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ABSTRACT

Empirical Analysis of Racial Disparities in Policing*

Racial disparities within the criminal justice system continue to be a pressing issue in the U.S. In this paper, we analyze data for almost four million stops by California's fifteen largest law enforcement agencies in 2019, examining the extent to which people of color experience searches, enforcement, intrusiveness, and use of force differently from white people. Black Californians are more likely to be searched than white Californians, but searches of Black civilians reveal less contraband and evidence. Black people are overrepresented in stops not leading to enforcement as well as in stops leading to an arrest. While differences in location and context for the stop significantly contribute to racial disparities, notable inequities remain after accounting for such factors. These disparities are concentrated in traffic stops. A notable proportion of which lead to no enforcement or discovery—suggesting that gains in efficiency and equity are possible. Through a "veil of darkness" analysis, we find evidence that racial bias may be a contributing factor to disparities in traffic stops for Black and Latino drivers. These findings suggest that traffic stops for non-moving violations deserve consideration for alternative enforcement strategies.

JEL Classification: J15, K42, K14, H41

Keywords: policing, racial disparities, racial bias, stops, searches, enforcement

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(Mis)Pricing in Loans to Businesses Owned by People of Color

1. Introduction

Credit mispricing occurs when lenders adjust the terms for borrowers based on factors unrelated to their financial risk, such as the race of the business owner, rather than basing decisions on economic and creditworthiness indicators. This study explores whether mispricing is evident across racial groups on loans made to small firms. We compare the interest rates and collateral requirements of racial minority owned firms to those of white owned firms.

Such an analysis is important because access to credit is crucial to the growth of small businesses (Bates and Robb, 2013). The U.S small business sector is important for job creation and other components of economic growth. Within the small business sector, minority owned firms play an increasingly key role. Between 2002 and 2022, U.S. small businesses increased their workforce by 5.4 million jobs. Businesses owned by people of color increased their job count by almost 5 million in that period, making them the primary source of job increases for the nation's small business sector.[1] Borrowing difficulties can be one of the most important obstacles in operating and growing a business. This study examines the nature of the credit provided to support the growth of these firms.

Racial discrimination in small business lending has long been a concern in the United States. Prior to this study, the most recent data set containing interest rate and collateral differences in loans to small businesses across racial groups in the U.S. was the Federal Reserve's Survey of Small Business Finances (SSBF) in 2003. Research using the 2003 SSBF data indicated racial disparities: loan rejection rates and interest rates were inexplicably higher for some groups of minority borrowers (for example, see Asiedu et al., 2012). For this study, we collected data from 44 states on loans made to privately-owned businesses

[1] See Bates et. al, 2022, table 4, the 2002 Survey of Business Owners of the U.S. Census Bureau, and the 2022 Annual Business Survey of the U.S. Census Bureau.

with 500 or fewer employees between January 2022 and June 2023. This study provides a picture of small business financing in the early post-COVID period.

This paper makes several contributions to the literature. First, we add to the sparse literature on this important topic. Second, we provide results from the first data set containing interest rate and collateral differences in loans to small businesses across U.S. racial groups since the 2003 SSBF. Third, we provide more extensive minority firm-white firm comparisons of collateral than previous studies and increase the measures of collateral examined. The 2003 SSBF includes only whether and what type of collateral was required. Our study includes those two items and adds the value of the collateral relative to the amount of credit provided. Fourth, the number of observations of minority business loans in our sample is much larger than those in the 2003 SSBF, allowing us to draw more statistically robust inferences. Our data includes information on loans, firms, and lenders for 434 Black-owned firms, 649 Hispanic-owned firms, 320 Asian American-owned firms, and 389 Native American and Alaskan Native-owned firms (we combine these two in the study, but for brevity use only the Native American label). The 2003 SSBF contains credit terms for only 11 Black-owned firms, 18 Hispanic-owned firms and 29 Asian American-owned firms. Some studies that used SSBF combined cross sections that differed by five years, e.g., 1998 and 2003, even then, they totaled only 45, 56 and 58, Black-owned firms, Hispanic-owned firms and Asian American-owned firms, respectively (Asiedu et al., 2012, p. 533). Fifth, we compare credit terms across six types of lenders: large banks (deposits greater than $10 billion), small banks, Community Development Financial Institutions (CDFIs), credit unions, fintech lenders, and nonbank financing companies; and make minority firm-white firm comparisons across these lenders.

