneously. They find a significant correlation between the two equations ($\rho = -0.49$), which is a sign of self-selection, but they also find that adding the selection equation results in estimates of discrimination that are very similar to those obtained from a single-equation model.

**The Interest Rate Equation**

Blanchflower et al. (2003) and Cavalluzzo et al. (2002) both analyze inter-group differences in interest rates, controlling for most of the same variables that are in the loan-denial regressions. Both studies use OLS, however, and therefore assume that loan characteristics other than interest rate were exogenous to the interest rate decision. Cavalluzzo et al. (2002) find that the black-white difference in interest rates is not significant, whereas Blanchflower et al. (2003) find that it is. Specifically, Blanchflower et al. find that in 1993 black-owned firms paid 98 to 122 basis points (i.e., about one percentage point) more in interest than equally qualified white-owned firms. Cavalluzzo et al. (2002) do not find evidence of discrimination in interest rates

against Hispanic-owned firms, whereas Blanchflower et al. (2003) find a significant difference, about 50 basis points, between Hispanic-owned and white-owned firms in 1993 and a significant difference, 85 basis points, between Asian-owned and white-owned firms in 1998. These results may all be biased because of the endogeneity of other loan terms.

**The Causes of Discrimination in Business Lending**

The literature on mortgage lending discrimination suggests that discrimination in small business lending may have two different causes.[9] First, following Becker (1971), some lenders may be prejudiced against applicants in certain groups and therefore be more likely to turn down applications from people in these groups than from people in other groups who are, according to the lender's underwriting standards, equally qualified.

Second, some lenders may use membership in certain groups as an indicator for certain credit characteristics that cannot be observed. A lender who denies loans to people in historically disadvantaged groups under the assumption that people in these groups have poor unobserved credit qualifications is practicing "statistical discrimination." Even if it is profitable, however, "[t]his behavior is illegal—under the pertinent laws, a lender must base his or her decision on the *observed credit characteristics* of an applicant—but some lenders may respond to the economic incentive instead of to the requirements of the law" (Ross and Yinger 2002, p. 214, emphasis in original). Evidence for statistical discrimination has been found for other markets, including the housing market (Ondrich, Ross, and Yinger, 2003).

Cavalluzzo et al. (2002) and Cavalluzzo and Wolken (2002) argue, based on Becker (1971), that competition will eliminate discrimination motivated by prejudice and test this hypothesis by interacting the group membership variables with HHI.[10] In their initial analysis, for example, Cavalluzzo et al. estimate that in competitive banking markets, white-owned and black-owned firms faced denial probabilities of 32 percent and 39 percent, respectively—a 7 point difference. In concentrated banking markets, the probability of denial fell to 27 percent for

white-owned firms and climbed to 55 percent for black-owned firms—a 28-point difference. They also find, however, that black-owned firms are less likely to apply for credit in less competitive markets, and when they control for this (using the selection model discussed earlier), the HHI interaction term for black-owned businesses is no longer statistically significant.

Although this is an appealing approach, several studies have shown that competition cannot be expected to eliminate prejudice-based discrimination in lending (Longhofer and Peters 2005; Ferguson and Peters 2000). Moreover, as pointed out by Ross and Yinger (2002), competition may change underwriting weights, as well as the treatment of applicants in certain groups. This possibility is not considered in the Calvalluzzo et al. (2002) analysis.

## Data

Our analysis uses the 1998 and 1993 SSBF. As the literature has recognized, estimates of discrimination in loan denial in these two years are not comparable because the 1993 survey asked about both new loans and extensions of old loans, not just about new loans as in 1998. To simplify our presentation and to focus on new loans, the text concentrates on the 1998 results and some of the key results from 1993 are presented in footnotes.[11]

Table 1 provides definitions and Table 2 presents summary statistics for key variables in the 1998 data, weighted to provide estimates for the U.S. population. Table 2 shows that the 1998 sample includes 3,561 firms, 78.8 percent white-owned, 7.7 percent black-owned, 6.9 percent Hispanic-owned, and 6.7 percent owned by other racial/ethnic groups. The 1997 Survey of Minority- and Women-Owned Business Enterprises, which keeps statistics on the population of minority business, reports that 4 percent of all businesses are black-owned, 5.8 percent Hispanic-owned, and 5.3 percent owned by members of other races/ethnicities.

The differences between these two data sets may be due to the over-sampling of minorities in the SSBF, but they are not large enough to raise concern over the SSBF's

representation of the nation's small businesses. Bates (1999) argues that the SSBF is not representative of minority-owned small businesses because the average age of the minority firms in the SSBF is four to five years older than the average reported by the Census Bureau. This possibility does not appear to be a source of bias in our estimates; Blanchflower et al. (2003) find no significant differences in discrimination against younger and older minority-owned firms.

Table 2 also shows that while minority business owners are as likely to apply for credit as white business owners, they are more likely to be denied credit and they pay higher interest rates. Blacks are 43 percentage points more likely than white men to be denied credit, Hispanics 33 points more likely, and other races 22 points more likely. We also find that blacks paid 0.63 percentage points more than the average white, male interest rate of 9.23 percent, while Hispanics and other races paid 0.87 and 1.27 percentage points more, respectively. These differences may be explained, of course, by differences in credit history, firm and owner characteristics, and other relevant factors. Table 2 also shows that these other factors vary with race/ethnicity. These large differences do not appear in a comparison of businesses owned by white men and women; firms owned by white women have only a slightly higher denial rate and actually have interest rates that are 0.34 percentage points lower.

Table 2 uses five mutually exclusive racial/ethnic/gender categories: African American, Hispanic, Asian or Native American or Pacific Islander, non-Hispanic white woman, and non-Hispanic white man. The SSBF data set does not include enough minority women or enough black Hispanics to include them as separate categories. We include the few (4 in 1998) black Hispanics in the data in the African-American category. This grouping differs from the one in Blanchflower et al. (2003), who combine Hispanic women and non-Hispanic white women in one category. An alternative approach is to define a category for women (of any race/ethnicity) and to allow an applicant to be in more than one category. We use the first approach, but the results are similar with this alternative approach.

Following the approach used by the Census in the 2002 Survey of Business Owners, we classify a business in a particular category if more than 50 percent of it is owned by people in that category. This definition differs slightly from the one in Blanchflower et al. (2003), who include firms with exactly 50 percent minority ownership in the minority-owned category.[12] Because few firms are exactly at this boundary, regression results are virtually identical with either definition.

Finally, a few firms were dropped from the analysis because they reported that their loan applications were sometimes approved and sometimes denied.[13] Only 83 firms were in this category in 1998 (and none in 1993), and excluding them has virtually no impact on our results.

## Results

Our objective is to estimate disparate-treatment discrimination in loan denial and interest rates using the best methodology possible with available data. We also ask whether the methodological deficiencies discussed above bias previous estimates of $\beta$ in a significant way.

### Loan Denial: Basic Results

Table 3 presents our results from the loan denial analysis using the 1998 SSBF. The entries in the table are mean marginal effects with their standard errors and p-values. Following Blanchflower et al. (2003), we estimate baseline probabilities that race/ethnicity and gender alone influence loan denial, and then successively control for other factors that are likely to influence the loan-denial decision. Each row is a separate unweighted regression, and only the $\beta$s and robust standard errors are reported.[14] The first row shows that with no controls blacks, Hispanics, and members of other races face a 43, 33, and 15 percent higher chance of being denied business credit, respectively, compared to white men (the omitted category), which closely mirrors the differences in Table 2. The small difference in denials between white-women-owned and white-male-owned firms is not significant at the 5 percent level.

The other rows in the table provide the results with successive introduction of controls for the applicant's credit history and credit rating, characteristics of the firm, characteristics of the firm's owner, characteristics of the loan, characteristics of the lender, geographical variables, and application year dummies. The specific variables in each category are listed in Table 1. Not surprisingly, adding controls usually lowers the estimated inter-group differences. With all controls added (Model (8) in Table 3), black-owned and Hispanics-owned firms face a probability of denial that is 17 and 15 percent, respectively, higher than the probability for firms owned by white males.[15] These differences are highly significant statistically. The probability of loan-denial is not significantly higher for firms owned by other races or by white women than for white-male-owned firms.

**Omitted Variable Bias**

The results in Table 3 include all the controls in Blanchflower et al. (2003), but we have also added several additional control variables to further minimize the possibility of omitted variable bias. First, small businesses owned by members of a protected class may tend to select certain types of lenders or to apply for loans for certain purposes. If so, and if approval rates vary by lender type or loan purpose, then unbiased estimates of discrimination require controls for these factors. Thus, indicators of loan purpose and whether the lender is a commercial bank, savings bank and loan association, finance company, or something else are included in Models (5) and (6).[16]

Second, because lenders may have a policy that directs them to consider loans to businesses within its service area more favorably than those outside this area, we include a dummy variable indicating whether the lender was in the same area as the firm (Petersen and Rajan 2000). Third, given the importance of the relationship between the lender and applicant, we also include the number of months the lender has worked with firm (Berger and Udell 1995; and Petersen and Rajan 1994).[17]

Even with the addition of these new controls blacks and Hispanics are significantly more likely to be denied a loan than are white males. Nevertheless, our estimate of these denial gaps is considerably smaller than the estimate provided by Blanchflower et al. (2003). To be specific, Blanchflower et al. estimate that denial gap facing blacks drops from 38.2 percentage points to 30.1 percentage points when all their controls are added. We find a much larger drop, from 43.1 to 17.3 percentage points. In the case of Hispanics, Blanchflower et al. estimate that the gap drops from 31.4 percentage points to 21.5 points, whereas we estimate that it drops from 33.0 to 14.7 points. The question is whether our additional controls account for these differences.