In estimating the mispricing of loans to minority firms, we considered a range of factors that affect loan terms, such as the size of the business, credit rating, owner experience, industry, revenues, and more. These factors are important because they determine the risk for lenders when making a loan. Our statistical approach determined if, after considering that range of risk factors, minority ownership affects the terms of

the loan. The minority owned status should not influence interest rates or collateral if the financial risk factors have already been considered.

Our basic models indicate that after controlling for firm risk factors: Compared to white-owned firms, Asian American-owned firms paid 2.88 percentage points higher rates, Hispanic-owned firms paid 2.91 percentage points higher rates, and Black-owned firms paid 3.09 percentage points higher rates. While Black-owned firms pay higher interest rates in states with higher structural racism, the structural racism effect is not statistically significant for the other minority groups. Using weighted models to approximately mirror the national distributions of minority firms, then collectively Asian American-, Black-, and Hispanic- owned businesses annually pay $9.1 billion more in interest than comparable white counterparts.[2] Lenders were more likely to require an outside co-signer on loans to Asian American- Black-, Hispanic- and Native American-owned businesses than their white counterparts. The survey data was not sufficient to estimate the economic impact. This is an important topic for future research.

While above we report the overall interest rate differential relative to white-owned firms for each minority group, we also found that the minority groups' experiences differed across lenders. Consistent with the approach that controls for a broad range of factors that affect loan risk, we found that: Black-owned firms paid higher rates than their white counterparts at credit unions, fintech lenders and nonbank finance companies. We did not find that race was statistically significant in bank and CDFI loans: the black firm-white firm interest rate differences for these lenders were explained by factors such as credit score and size of firm, not race.

Hispanic-owned firms paid higher interest rates than their white counterparts at each of the six lender types. Asian American-owned firms paid higher interest rates than their white counterparts at large banks. There were too few cases in the sample to make inferences about the other lenders to Asian American-

[2] To place this gap into context, according to the Bureau of Labor Statistics (BLS), the median annual earnings for full-time workers in the US in 2023 were $58,019. Divide $9.1 billion by this amount and this translates into 156,845 job equivalents that the minority firms were unable to directly provide to their communities.

owned firms. Disparities in borrowing experiences can have far-reaching implications beyond the economic sphere, contributing to broader inequalities and perpetuating historical patterns of discrimination and exclusion. If such disparities exist, addressing these disparities will require concerted efforts from policymakers, regulators, lenders, and other stakeholders to improve access to credit and reduce discrimination in lending.

The remainder of this paper is organized as follows. Part 2, Background, presents the focus of this study in terms of the credit issues examined, and provides summary statistics on the firms that are analyzed in the study. Part 3, Mispricing Analyses, introduces the statistical approach used in the study and reports the results on interest rate and collateral mispricing. Part 4, Conclusion, overviews the results and provides estimates of the economic cost of the interest rate differentials found between minority and white small business borrowers.