To answer this question, we begin by trying to replicate the Blanchflower et al. results and then to examine the impact on estimated denial gaps of all known differences between the two studies. We conclude that our additional control variables explain 29.7 percent of the difference in black-white denial gaps between the two studies. In contrast, removing these variables from our analysis actually widens the difference in Hispanic-nonHispanic gaps between the two studies by 27.9 percent. We conclude that the differences between our results and those of Blanchflower et al. are largely due to things other than our additional control variables. The main difference, which accounts for roughly half the difference for both blacks and Hispanics, is an esoteric one. As is customary with probit models, both studies present marginal effects, not regression coefficients. Blanchflower et al. present marginal effects at the mean value of the explanatory variables, whereas we present mean marginal effects in the sample. Although both measures are valid, we believe that the mean marginal effect is a more appealing measure of impact in a heterogeneous sample. Other factors that help explain the differences in the results include the differences in group definition discussed earlier, minor differences in the definitions of other variables, and minor differences in the sample.[18]

We cannot prove, of course, that we have controlled for every credit variable that lenders consider in evaluating applications for business loans. The SSBF data make it possible to control

for a very wide range of such variables, thereby greatly lowering the probability that our estimates are affected by omitted variable bias. As a result, we believe that our results provide credible, but not airtight, estimates of discrimination.

**Specification**

We consider two principal specification issues. The first is whether estimates of discrimination are affected by nonlinearities in underwriting standards. The second is whether estimates of discrimination change when one accounts for the possibility that lenders may legitimately use different underwriting standards for applications from different pools of businesses. We address these issues using the strategy developed by Blanchflower et al. (2003), namely, by examining regressions based on split samples.

As discussed earlier, nonlinearities may arise because the impact of many underwriting variables is different for applicants with strong credit credentials than for applicants with weak credit credentials. Blanchflower et al. (2003) addressed this possibility with split-sample regressions based on both past credit problems and credit ratings. As shown in Table 4, we expand this analysis by considering split-sample regressions based on firm net worth, owner's housing wealth, and owner's non-housing wealth. We find significant discrimination against black-owned and Hispanic-owned firms in every one of these split sample tests. The discrimination does not always appear in both samples, however. The regression for firms with high net worth finds no discrimination against black-owned firms, for example. Moreover, the regressions for high-wealth owners, based on either housing wealth or non-housing wealth, indicate higher discrimination against Hispanics than do the regressions for low-wealth owners.

Nonlinearities also might arise for other reasons, such as firm age or firm size, both of which are examined by Blanchflower et al. (2003). We consider several additional possibilities, namely, the length of the relationship between the lender and the applicant, the purpose of the loan, and the amount requested. Again we find that accounting for these potential nonlinearities

also does not alter the conclusion that discrimination exists. More specifically, Table 4 reveals significant discrimination against black-owned and Hispanic-owned firms in the regression for firms that have long relationships (greater than three years) with the lender, in the regressions for both types of loan purpose, and in the regression for small loans (less than $50,000). In addition, black-owned firms face discrimination in the regression for firms without a long relationship with the lender and Hispanic-owned firms face discrimination in the regression for large loans.

The second specification issue concerns the possibility that underwriting standards differ for applications from different applicant pools. As explained earlier, this possibility complicates a test for discrimination. Variation in underwriting standards that accurately reflects differences in the factors associated with loan default that appear in different applicant pools can lead to a significant $\beta$ coefficient even with no discrimination. To account for this possibility, we identify several variables that might be associated with different applicant pools and estimate split-sample regressions based on these variables. To the extent that these variables accurately identify different applicant pools, these split-sample regressions estimate within-pool measures of discrimination, which cannot be influenced by legitimate across-pool variation in underwriting standards (Ross and Yinger 2002).

Although they do not mention the issue of variation in underwriting standards, Blanchflower et al. (2003) provide split-sample results based on organization type (corporation and other) and on sales market (local compared to regional, national, or international), which can be interpreted as controls for different applicant pools. They find discrimination against black-owned and Hispanic-owned businesses in the regressions for both types of sales market and in the regression for proprietorships and partnerships. They also find discrimination against black-owned businesses in the corporation regression.

We add two more versions of this test. The first, which we believe to be the most compelling, is to split the sample based on type of lender. After all, different types of lenders

specialize in different types of loan products and are very likely to draw on different applicant pools. In addition, we split the sample based on the industry of the applicant. Because each industry faces different economic circumstances, the factors leading to default could also differ by industry. As shown in Table 4, we find discrimination against black-owned and Hispanic-owned businesses in both the service industry and the non-service industry regressions, as well as in the regression for commercial banks. The regression for other types of lenders indicates discrimination against black-owned but not against Hispanic-owned businesses.

Overall, the conclusion that black-owned and Hispanic-owned businesses face discrimination in small business lending is not altered when we account for a variety of nonlinearities in underwriting standards or for the possibility that underwriting standards vary with the applicant pool.

**Selection Bias**

We now turn to a test of whether the self selection of firm owners in applying for a loan biases the estimate of $\beta$. This form of bias arises when borrowers that choose to apply for credit are systematically different from those who choose not to apply. Bloom et al. (1983) argue that when lenders prescreen borrowers, the usual estimates of discrimination will be biased to the extent that the factors influencing the decision to apply are correlated with race/ethnicity but not observed by the researcher. They also develop a bivariate probit model to address this potential bias. As noted earlier, Cavalluzzo et al. (2002) estimate this model using the 1993 SSBF and find that it has little impact on estimates of discrimination.

We replicate the work of Cavalluzzo et al. (2002) using the 1998 SSBF. Our results are shown in Tables 5. We find that the $\beta$s estimated using a single-equation probit are not significantly different from those estimated using the bivariate probit. Moreover, the estimated correlation between the two equations is not statistically significant, which indicates that the

selection correction is not necessary. In addition, we find no significant differences across groups in the probability of applying for credit, all else equal.

**Interest Rates**

Table 6 presents our analysis of interest rates on approved loans in 1998. Without controls, we find that businesses owned by blacks, Hispanics, and other races all face significantly higher interest rates, but these differences disappear once controls are added (Models 3 through 8).[19] In the case of businesses owned by white women, we find no interest-rate gap without controls, but find significantly lower interest rates in the regression with controls. On average, white women business owners obtain a 0.74 percentage point discount on their loan interest rate after controlling for creditworthiness and other factors.

Because lenders may set interest rates and other loan terms simultaneously, we also determine whether our findings change when other loan terms are treated as endogenous. The challenge here is finding instrumental variables that are correlated with the other loan term but not with interest rates. We found suitable instruments for the loan amount approved,[20] but only weak instruments for whether the loan had a fixed interest rate, whether the lender required collateral, whether the lender required a guarantor, and the points required at loan closing.[21] The results for Model 9 in Table 6 show that controlling for endogeneity in loan terms has no effect on estimates of discrimination, but further research on this topic is needed, particularly with data sets that provide stronger instruments.[22]

Table 7 uses the split-sample technique to determine whether nonlinearities or differences in underwriting standards across loan applicant pools alter the findings of no interest-rate discrimination by race or ethnicity. Panel A of this table reveals that black-owned businesses pay, on average, a 1.12 percentage point interest rate premium for loans other than credit line loans, and that business owners of other races with low non-housing wealth may face discrimination by paying a 1.45 percentage point premiums more in interest. Interestingly,

relatively wealthy Hispanic business owners are found to receive favorable treatment in interest-rate setting. Hispanics with over $75,000 in housing equity received a 1.26 percentage point discount, and those with non-housing wealth over $150,000 received a 1.04 percentage point discount, the latter of which being statistically significant only at the 10 percent level. Table 7 also suggests that the apparent favoritism shown to white women business owners for lines of credit is nearly twice the favoritism for other loan types, but otherwise is limited to those with greater wealth, longer lender relationships, and those applying for smaller loans.

Accounting for possible differences in underwriting standards also matters. Table 7 reveals that black-owned businesses encounter interest rate discrimination from non-commercial bank lenders, where they pay, on average, a 2.5 percentage point interest rate premium. This finding is significant only at the 10 percent level. Hispanic-owned and white-women-owned firms receive a 0.76 and 0.73 percentage point discount, respectively, in non-service related industries, while the white women favoritism shown above seems to be limited to commercial banks. Although discrimination in the setting of interest rates does not appear in Table 6, these split sample results suggest that it may nevertheless arise under some circumstances—a finding that is worthy of further exploration.

**The Causes of Discrimination**

A theory about the causes of discrimination identifies circumstances under which discrimination is more likely to occur. To test the hypothesis that discrimination is caused by lender prejudice, for example, we must identify variables associated with lender prejudice and see if they influence the estimate of discrimination. This test involves interacting these variables with the group membership variables and determining whether this interaction term is statistically significant with the expected sign.[23] The problem, of course, is that variables clearly linked to lender prejudice or to statistical discrimination are difficult to identify. In this section we provide a preliminary look at the causes of discrimination by identifying a few variables that

might be linked to one of these hypotheses and determining whether they are statistically significant when interacted with group membership.

The SSBF does not provide much information about lenders, but two variables indicate lender characteristics that might be associated with lender prejudice, namely whether the lender operates in the same location as the applicant and whether the lender has a long-term relationship with the applicant. Lenders who operate in the same location as black or Hispanic applicants or lenders who have a long-term relationship with a black or Hispanic applicant may be revealing a lack of prejudice. As shown in Table 8, one result supports this prediction, namely that discrimination against blacks is lower when the lender and applicant are located near each other. However, two other results work against this hypothesis: Hispanic-owned businesses encounter more discrimination when the lender is located in the same area, and black-owned businesses encounter more discrimination when they have a long-term relationship with the lender. These results therefore do not provide clear support for the hypothesis that agent prejudice is at work, but the variables we use may be poor indicators of lender prejudice.

The precise form of statistical discrimination, if indeed it exists, is not well understood, but it seems plausible that it will involve stereotypes about the ability of applicants in certain groups to succeed if they have certain types of backgrounds or engage in certain kinds of business ventures. To look for hints of statistical discrimination, therefore, we interact group membership with a variety of firm characteristics. The results for these interaction terms in our loan-denial model (but not for all the other non-interacted variables from Table 3, which are also in this regression) are presented in Table 8.

Only a few of these interaction terms are statistically significant, and only one of them is significant for more than one group. Strong indications of statistical discrimination operating the same way for different groups are not present here. The results for the national sales market variable provide perhaps the most intriguing hint. We find that both black-owned and white-

women-owned businesses face more discrimination if they operate in a national market than if they operate in a local market. This suggests that lenders have a stereotype that these businesses will not succeed at the national level. A similar stereotype could explain the increase in discrimination against Hispanic-owned firms that operate in an international market. It may be worthwhile for future research to gather lender's perceptions about the capabilities of firms owned by different groups.[24]

Table 9 presents the results of interest-rate regressions with similar interaction terms. This table provides two particularly striking hints about the causes of discrimination.[25] First, loans for capital leases involve less discrimination than other loans for blacks, other races, and white women. A capital lease protects a firm against obsolescence and may provide a signal that a firm is relatively sophisticated; if so, this signal may offset stereotypes that a lender has about businesses owned by certain groups and lower the interest-rate premium it requires these groups to pay. Second, we find clear evidence that discrimination is more likely when the lender is not a commercial bank. In the case of black-owned businesses, the three types of non-commercial banks identified in Table 9 are all more likely to discriminate. In the case of other races and white women, only finance companies are more likely to discriminate. This finding may reflect the fact that finance companies serve riskier borrowers than do commercial banks (Carey, Post, and Sharpe 1998) and are therefore more aggressive in using all information available, including group membership, to predict the probability of default.

The SSBF data allow us to compare key credit, firm, and owner characteristics for borrowers that used finance companies with those that used commercial banks. On the one hand, the incidence of judgments for finance company borrowers is half that for commercial banks, and there are no significant differences on other credit measures. On the other hand, finance companies serve a significantly higher percent of low-sales firms, and lower percentages of firms with high owner experience levels and high owner wealth. Overall, this evidence on risk

differences between the applicant pools of commercial banks and finance companies is mixed, and the role of risk in explaining the higher interest rates charged to black firms by finance companies is worthy of further investigation.

Finally, we estimate a split-sample regression based on the HHI variable to test the hypothesis that prejudice-based discrimination is higher in less competitive markets (see Table 10). This approach, unlike the comparable tests in Cavalluzzo et al. (2002) and Cavalluzzo and Wolken (2002), accounts for the possibility that market concentration may affect many underwriting weights, not just discrimination. The hypothesis that discrimination is the same for loans in low-HHI areas and in high-HHI areas cannot be rejected for any group in either loan denial or interest rates. We find, for example, that, compared to white-owned firms, black-owned firms face a probability of loan denial that is 20.5 percentage points higher in low-HHI areas and 21.0 percentage points higher in high-HHI areas. Both estimates are highly significant statistically. These results indicate either that discrimination is not motivated primarily by lender prejudice or that prejudice-based discrimination is not eliminated by competition—or both.

## Conclusion

This paper adds to the growing literature on discrimination in small business credit markets by examining whether the methodological deficiencies identified in this literature have a significant impact on the estimation of discrimination. We first replicated the results in the most recent of these studies, and then proceeded to an analysis of whether omitted variables, misspecification, self selection, or endogeneity substantially altered the estimated coefficient of interest. We find substantial, statistically significant evidence of discrimination in loan denial against black-owned and Hispanic-owned businesses in 1998 with additional control variables, with a variety of different specifications, and with a simultaneous model of the application and loan-denial decisions. Moreover, we find that neither adding additional control variables nor

accounting for possible endogeneity alters the conclusion that no group faces discrimination in the setting of interest rates on approved business loans. We also find, however, that the specification of the interest-rate equation does matter. Black-owned businesses do face discrimination in interest rates, for example, when a separate interest-rate-setting model is estimated for lenders other than commercial banks. Discrimination in interest rates may therefore exist under some circumstances.

These estimates are based on the best available data and methodology that have so far been identified, but they still have limitations. The SSBF may not contain some important underwriting variables and we may not have identified all the important specification issues in a loan-denial or interest-rate equation. Nevertheless, we believe that these results, along with those in previous articles on the subject, establish a strong presumption that black- and Hispanic-owned businesses face discrimination in obtaining loans. These results also indicate that these businesses may, under some circumstances, face discrimination in the interest rates on loans they receive. We encourage other researchers to determine whether these conclusions hold up with alternative methods and alternative data sets.

We also believe that this presumption of discrimination in loan denial should also be of great concern to the American public and to federal financial regulatory institutions. In a legal case against a lender who is alleged to have practiced discrimination, evidence of a higher denial rate for black- or Hispanic-owned businesses than for equally qualified white-male-owned businesses would establish a prima facie case that discrimination had taken place (FFIEC undated; Ross and Yinger 2002). It would then be up to the lender to prove that the remaining across-group differences in loan approval could be explained on the basis of legitimate business considerations. This logic can also be applied to a debate about the role of federal regulators. These regulators should re-double their efforts to uncover and prosecute lenders who discriminate against black- and Hispanic-owned businesses unless the regulators (or future

research) demonstrate that the results in this and previous studies can be explained by legitimate business factors that have so far been ignored.

Finally, this study provides a preliminary investigation into possible causes of discrimination in small business lending. Our results do not provide clear evidence of a particular cause that operates across all groups, but we do find a few hints. In particular, we find some evidence consistent with the view that discrimination in small business lending may take the form of statistical discrimination, driven by lenders' stereotypes about the ability of black- and Hispanic-owned businesses to succeed under some circumstances. In the case of loan-denial, we find significantly higher discrimination against black-owned businesses operating in the national market and for Hispanic-owned businesses operating in an international market. This result suggests that, in the view of lenders, black- and Hispanic-owned businesses operating outside a local market are more risky than white-owned businesses that operate in the same market and that have all the same observable credit characteristics. Acting on this belief is a form of statistical discrimination. In addition, discrimination in the setting of interest rates appears to be confined to some types of lenders, particularly finance companies. Because finance companies specialize in higher-risk borrowers, this finding might indicate that they are willing to consider group-membership as a risk predictor despite the illegality of this practice.

Overall, existing research has paid little attention to the causes of discrimination in small business lending. We hope these hints will encourage research on this topic in the future.

# Endnotes

1. From 1997 to 2002, the number of black-, Hispanic-, Asian-, and women-owned firms grew by 45, 31, 24, and 20 percent, respectively. Over the same time, the respective sales receipts increased by 30, 22, 13, and 16 percent. By comparison, the total number of firms grew by 10 percent over this time period, with sales receipts overall increasing by 22 percent. Nevertheless, in 2002 white male-owned firms took in over three times as many receipts per firm as minority- and white-women-owned firms. Source: 2002 Survey of Business Owners, Preliminary Estimates of Business Ownership, US Census Bureau, Company Statistics Division.

2. FFIEC is an interagency organization that develops uniform principles, standards, and report forms for the various financial regulatory agencies.

3. Note that, according to this nation's fair lending laws, $M$ cannot be included in $\pi$ or in $\pi_E$, even if it predicts loan profitability. A lender must base its decisions on applicants' economic and financial characteristics, not on their membership in a particular racial/ethnic group or on their gender. As discussed by Ross and Yinger (2002), a correlation between $M$ and profitability after controlling for other factors gives lenders an incentive to discriminate, but it does not give them the legal right to do so.

4. In principle, the bias could work in either direction, but it seems likely that even legitimate variation in underwriting standards will have a disproportionately negative impact on groups with relatively poor credit credentials, especially minorities, so that the average disadvantage of minorities will be overstated when this variation is ignored.

5. Some firms may not apply for a loan because they anticipate encountering discrimination. The SSBF asked survey respondents that did not apply for a loan why they did not apply, and some reported that they were afraid of being denied for reasons of prejudice. We return to this issue below.

6. In the mortgage market, the range of products—and interest rates—has grown in recent years, and a few studies have investigated discrimination in mortgage interest rates (Courchane and Nickerson 1997; Crawford and Rosenblatt 1999).

7. We do not include loan terms in the loan-denial model for both conceptual and practical reasons. Conceptually, our model assumes that a lender bases its estimate of profitability on the most profitable set of loan terms possible for each application. As a practical matter, we do not observe loan terms for denied loans.

8.      A similar argument appears in the mortgage discrimination literature. See Munnell et al. (1996), Bostic (1996), and Hunter and Walker (1996).

9.      Some scholars have argued that a third cause, called cultural affinity, is also at work. See Calomiris, Kahn, and Longhofer (1994), Hunter and Walker (1996), and Longhofer (1996). Ross and Yinger (2002) show that all existing theories of cultural affinity reduce to either statistical discrimination or discrimination based on prejudice.

10.     Bostic and Lampani (1999) also include HHI in their regressions but do not interact it with group membership.

11.     A complete set of tables based on the 1993 SSBF data set is available from the authors upon request.

12.     Blanchflower et al. (2003) do not, however, include firms with ownership that is exactly 50 percent non-Hispanic white female in the female-owned category. In fact, they dropped these firms from the analysis.

13.     It appears that in Blanchflower et al. (2003), these 83 firms were considered to have been denied loans in the loan denial analysis and to have been approved for loans in the interest                                            rate                                            analysis.