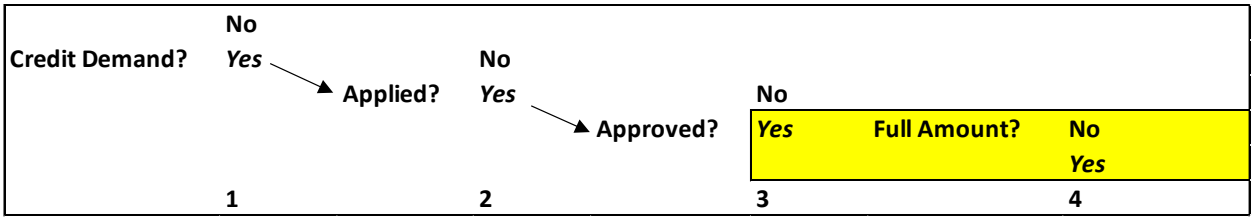
2. Background

A. Focus of the Research

Numerous studies have examined the differences in financing patterns between minority owned firms and white owned firms. The most detailed data regarding financing pattern is the Federal Reserve's SSBF, which were cross section surveys covering the years 1989, 1993, 1998 and 2003. Researchers have used SSBF to explore a) the number of businesses discouraged from applying for a loan due to fear of rejection and b) the loan denial rates for businesses applying for credit, comparing minority to White-owned firms. Overall, these studies conclude that a) a higher fraction of bankable minority business owners than comparable white business owners do not apply for loans because of fear of rejection; and b) for those minority businesses that apply, higher fractions of bankable minority businesses are rejected for financing than comparable white businesses. These studies include Cavalluzzo and Cavalluzzo (1998), Bostic and Lamani (1999), Cavalluzzo et al. (2002), Blanchflower et al. (2003), Blanchard et al. (2008) and Asiedu et al. (2012).

More recent research has had to rely on data sources that have less information on business loans than SSBF. These sources include first, the Kauffman Foundation Survey (KFS), which contains data on the financing of new firms and goes from 2004 through 2011. Second, the Federal Reserve has completed annual Small Business Credit Surveys (SBCS), for each year 2019 – 2022. Using the KFS, Fairlie et al. (2022) and Bates and Robb (2015, 2016) found that owners of new minority business are more likely to be discouraged from borrowing and more likely to be rejected for credit than new white business owners. Barkley and Schweitzer, M. (2023) had similar findings using the SBCS. Neither data set includes information on the terms of loans granted to minority owned businesses.

Since this current study concerns loan granted to firms, it does not consider firms that wanted credit but did not apply, nor firms that applied and were rejected for financing. A firm desiring debt financing is the first step in the sequence that ends in obtaining a loan. However, not all the firms that want debt financing apply for a loan. A firm must take the second step and apply for a loan. The third step resulting in a loan is the lender accepting the loan request and making the loan. There must be a promised or actual loan that occurs. The loan granted may differ from the loan requested. Thus, step four concerns whether the loan was fully or partially accepted. We collected data on both the loan requested and the final loan committed. We explore the loan terms conditional on the firm having received a loan with a focus on interest rates and collateral. This covers the outcomes in yellow below.



B. Survey Summary Statistics

This section describes how the data were obtained and provides summary statistics on the responses of the surveyed firms. Supplier.IO is a private firm that provides diverse suppliers with connections to firms and organizations that seek to hire diverse suppliers, while concurrently providing firms seeking diverse suppliers with access to its list of diverse suppliers. It also assists firms in developing and growing their programs for hiring minority suppliers. Supplier.IO provided the authors with a list of over 300,000 firms, to which we sent an internet survey. The survey collected firm/owner/lender information on non-government guaranteed borrowing by small firms (< 500 employees) from January 2022 through May 2023. Duns credit score information was added for a subset of firms that completed the survey. To be eligible for the survey, a business must be operating at the time of the survey and a for-profit firm with employees. Also, it must have borrowed during the specified period through a line of credit or loan. Following previous studies, firms in the finance industry were ineligible.

The summary statistics of the responding firms will be presented as follows: interest rates on financing received, other loan terms (including collateral), firm information, lender information, loan terms, and other survey information. The key outcomes of the loan process that we examine are the rate paid in borrowing and the collateral requirements associated with borrowing. We winsorized the reported interest rates at the bottom 1% and top 2% to reduce the distortive effect of outliers. Exhibit I shows that the average interest rate is higher for each of the minority groups than for the white-owned firms.

In Part 3, we determine to what extent these rates embody mispricing of minority owned firms, i.e., the extent to which the rates for minority owned firms are higher than they should be, after the risk factors are considered. The comparisons at the top of Exhibit II show the loan rate spread, which is the interest rate paid minus the prime rate at the time that the loan was granted. The results of the loan spread mirror those of the loan rate for each group of firms.