14.     Estimated coefficients for the full model can be found in Appendix A.

15.     In 1993, the regression with full controls indicates that black-owned businesses face significant discrimination, but the results are not significant for any other group.

16.     Blanchflower et al. (2003) include loan purpose variables, not lender type variables, but only in 1993. Cavalluzzo et al. (2002) control for loan purpose in their bivariate probit analysis controlling for selection, but not in their baseline model.

17.     Cavalluzzo et al. (2002), Cavalluzzo and Wolken (2002), and Cavalluzzo and Cavalluzzo (1998) include this relationship variable in their analyses of the denial decision.

18.     The following table indicates the share of the difference between our study and Blanchflower et al. (2003) that can be explained by various factors:

|  | Black | Hispanic |
|---|---|---|
| Unexplained differences | 18.75% | 25.00% |
| Use of mean marginal effect instead of marginal effect at the mean | 42.19% | 57.35% |
| Four additional sets of control variables | 29.69% | -27.94% |
| Differences in group definitions | -2.34% | 25.00% |
| Minor differences in sample and variable definitions | 11.72% | 20.59% |

19. In 1993, the regression with full controls indicates no significant inter-group differences in interest rates.

20. Since loan terms vary by industry and region, we first created industry by region dummy variables. For each of these 63 categories, we calculated different parts of the distribution (minimum to maximum) for firm, owner, and lender characteristics. We then ran a series of tests, including those suggested by Wooldridge (2003) and Hahn and Hausman (2002) (to ensure that the instruments are correlated with loan terms and not interest rates) and by Bound, Jaeger, and Baker (1995) (to identify weak instruments). The following instruments identifying the loan amount approved passed these tests: the median length of firm relationship with its primary lender and the $10^{th}$ percentile of firm inventory.

21. The weak instruments include the following: average years of owner experience, $10^{th}$ percentile of owner age, and the interaction of the previous two; $5^{th}$ percentile of sales, $10^{th}$ percentile of housing equity, standard deviation of firm distance to lender, the interaction of the $25^{th}$ percentile of sales with maximum firm assets; and the interaction of the $25^{th}$ percentile of inventory with maximum employment.

22. Moreover, none of the endogenous variables is significant. Because the collateral requirement variable was statistically significant in the expected negative direction when treated exogenously, we suspect that interest rates are set by lenders after collateral availability is determined.

23. Cavalluzzo and Wolken (2002) also interact group membership with underwriting characteristics. Their purpose is not to study the causes of discrimination, but is, instead, to decompose inter-group differences in denial rates into two components, one representing differences in firm and owner characteristics across groups and the other representing differences in the treatment of borrowers in each group given these characteristics (i.e., discrimination). This approach leads to similar estimates of discrimination as the one used in this study and in most of the previous literature. This type of decomposition also appears in the literature on mortgage discrimination (Glennon and Stengel 1994; Munnell et al. 1996).

24. Several of the other results in Table 8 are also intriguing, but given the exploratory nature of this regression, we do not wish to over-interpret them. Nevertheless, it might be useful for a future survey to determine whether lenders have stereotypes about black-owned businesses with prior delinquencies, about women who own small firms, or about the ability of various groups to succeed with various forms of firm organization.

25. Table 9 also reveals that interest-rate discrimination often varies by industry. These results hint that lenders may act upon stereotypes about which groups are likely to succeed in which industries. This hint suggests that it might be fruitful to gather information on probabilities of success by group by industry or on related lender perceptions.

**Table 1. Variable Definitions**

Credit History

| | |
|---|---|
| Business delinquency | whether the firm had delinquent business obligations in the past three years |
| Personal delinquency | whether the firm owner had delinquent personal obligations in the past three years |
| Bankruptcy | whether the firm or the owner declared bankruptcy in the past seven years |
| Judgment | whether there was judgment against the firm owner |

Credit Rating

| | |
|---|---|
| Low (moderate, significant, high) risk | whether credit risk was low (moderate, significant, high) according to the Dunn & Bradstreet credit score. The omitted category is average credit risk. |

Firm Characteristics

| | |
|---|---|
| Small (large) sales | whether sales was less than $100,000 (greater than $2,000,000) |
| Negative (large) profit | whether profit was less than $0 (greater than $200,000) |
| Negative (large) net worth | whether net worth was less than $0 (greater than $500,000) |
| Firm age | the age of the firm |
| Employment | number of employees and owners |
| Organization type | whether the firm was sole proprietorship/c-corporation/other type. The omitted category is s-corporation. |
| Regional (national, international) market | whether the firm's sales market was regional (national, international). The omitted category is local sales market. |
| Industry fixed effects | whether the firm was in mining or construction industry/transportation industry/ communications, electric, gas or sanitary industry/wholesale trade industry/ retail trade industry/finance, insurance or real estate industry. The omitted category is service industry. |

Owner Characteristics

| | |
|---|---|
| Education fixed effects | whether the owner's education level was high school dropout/high school graduate/some college/associate degree/ trade school/postgraduate degree. The omitted category is college degree. |
| Short (long) business experience | whether the owner had less than 5 years (greater than 25 years) business experience |

| | |
|---|---|
| Owner manage | whether the owner made day-to-day management |
| Small (large) housing wealth | whether the owner's housing wealth was less than $20,000 (greater than $200,000) |
| Small (large) non-housing wealth | whether the owner's non-housing wealth was less $20,000 (greater than $2,000,000) |
| Loan Characteristics | |
| Small (large) loan | whether the amount of loan requested was less than $10,000 (greater than $150,000) |
| Purpose of loan | whether the loan was capital lease/mortgage/vehicle loan/equipment loan/other type of loan. The omitted category is new line of credit |
| Fixed-interest-rate loan | whether the interest rate is fixed (for approved loans only) |
| Collaterals required | whether collaterals were required (for approved loans only) |
| Type of collaterals | whether inventory or accounts receivable/business securities or deposits/business real estate/personal real estate/other personal assets/other assets were used as collaterals (for approved loans only). The omitted category is equipment or vehicles used as collaterals. |
| Guarantor required | Whether a guarantor is required to co-sign on the loan (for approved loans only) |
| Amount approved | The loan amount approved by the lender (not always what is requested; for approved loans only) |
| Points paid at closing | The points (in interest percentage terms) paid at closing (for approved loans only) |
| Lender Characteristics | |
| Type of lender | Whether the lender was saving bank, loan association or credit union/finance company/ other type of institution or source. The omitted category is commercial bank. |
| Same area with the borrower | whether the lender was in the same area with the borrower |
| Short (long) relation with the borrower | whether the lender had less than 3 months (more than 3 years) business relationship with the borrower |
| Geographic Variables | |
| Metropolitan area | whether the firm was in a Metropolitan Statistical Area (MSA) |
| Region fixed effects | whether the firm was located in New England/Mid Atlantic/East North Central/West North Central/South Atlantic/East South Central/West South Central/Mountain region. The omitted category is Pacific region. |

Table 2.  Selected Sample Means of the 1998 SSBF Data [a]

| | All | White Men | African American | Hispanic | Asian, Native American, and Pacific Islander | White Women |
|---|---|---|---|---|---|---|
| **Full Sample of Small Business Firms** | | | | | | |
| Sample size | 3561 | 2199 | 273 | 245 | 238 | 606 |
| Share of the full sample (%, unweighted) | 100 | 61.75 | 7.67 | 6.88 | 6.68 | 17.02 |
| % Applied for a loan | 23.33 | 24.48 | 25.76 | 25.76 | 20.90 | 19.20 |
| | | | | | | |
| **Sample of Loan Applications** | | | | | | |
| Sample size | 879 | 566 | 71 | 67 | 49 | 126 |
| Treatment | | | | | | |
| % Loan application denied | 21.8 | 16.2 | 59.3 | 49.1 | 38.1 | 20.7 |
| Interest rate charged on approved loan (%) | 9.257 | 9.227 | 9.862 | 10.099 | 10.499 | 8.883 |
| Credit History | | | | | | |
| % Business delinquency | 21.1 | 19.9 | 26.1 | 17.6 | 13.9 | 27.4 |
| % Personal delinquency | 17.1 | 15.7 | 33.2 | 16.1 | 20.2 | 18.2 |
| % Bankruptcy | 2.5 | 2.0 | 11.3 | 2.4 | 0.0 | 2.6 |
| % Judgments | 6.2 | 5.9 | 13.0 | 4.0 | 9.9 | 5.2 |
| Credit Rating | | | | | | |
| Low risk | 6.1 | 7.5 | 0.0 | 6.9 | 1.4 | 2.8 |
| Moderate risk | 27.3 | 29.5 | 14.8 | 23.1 | 29.0 | 23.1 |
| Average risk | 33.9 | 32.9 | 41.6 | 29.3 | 39.6 | 36.0 |
| Significant risk | 21.8 | 19.7 | 31.1 | 25.6 | 21.6 | 26.1 |
| High risk | 10.9 | 10.3 | 12.5 | 15.1 | 8.4 | 11.9 |
| Firm Characteristics | | | | | | |
| % Sales<$100,000 | 26.8 | 21.9 | 59.4 | 50.5 | 32.3 | 27.8 |
| % Sales>$2,000,000 | 13.1 | 16.2 | 3.1 | 4.1 | 10.2 | 7.5 |
| % Profit<=$0 | 20.4 | 18.4 | 22.6 | 22.6 | 21.9 | 26.1 |
| % Profit>$200,000 | 14.6 | 18.2 | 7.1 | 2.6 | 7.9 | 8.5 |
| % Net worth<=$0 | 29.6 | 28.0 | 33.4 | 19.8 | 27.5 | 38.3 |
| % Net worth>$500,000 | 9.2 | 11.3 | 1.0 | 1.1 | 7.6 | 6.3 |
| Firm age (years) | 11.492 | 12.381 | 9.213 | 8.277 | 9.053 | 10.380 |
| Employment | 11.835 | 13.289 | 6.784 | 8.151 | 12.948 | 8.593 |
| Owner Characteristics | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| % High school dropout | 4.4 | 3.7 | 1.6 | 20.6 | 0.0 | 3.1 |
| % High school graduate | 22.1 | 22.0 | 20.1 | 22.1 | 22.5 | 23.0 |
| % Some college | 18.9 | 17.8 | 17.4 | 17.4 | 14.6 | 24.9 |
| % College | 29.1 | 30.9 | 22.1 | 28.8 | 23.6 | 25.4 |
| % Postgraduate degree | 17.5 | 17.4 | 14.6 | 7.4 | 37.0 | 17.4 |
| % Business experience<=5 years | 12.9 | 11.3 | 14.8 | 19.3 | 15.8 | 15.5 |
| % Business experience>25 years | 15.1 | 18.5 | 7.5 | 12.1 | 5.0 | 7.5 |
| % Housing wealth<=$20,000 | 25.6 | 21.0 | 28.2 | 38.8 | 50.1 | 31.8 |
| % Housing wealth>$200,000 | 14.2 | 16.3 | 5.6 | 6.7 | 10.5 | 11.9 |
| % Non-housing wealth<=$20,000 | 20.3 | 18.0 | 34.3 | 26.1 | 23.6 | 22.8 |
| % Non-housing wealth>$2,000,000 | 4.5 | 5.0 | 0.2 | 4.9 | 2.3 | 3.9 |
| Loan Characteristics | | | | | | |
| % Loan<=$10,000 | 24.6 | 22.7 | 32.1 | 25.7 | 26.6 | 29.4 |
| % Loan>$150,000 | 16.3 | 18.1 | 4.6 | 13.1 | 21.5 | 12.3 |
| % Fixed interest rate loan | 70.7 | 67.7 | 68.7 | 85.6 | 63.5 | 81.1 |
| % Collaterals required | 56.8 | 61.0 | 50.3 | 43.0 | 55.0 | 44.4 |
| % Guarantor required | 52.9 | 55.7 | 45.2 | 44.2 | 29.1 | 49.4 |
| Approved amount ($1,000) | 182.4 | 184.3 | 57.0 | 71.6 | 243.0 | 204.6 |
| % Points paid at closing | 14.5 | 14.1 | 32.8 | 7.4 | 12.5 | 15.6 |
| Lender Characteristics | | | | | | |
| % Lender was commercial bank | 69.3 | 68.8 | 79.7 | 72.0 | 69.1 | 67.5 |
| % Lender was saving bank, loan association or credit union | 8.7 | 10.2 | 4.2 | 5.5 | 0.0 | 7.0 |
| % Lender was finance company | 10.8 | 10.4 | 12.3 | 8.8 | 18.7 | 11.2 |
| % Lender was other type of institution | 11.2 | 10.6 | 3.7 | 13.7 | 12.3 | 14.3 |
| % Lender in the same area with the firm | 73.0 | 74.3 | 77.7 | 73.8 | 70.7 | 67.1 |
| % Lender's relation with the firm<=3 months | 31.0 | 28.0 | 36.1 | 45.1 | 24.1 | 37.8 |
| % Lender's relation with the firm>3 years | 43.1 | 45.7 | 46.0 | 30.5 | 42.1 | 37.0 |

Note:

a. The sample of loan applications only includes the firms that applied for a loan in the last three years. It does not include 83 firms that reported their loans were sometimes approved and sometimes denied. Sample weights are used to provide statistics.

**Table 3.  Estimates of Discrimination in Loan Denial, 1998 SSBF Data [a]**

| Specification (N=879) [b] | African American | Hispanic | Asian, Native American, and Pacific Islander | White Women | Pseudo $R^2$ |
|---|---|---|---|---|---|
| (1) None | 0.431*** | 0.330*** | 0.145** | 0.068* | 0.102 |
| | (0.058) | (0.061) | (0.066) | (0.041) | |
| (2) Model 1 plus Credit History and Credit Rating | 0.298*** | 0.283*** | 0.126** | 0.045 | 0.264 |
| | (0.058) | (0.057) | (0.059) | (0.036) | |
| (3) Model 2 plus Firm Characteristics | 0.193*** | 0.197*** | 0.079 | 0.009 | 0.355 |
| | (0.051) | (0.052) | (0.052) | (0.032) | |
| (4) Model 3 plus Owner Characteristics | 0.203*** | 0.185*** | 0.060 | 0.002 | 0.367 |
| | (0.052) | (0.053) | (0.052) | (0.031) | |
| (5) Model 4 plus Loan Characteristics | 0.159*** | 0.190*** | 0.047 | -0.000 | 0.418 |
| | (0.047) | (0.051) | (0.049) | (0.031) | |
| (6) Model 5 plus Lender Characteristics | 0.148*** | 0.184*** | 0.057 | -0.006 | 0.445 |
| | (0.046) | (0.051) | (0.049) | (0.030) | |
| (7) Model 6 plus Geographic Variables | 0.144*** | 0.152*** | 0.039 | -0.010 | 0.459 |
| | (0.046) | (0.049) | (0.048) | (0.030) | |
| (8) Model 7 plus Application Year Fixed Effects | 0.173*** | 0.147*** | 0.037 | -0.003 | 0.468 |
| | (0.049) | (0.049) | (0.047) | (0.030) | |

Notes:

a. This table reports mean of marginal effects from unweighted probit. The omitted racial/ethnic/gender group is white males. Estimated standard errors are in parentheses. * is significant at the 10% level. ** is significant at the 5% level. *** is significant at the 1% level.

b. The final sample does not include 83 firms which reported their loans were sometimes approved and sometimes denied. Loan characteristics here do not include whether the interest rate was fixed, whether collaterals were required, and the type of collaterals.

**Table 4.  Estimates of Discrimination in Loan Denial Based on Split Samples, 1998 SSBF Data [a]**

| | African American | Hispanic | Asian, Native American, and Pacific Islander | White Women | Sample Size |
|---|---|---|---|---|---|
| **Panel A.  Nonlinearities in Underwriting Standards** | | | | | |
| Firm Net Worth | | | | | |
| Net Worth<=$50,000 | 0.255*** | 0.188*** | 0.069 | -0.038 | 432 |
| | (0.069) | (0.069) | (0.071) | (0.046) | |
| Net Worth>$50,000 | 0.078 | 0.179** | 0.022 | 0.034 | 405 |
| | (0.065) | (0.084) | (0.075) | (0.051) | |
| Owner's Housing Wealth | | | | | |
| Housing Wealth<=$75,000 | 0.163*** | 0.139** | 0.045 | -0.050 | 422 |
| | (0.059) | (0.059) | (0.062) | (0.047) | |
| Housing Wealth>$75,000 | 0.218*** | 0.253** | -0.030 | 0.048 | 398 |
| | (0.081) | (0.100) | (0.059) | (0.043) | |
| Owner's Non-Housing Wealth | | | | | |
| Non-Housing Wealth<=$150,000 | 0.188*** | 0.115* | 0.020 | -0.066 | 389 |
| | (0.071) | (0.065) | (0.079) | (0.048) | |
| Non-Housing Wealth>$150,000 | 0.231*** | 0.336*** | 0.059 | 0.037 | 481 |
| | (0.070) | (0.096) | (0.055) | (0.039) | |
| Length of Relation with the Lender | | | | | |
| <=3 Years | 0.111* | 0.038 | -0.048 | -0.069* | 432 |
| | (0.065) | (0.050) | (0.053) | (0.036) | |
| >3 Years | 0.266*** | 0.243** | 0.137 | 0.024 | 386 |
| | (0.079) | (0.098) | (0.085) | (0.048) | |
| Purpose of Loan | | | | | |
| New Line of Credit | 0.148** | 0.185** | 0.116 | 0.014 | 287 |
| | (0.072) | (0.093) | (0.100) | (0.066) | |
| Other Purpose | 0.263*** | 0.161** | 0.043 | -0.027 | 568 |
| | (0.089) | (0.066) | (0.064) | (0.034) | |
| Loan Amount Requested | | | | | |
| Loan<=$50,000 | 0.204*** | 0.226*** | 0.129 | -0.022 | 385 |
| | (0.069) | (0.071) | (0.085) | (0.048) | |
| Loan>$50,000 | 0.063 | 0.261** | 0.034 | -0.030 | 396 |
| | (0.077) | (0.110) | (0.060) | (0.041) | |
| **Panel B: Variation in Underwriting Standards Across Applicant Pools** | | | | | |
| Type of Lender | | | | | |
| Commercial Bank | 0.181*** | 0.211*** | 0.062 | 0.043 | 622 |
| | (0.058) | (0.065) | (0.063) | (0.040) | |
| Other Type of Lender | 0.162** | -0.046 | -0.090 | -0.165 | 246 |
| | (0.082) | (0.070) | (0.062) | (0.016) | |

| Firm Industry | | | | | |
|---|---|---|---|---|---|
| Service Industry | 0.291*** | 0.166** | 0.027 | -0.051 | 289 |
| | (0.094) | (0.084) | (0.078) | (0.061) | |
| Non-Service Industry | 0.143** | 0.139** | 0.024 | 0.000 | 563 |
| | (0.057) | (0.062) | (0.068) | (0.033) | |

Note:

a. This table reports mean of marginal effects from unweighted probit. The omitted racial/ethnic/gender group is white males. Estimated standard errors are in parentheses. Each row of this table represents a separate regression with the same control variables as Model (8). * is significant at the 10% level. ** is significant at the 5% level. *** is significant at the 1% level.

| | African American | Hispanic | Asian, Native American, and Pacific Islander | White Women |
|---|---|---|---|---|
| Probit (N=879) | | | | |
| Denial [b] | 0.975*** | 0.846*** | 0.242 | -0.024 |
| | (0.241) | (0.247) | (0.296) | (0.211) |
| Bivariate Probit with Sample Selection (N=3,478) | | | | |
| Denial [b] | 0.997*** | 0.828*** | 0.203 | -0.053 |
| | (0.233) | (0.246) | (0.292) | (0.206) |
| Apply [c] | 0.116 | 0.074 | -0.057 | -0.062 |
| | (0.099) | (0.101) | (0.107) | (0.072) |
| Correlation between Estimation Equations | 0.342 | | | |
| | (0.431) | | | |

Notes:

a. This table reports the estimated coefficients from unweighted probit and bivariate probit with sample selection. The omitted racial/ethnic/gender group is white males. Estimated standard errors are in parentheses. * is significant at the 10% level. ** is significant at the 5% level. *** is significant at the 1% level. The final sample does not include 83 firms which reported their loans were sometimes approved and sometimes denied.

b. The specification of the loan denial equation is the same as Model (8).

c. In the application equation, the right-hand-side variables include credit history, credit rating, firm characteristics, owner characteristics, region fixed effects, and the number of institutions that the firm used for all financial services.

**Table 6.  Estimates of Discrimination in Interest Rates Charged on Approved Loans, 1998 SSBF D**ata [a]

| Specification (N=713) [b] | African American | Hispanic | Asian, Native American, and Pacific Islander | White Women | Adjusted $R^2$ |
|---|---|---|---|---|---|
| (1) None | 0.913[**] | 0.734[**] | 0.780[**] | -0.170 | 0.013 |
|  | (0.401) | (0.381) | (0.376) | (0.244) |  |
| (2) Model 1 plus Credit History and Credit Rating | 0.784[**] | 0.765[**] | 0.777[**] | -0.251 | 0.030 |
|  | (0.399) | (0.380) | (0.373) | (0.243) |  |
| (3) Model 2 plus Firm Characteristics | 0.492 | 0.384 | 0.682[*] | -0.486[**] | 0.087 |
|  | (0.397) | (0.375) | (0.373) | (0.243) |  |
| (4) Model 3 plus Owner Characteristics | 0.493 | 0.239 | 0.544 | -0.626[***] | 0.108 |
|  | (0.398) | (0.379) | (0.377) | (0.244) |  |
| (5) Model 4 plus Loan Characteristics | 0.459 | 0.256 | 0.566 | -0.737[***] | 0.144 |
|  | (0.402) | (0.375) | (0.384) | (0.243) |  |
| (6) Model 5 plus Lender Characteristics | 0.351 | 0.026 | 0.593 | -0.727[***] | 0.165 |
|  | (0.398) | (0.375) | (0.380) | (0.241) |  |
| (7) Model 6 plus Geographic Variables | 0.454 | -0.135 | 0.524 | -0.767[***] | 0.180 |
|  | (0.400) | (0.377) | (0.381) | (0.241) |  |
| (8) Model 7 plus Application Year and Month Fixed Effects | 0.456 | -0.188 | 0.384 | -0.773[***] | 0.184 |
|  | (0.408) | (0.379) | (0.384) | (0.244) |  |
| (9) Model 8 plus Endogenous Loan Characteristics [c] | 0.560 | -0.160 | 0.339 | -0.727[***] | 0.156 |
|  | (0.439) | (0.409) | (0.405) | (0.260) |  |

Notes:

a.  With the exception of Model 9, this table reports the estimated coefficients from unweighted OLS. The omitted racial/ethnic group is white men. Estimated standard errors are in parentheses.  * is significant at the 10% level; ** is significant at the 5% level; and  *** is significant at the 1% level.

b.  The final sample does not include 83 firms which reported their loans were sometimes approved and sometimes denied.

c.  Model 9 was estimated using unweighted two-stage least squares (2SLS), treating the following loan characteristics as exogenous: the size of loan request, purpose of loan, whether it had a fixed interest rate, whether collateral was required, whether a guarantor was required, amount approved, and points paid at closing. Instruments varying across 63 industry by region categories include the following: average years of owner experience, 10th percentile of owner age, and the interaction of the previous two; 5th percentile of sales, 10th percentile of housing equity, standard deviation of firm distance to lender, median length of firm relationship with lender, and 10th percentile of inventory; the interaction of the 25th percentile of sales with maximum firm assets; and the interaction of the 25th percentile of inventory with maximum employment.

**Table 7.  Estimates of Discrimination in Interest Rates on Approved Loans Based on Split Samples, 1998 SSBF Data [a]**

| | African American | Hispanic | Asian, Native American, and Pacific Islander | White Women | Sample Size |
|---|---|---|---|---|---|
| **Panel A.  Nonlinearities in Underwriting Standards** | | | | | |
| Firm Net Worth | | | | | |
|    Net Worth<=$50,000 | 0.121 | 0.028 | 0.774 | -0.533 | 332 |
| | (0.659) | (0.594) | (0.593) | (0.395) | |
|    Net Worth>$50,000 | 0.660 | -0.584 | -0.310 | -1.138[***] | 381 |
| | (0.553) | (0.556) | (0.577) | (0.329) | |
| Owner's Housing Wealth | | | | | |
|    Housing Wealth<=$75,000 | 0.811 | 0.657 | 0.491 | -0.357 | 327 |
| | (0.608) | (0.588) | (0.578) | (0.428) | |
|    Housing Wealth>$75,000 | 1.039 | -1.262[**] | 0.473 | -0.949[***] | 386 |
| | (0.683) | (0.611) | (0.610) | (0.327) | |
| Owner's Non-Housing Wealth | | | | | |
|    Non-Housing Wealth<=$150,000 | 0.633 | 0.400 | 1.456[**] | -0.666 | 277 |
| | (0.716) | (0.643) | (0.734) | (0.505) | |
|    Non-Housing Wealth>$150,000 | 0.290 | -1.045[*] | 0.069 | -0.967[***] | 436 |
| | (0.554) | (0.562) | (0.495) | (0.301) | |
| Length of Relation with the Lender | | | | | |
|    <=3 Years | 0.338 | 0.389 | 0.882 | -0.594 | 364 |
| | (0.610) | (0.508) | (0.621) | (0.378) | |
|    >3 Years | 0.754 | -0.714 | -0.392 | -0.956[***] | 349 |
| | (0.643) | (0.772) | (0.549) | (0.347) | |
| Purpose of Loan | | | | | |
|    New Line of Credit | 0.996 | 0.822 | 1.661[*] | -1.097[*] | 218 |
| | (0.748) | (0.846) | (0.865) | (0.587) | |
|    Other Purpose | 1.122[**] | -0.350 | -0.082 | -0.646[**] | 495 |
| | (0.571) | (0.452) | (0.454) | (0.276) | |
| Loan Amount Requested | | | | | |
|    Loan<=$50,000 | 0.191 | -0.182 | 0.795 | -1.062[**] | 362 |
| | (0.659) | (0.580) | (0.765) | (0.423) | |
|    Loan>$50,000 | 0.444 | -0.283 | -0.037 | -0.289 | 351 |
| | (0.548) | (0.531) | (0.397) | (0.294) | |
| | | | | | |
| **Panel B: Variation in Underwriting Standards Across Applicant Pools** | | | | | |
| Type of Lender | | | | | |
|    Commercial Bank | -0.048 | 0.342 | 0.120 | -0.913[***] | 507 |
| | (0.412) | (0.422) | (0.407) | (0.261) | |
|    Other Type of Lender | 2.559[*] | -0.239 | 1.320 | -0.679 | 206 |
| | (1.341) | (1.025) | (1.096) | (0.667) | |
| Firm Industry | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Service Industry | 1.374 | -0.201 | 0.784 | -0.756 | 237 |
| | (0.978) | (0.800) | (0.682) | (0.530) | |
| Non-Service Industry | 0.122 | -0.757[*] | 0.021 | -0.728[***] | 476 |
| | (0.470) | (0.453) | (0.526) | (0.281) | |

Note:

a. This table reports estimated coefficients from unweighted OLS. The omitted racial/ethnic/gender group is white males. Estimated standard errors are in parentheses. Each row of this table represents a separate regression with the same control variables as Model (8). * is significant at the 10% level. ** is significant at the 5% level. *** is significant at the 1% level.

**Table 8. Estimated Coefficients on Interaction Variables from the Loan Denial Model (Probit), 1998 SSBF data [a]**

| | African American | Hispanic | Asian, Native American, and Pacific Islander | White Women |
|---|---|---|---|---|
| Main Effect [b] | 0.191 | -2.187 | 0.443 | -1.564 |
| | (1.153) | (1.443) | (1.284) | (1.117) |
| Firm Characteristics | | | | |
| Business Delinquency | -1.779** | 0.627 | -0.538 | -0.092 |
| | (0.728) | (0.935) | (0.990) | (0.635) |
| Sales<$100,000 | 0.333 | 0.379 | -0.657 | 1.891** |
| | (0.737) | (0.782) | (0.868) | (0.842) |
| Sales>$2,000,000 | -1.221 | -0.519 | _ | 0.850 |
| | (1.060) | (1.161) | | (0.720) |
| Proprietorship | -0.061 | -0.147 | 0.055 | -2.059*** |
| | (0.759) | (0.907) | (0.843) | (0.800) |
| C-Corporation | -0.735 | 0.329 | 0.602 | -0.344 |
| | (0.963) | (1.051) | (1.390) | (0.703) |
| Other Type of Organization | 2.669* | 0.951 | -0.469 | _ |
| | (1.536) | (1.595) | (1.231) | |
| Regional Sales Market | 0.986 | 0.736 | 1.200 | 0.674 |
| | (0.737) | (0.798) | (0.878) | (0.648) |
| National Sales Market | 2.191* | -0.026 | -0.497 | 2.189*** |
| | (1.324) | (1.452) | (1.013) | (0.788) |
| International Sales Market | 1.003 | 3.375* | 0.777 | 2.238 |
| | (1.641) | (1.967) | (1.521) | (1.372) |
| Lender Characteristics | | | | |
| In the Same Area with the Firm | -1.121* | 2.372** | -0.377 | 0.945 |
| | (0.672) | (0.945) | (0.872) | (0.777) |
| Relation with the Firm<=3 Months | 0.736 | 0.686 | 0.079 | 0.577 |
| | (0.942) | (0.852) | (1.081) | (0.817) |
| Relation with the Firm>3 Years | 2.504** | 0.679 | 0.637 | 0.549 |
| | (0.994) | (0.844) | (0.998) | (0.747) |

Notes:

a. This table reports the estimated coefficients on interaction variables between group membership variables and other selected explanatory variables. The specification is Model (8) plus the interaction variables listed above. The authors also experimented with adding other interaction variables and found they are not significant at the 5% level. Estimated standard errors are in parentheses. * is significant at the 10% level. ** is significant at the 5% level. *** is significant at the 1% level. – means the variable is dropped because it predicts loan denial/approval perfectly.

b. The first row reports the estimated coefficients for uninteracted group membership variables; in these models, this is no longer a measure of the average effect.

**Table 9. Estimated Coefficients on Interaction Variables from the Interest Rate Model (OLS), 1998 SSBF data [a]**

| | African American | Hispanic | Asian, Native American, and Pacific Islander | White Women |
|---|---|---|---|---|
| Main Effect [b] | -0.451 | 2.623** | -0.113 | -1.861*** |
| | (1.096) | (1.213) | (1.175) | (0.652) |
| **Firm Characteristics** | | | | |
| Net worth<=$0 | 0.205 | 0.583 | 2.545** | 0.888 |
| | | (1.357) | (1.024) | (0.576) |
| | (1.319) | | | |
| Net worth>$500,000 | 1.833 | -0.590 | 2.200 | 0.278 |
| | (2.539) | (2.067) | (1.614 ) | (0.781 ) |
| Regional Sales Market | 0.917 | -1.594 | 0.132 | 0.695 |
| | (1.259) | (1.072) | (1.245 ) | (0.557 ) |
| National Sales Market | -0.359 | 0.442 | -0.151 | 0.928 |
| | (2.136 ) | (1.849) | (1.378) | (1.044) |
| International Sales Market | 0.542 | -1.316 | 0.177 | -5.278*** |
| | (2.294 ) | (4.557) | (2.419) | (1.791) |
| Mining or Construction industry | -2.358 | -3.129** | -0.968 | 0.266 |
| | 1.821) | (1.533) | (2.078) | (1.093 ) |
| Transportation Industry | -1.309 | 1.274 | -1.127 | 0.973 |
| | (1.432) | (2.722 ) | (1.684) | (0.972) |
| Communications, Electric, Gas or Sanitary Industry | – | -2.830* | -3.050* | 2.599 ** |
| | | (1.562) | (1.832) | (1.026) |
| Wholesale Trade Industry | – | -0.960 | -1.015 | 0.570 |
| | | (1.813) | (2.241) | (1.298) |
| Retail Trade Industry | 0.216 | -3.841** | 0.581 | 0.079 |
| | (1.345) | (1.760) | (1.622) | (0.626) |
| Finance, Insurance or Real Estate Industry | -1.019 | -3.444 | 2.826 | 0.431 |
| | (2.214) | (2.408) | (2.663) | (0.998) |
| **Loan Characteristics** | | | | |
| Loan<=$10,000 | 0.973 | -3.475** | 2.407* | 0.378 |
| | (1.467) | (1.621) | (1.370) | (0.647) |
| Loan>$150,000 | -0.004 | -2.780* | -0.266 | -1.380 * |
| | (1.357) | (1.667) | (1.079) | (0.729) |
| Capital Lease | -6.788** | 0.984 | -4.362** | -2.431* |
| | (2.860) | (2.271) | (1.880) | (1.317) |
| Mortgage | – | 0.067 | -1.576 | 1.026 |
| | | (1.864) | (1.521) | (0.817) |
| Vehicle Loan | -6.684** | -1.102 | -0.565 | -1.124 |
| | (3.115) | (2.015) | (1.616) | (0.815) |
| Equipment Loan | 1.700 | 1.517 | -3.658 | 1.339* |
| | (1.468) | (1.850 ) | (2.714) | (0.714) |

| | | | | |
|---|---|---|---|---|
| Other Type of Loan | 0.786 | 3.440 | -0.529 | 1.092 |
| | (1.341) | (2.603) | (1.209) | (0.817) |
| Lender Characteristics | | | | |
| Saving Bank, Loan Association or Credit Union | 5.005* | 3.459 | – | 0.510 |
| | (2.669) | (2.864) | | (0.929) |
| Finance Company | 7.146*** | -0.747 | 3.309* | 1.427* |
| | (2.609) | (1.595) | (1.918) | (0.808) |
| Other Type of Institution | 5.989** | 0.308 | 0.698 | 0.195 |
| | (2.388) | (1.801) | (1.299) | (0.755) |

Notes:

a. This table reports the estimated coefficients on interaction variables between group membership variables and other selected explanatory variables. The specification is Model (8) plus the interaction variables listed above. The authors also experimented with adding other interaction variables and found they are not significant at the 5% level. Estimated standard errors are in parentheses. * is significant at the 10% level. ** is significant at the 5% level. *** is significant at the 1% level. – means the variable is dropped due to a lack of variation.

b. The first row reports the estimated coefficients for uninteracted group membership variables; in these models, this is no longer a measure of the average effect.

**Table 10. Estimates of Discrimination Based on Split Samples by Lender Competition, 1998 SSBF Data [a]**

| | African American | Hispanic | Asian, Native American, and Pacific Islander | White Women | Sample Size |
|---|---|---|---|---|---|
| Loan Denial | | | | | |
| HHI>=1800 | 0.210*** | 0.100 | 0.087 | -0.051 | 469 |
| | (0.081) | (0.072) | (0.073) | (0.038) | |
| HHI <1800 | 0.205*** | 0.171*** | 0.020 | 0.031 | 401 |
| | (0.052) | (0.052) | (0.064) | (0.055) | |
| Interest Rate | | | | | |
| HHI >=1800 | 0.710 | 0.011 | 0.563 | -0.841*** | 377 |
| | (0.639) | (0.553) | (0.602) | (0.323) | |
| HHI <1800 | 0.783 | -0.147 | 0.620 | -0.591 | 336 |
| | (0.645) | (0.594) | (0.578) | (0.440) | |

Note:

a. The first panel reports the estimated mean of marginal effects from unweighted probit and the second panel reports the estimated coefficients from unweighted OLS. Estimated standard errors are in parentheses. Each row represents a separate regression with the same control variables as Model (8). * is significant at the 10% level. ** is significant at the 5% level. *** is significant at the 1% level.

**Appendix A. Estimated Results for the Full Model of Loan Denial, Unweighted Probit, 1998 SSBF Data**

| N=879 | Mean of Marginal Effect | Standard Error | P Value |
|---|---|---|---|
| African American | 0.173 | 0.049 | 0.000 |
| Hispanic | 0.147 | 0.049 | 0.003 |
| Asian, Native American, or Pacific Islander | 0.037 | 0.047 | 0.437 |
| White women | -0.003 | 0.030 | 0.910 |
| Business delinquency | 0.113 | 0.033 | 0.000 |
| Personal delinquency | 0.118 | 0.037 | 0.001 |
| Bankruptcy | 0.494 | 0.144 | 0.001 |
| Judgment | 0.220 | 0.065 | 0.001 |
| Low credit risk | -0.054 | 0.049 | 0.273 |
| Moderate credit risk | -0.031 | 0.027 | 0.244 |
| Significant credit risk | 0.001 | 0.027 | 0.963 |
| High credit risk | -0.035 | 0.031 | 0.269 |
| Sales<$100,000 | 0.118 | 0.038 | 0.002 |
| Sales>$2,000,000 | -0.080 | 0.037 | 0.033 |
| Profits<=0 | -0.010 | 0.025 | 0.676 |
| Profits>$200,000 | -0.016 | 0.035 | 0.645 |
| Firm net worth<=0 | 0.003 | 0.024 | 0.905 |
| Firm net worth>$500,000 | 0.016 | 0.045 | 0.724 |
| Firm age | -0.002 | 0.002 | 0.148 |
| Employment | -0.001 | 0.000 | 0.141 |
| Sole proprietorship | 0.011 | 0.029 | 0.695 |
| C-corporation | 0.010 | 0.031 | 0.746 |
| Other type of organization | 0.046 | 0.044 | 0.292 |
| Regional sales market | -0.018 | 0.025 | 0.465 |
| National sales market | 0.057 | 0.041 | 0.163 |
| International sales market | 0.036 | 0.049 | 0.473 |
| Mining or construction industry | 0.002 | 0.034 | 0.964 |
| Transportation industry | -0.009 | 0.038 | 0.816 |
| Communications, electric, gas or sanitary industry | -0.104 | 0.035 | 0.003 |
| Wholesale trade industry | -0.091 | 0.038 | 0.018 |
| Retail trade industry | -0.008 | 0.028 | 0.768 |
| Finance, insurance or real estate industry | -0.084 | 0.038 | 0.028 |
| High school dropout | 0.060 | 0.063 | 0.342 |
| High school graduate | 0.035 | 0.035 | 0.325 |
| Some college | 0.035 | 0.036 | 0.324 |
| Associate degree | -0.041 | 0.042 | 0.334 |
| Trade school | -0.034 | 0.048 | 0.479 |
| Postgraduate degree | 0.013 | 0.031 | 0.686 |
| Owner manage | -0.093 | 0.039 | 0.017 |
| Business experience<5 years | 0.002 | 0.033 | 0.963 |

| | | | |
|---|---|---|---|
| Business experience>25 years | -0.033 | 0.034 | 0.328 |
| Owner's housing wealth<$20,000 | 0.053 | 0.028 | 0.060 |
| Owner's housing wealth>$200,000 | -0.012 | 0.033 | 0.717 |
| Owner's non-housing wealth<$20,000 | -0.030 | 0.025 | 0.225 |
| Owner's non-housing wealth>$2,000,000 | -0.001 | 0.052 | 0.983 |
| Loan requested<=$10,000 | -0.067 | 0.024 | 0.005 |
| Loan requested>$150,000 | 0.021 | 0.032 | 0.520 |
| Capital lease loan | -0.029 | 0.046 | 0.532 |
| Mortgage loan | -0.070 | 0.029 | 0.017 |
| Vehicle loan | -0.146 | 0.023 | 0.000 |
| Equipment loan | -0.106 | 0.025 | 0.000 |
| Other type of loan | -0.023 | 0.027 | 0.394 |
| Saving bank, loan association or credit union | 0.008 | 0.050 | 0.879 |
| Finance company | -0.025 | 0.041 | 0.539 |
| Other type of institution or source | 0.033 | 0.041 | 0.427 |
| Lender and borrower in the same area | 0.085 | 0.025 | 0.001 |
| Relationship between lender and borrower<3 months | 0.058 | 0.032 | 0.074 |
| Relationship between lender and borrower>3 years | 0.086 | 0.029 | 0.003 |
| MSA fixed effect | 0.011 | 0.025 | 0.650 |
| New England | 0.013 | 0.061 | 0.828 |
| Mid Atlantic | 0.022 | 0.039 | 0.576 |
| East North Central | -0.053 | 0.036 | 0.141 |
| West North Central | -0.056 | 0.042 | 0.181 |
| South Atlantic | -0.025 | 0.032 | 0.439 |
| East South Central | -0.103 | 0.036 | 0.004 |
| West South Central | 0.009 | 0.036 | 0.795 |
| Mountain region | 0.012 | 0.041 | 0.768 |
| Year 1996 | -0.054 | 0.041 | 0.193 |
| Year 1997 | -0.076 | 0.026 | 0.003 |
| Year 1998 | -0.033 | 0.023 | 0.164 |
| Year 2000 | -0.005 | 0.043 | 0.899 |
| Pseudo $R^2$ | 0.468 | | |

**Appendix B. Estimated Results for the Full Model of Interest Rates, Unweighted OLS, 1998 SSBF Data**

| N=713 | Coefficient | Standard Error | P Value |
|---|---|---|---|
| African American | 0.456 | 0.408 | 0.264 |
| Hispanic | -0.188 | 0.379 | 0.619 |
| Asian, Native American, or Pacific Islander | 0.384 | 0.384 | 0.319 |
| White women | -0.773 | 0.244 | 0.002 |
| Business delinquency | 0.173 | 0.238 | 0.467 |
| Personal delinquency | 0.337 | 0.318 | 0.290 |
| Bankruptcy | -0.132 | 1.569 | 0.933 |
| Judgment | 0.082 | 0.598 | 0.892 |
| Low credit risk | 0.060 | 0.325 | 0.853 |
| Moderate credit risk | -0.201 | 0.216 | 0.353 |
| Significant credit risk | -0.202 | 0.230 | 0.380 |
| High credit risk | 0.193 | 0.310 | 0.534 |
| Sales<$100,000 | -0.481 | 0.294 | 0.103 |
| Sales>$2,000,000 | -0.284 | 0.256 | 0.267 |
| Profits<=0 | 0.185 | 0.235 | 0.431 |
| Profits>$200,000 | -0.115 | 0.233 | 0.622 |
| Firm net worth<=0 | -0.094 | 0.210 | 0.655 |
| Firm net worth>$500,000 | -0.268 | 0.267 | 0.316 |
| Firm age | -0.013 | 0.010 | 0.168 |
| Employment | -0.002 | 0.002 | 0.261 |
| Sole proprietorship | 0.297 | 0.252 | 0.241 |
| C-corporation | 0.168 | 0.209 | 0.422 |
| Other type of organization | -0.427 | 0.329 | 0.196 |
| Regional sales market | 0.423 | 0.197 | 0.033 |
| National sales market | 0.174 | 0.294 | 0.554 |
| International sales market | -0.054 | 0.380 | 0.887 |
| Mining or construction industry | 0.188 | 0.289 | 0.516 |
| Transportation industry | -0.145 | 0.289 | 0.617 |
| Communications, electric, gas or sanitary industry | -0.121 | 0.370 | 0.744 |
| Wholesale trade industry | -0.215 | 0.331 | 0.517 |
| Retail trade industry | -0.057 | 0.253 | 0.822 |
| Finance, insurance or real estate industry | 0.170 | 0.392 | 0.664 |
| High school dropout | 0.960 | 0.520 | 0.065 |
| High school graduate | -0.053 | 0.250 | 0.833 |
| Some college | 0.249 | 0.253 | 0.325 |
| Associate degree | 0.099 | 0.401 | 0.804 |
| Trade school | -0.440 | 0.543 | 0.418 |
| Postgraduate degree | -0.131 | 0.243 | 0.589 |
| Owner manage | -0.307 | 0.255 | 0.229 |
| Business experience<5 years | 0.715 | 0.322 | 0.027 |

| | | | |
|---|---|---|---|
| Business experience>25 years | -0.022 | 0.236 | 0.925 |
| Owner's housing wealth<$20,000 | 0.646 | 0.232 | 0.006 |
| Owner's housing wealth>$200,000 | 0.054 | 0.217 | 0.803 |
| Owner's non-housing wealth<$20,000 | 0.183 | 0.270 | 0.498 |
| Owner's non-housing wealth>$2,000,000 | -0.307 | 0.289 | 0.290 |
| Loan requested<=$10,000 | 1.096 | 0.270 | 0.000 |
| Loan requested>$150,000 | -0.180 | 0.239 | 0.451 |
| Capital lease loan | 0.478 | 0.430 | 0.267 |
| Mortgage loan | -0.324 | 0.359 | 0.367 |
| Vehicle loan | -0.572 | 0.301 | 0.058 |
| Equipment loan | 0.165 | 0.274 | 0.547 |
| Other type of loan | 0.219 | 0.276 | 0.427 |
| Fixed interest rate | -0.189 | 0.205 | 0.357 |
| Collaterals required | -0.321 | 0.220 | 0.145 |
| Inventory or accounts receivable used as collaterals | 0.001 | 0.301 | 0.997 |
| Business securities or deposits used as collaterals | 0.170 | 0.509 | 0.739 |
| Business real estate used as collaterals | -0.063 | 0.324 | 0.845 |
| Personal real estate used as collaterals | 0.274 | 0.361 | 0.447 |
| Other personal assets used as collaterals | -0.288 | 0.380 | 0.448 |
| Other assets used as collaterals | -0.328 | 0.464 | 0.480 |
| Saving bank, loan association or credit union | -0.646 | 0.348 | 0.063 |
| Finance company | 0.402 | 0.317 | 0.205 |
| Other type of institution or source | -0.133 | 0.303 | 0.662 |
| Lender and borrower in the same area | 0.083 | 0.216 | 0.700 |
| Relationship between lender and borrower<3 months | 0.608 | 0.237 | 0.011 |
| Relationship between lender and borrower>3 years | -0.048 | 0.214 | 0.823 |
| MSA fixed effect | -0.106 | 0.196 | 0.589 |
| New England | 0.272 | 0.449 | 0.545 |
| Mid Atlantic | 0.002 | 0.323 | 0.994 |
| East North Central | -0.510 | 0.309 | 0.100 |
| West North Central | -0.616 | 0.342 | 0.072 |
| South Atlantic | -0.751 | 0.281 | 0.008 |
| East South Central | -0.894 | 0.384 | 0.020 |
| West South Central | 0.153 | 0.312 | 0.624 |
| Mountain region | 0.085 | 0.357 | 0.811 |
| Year 1996 | 0.213 | 0.399 | 0.593 |
| Year 1997 | -0.099 | 0.248 | 0.690 |
| Year 1998 | -0.197 | 0.192 | 0.304 |
| Year 2000 | 0.412 | 0.415 | 0.321 |
| January | -0.247 | 0.376 | 0.511 |
| February | -0.287 | 0.379 | 0.450 |
| March | 0.393 | 0.387 | 0.310 |
| April | -0.399 | 0.376 | 0.290 |
| May | -0.730 | 0.401 | 0.069 |

| | | | |
|---|---|---|---|
| June | 0.277 | 0.398 | 0.487 |
| July | -0.216 | 0.369 | 0.558 |
| August | 0.250 | 0.357 | 0.483 |
| September | -0.249 | 0.380 | 0.512 |
| October | 0.225 | 0.375 | 0.548 |
| November | 0.277 | 0.357 | 0.439 |
| December | 9.933 | 0.586 | 0.000 |
| Constant | 0.456 | 0.408 | 0.264 |
| Adjusted $R^2$ | 0.184 | | |

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