Exhibit II also contains various measures of collateral associated with the loans, as reported by the firms.[3] The white-owned firms committed the least collateral relative to the loan amount, were least often required to commit more collateral than the amount of the loan, and least often required by the lender to have an external party sign for the loan. There are multiple reasons why these differences in interest rates and collateral exist including industry, geographical location, and prior years' profits that are unrelated to the race of the owner. Our analyses below control for creditworthiness and other firm attributes to see if minority-owned and white-owned firms of like attributes were treated the same in defining the interest rate and collateral requirements.

Exhibit III shows that firm characteristics vary across races. White-owned firms report the lowest fraction of firms with losses in 2022. The white-owned firms also report the highest fraction of firms with the same or higher revenue in 2022 vs. 2021 and the highest fraction of firms with the same or more employees in 2022 vs. 2021. They also report the highest credit rating scores. On the other hand, white-owned firms report the lowest fraction of firms in good or better condition at yearend 2022. The Black and Hispanic-owned firms have the lowest credit score profile. The other traits are mixed, and no group stands out as better or worse overall in the other firm measures. The survey also collected information on the type of lender that provided the credit: large banks (deposits of at least $10 billion), small banks, CDFIs, credit unions, fintech lenders, and nonbank finance companies. The lenders and rates charged to each group of borrowers are in Exhibit IV-A and IV-B. The lender utilization figures in Exhibit IV-A show that overall, large banks were used more often than the other lender groups. However, only 13% of the white-owned firms used large banks, while at least 60% of each of the four minority groups borrowed from large banks. About nine out of ten Asian American-owned firms and Native American-owned firms in our sample borrowed from large banks.

[3]Regarding collateral relative to the loan, the survey asked the firm where it placed in six intervals of collateral relative to the amount of credit granted: 0, 1 – 50%, 51 – 99%, 100%, 101 – 150%, or greater than 150%.

Meanwhile, a higher fraction of white-owned firms borrowed from small banks, credit unions, CDFIs, fintech lenders, and nonbank finance companies than did each minority group. Regarding the interest rate paid by the borrowing firms, nonbank finance companies charged the lowest rate, followed by fintech lenders, then CDFIs and large banks charged about equal rates, then small banks. Credit unions charged the highest average rates among the six lenders in our sample. These six lenders differ in their cost of capital, their regulatory environment, and their need to generate ROI for their investors. Nevertheless, for all lenders, owner race should not matter after making their adjustments for risk that reflect the financial attributes of the borrowing firms.

Regarding the borrower groups, Exhibit IV-B shows that white-owned firms are the only group that paid lower than average interest rates at each of the lenders. At the other end, Asian American-owned firms are the only group that paid higher than average interest rates at each of the lenders that provided them credit. Asian American-owned firms borrowed almost exclusively from large banks (92 percent), and their borrowing interest rate was higher than the average of all groups borrowing from large banks.

Hispanic-owned firms' borrowings were dominated by large banks, small banks, and credit unions, and for each of these sources Hispanic-owned firms paid higher rates than the average of all groups. After Asian American- and Hispanic-owned firms, Black-owned firms paid the highest average interest rate; however, the difference between the Hispanic- and Black-owned firms' borrowing rates is small. While Black-owned firms were charged a midrange average rate by large banks, they paid higher than average rates when borrowing from the other five lenders.

Exhibit IV-C provides the detail of the type of credit by owner race. White firms most often borrowed through a line of credit, while Asian American-owned firms least often used a line of credit. The credit of the white-owned firms was most often a new credit, while Asian American-owned firms borrowed least often through a new credit. Hispanic-owned firms most often borrowed for debt consolidation, while white-owned firms least often borrowed for that purpose. Finally, for white-, Black- and Native American-owned firms, nine out of ten loans were fixed rate loans.

3. Mispricing Analyses

A. Approach

The previous section shows descriptive statistics that generate insights to loan pricing and differences across race/ethnicity. However, these observed rate gaps may not represent what we refer to as loan mispricing as t they do not control for risk factors among the borrowers. This section reports the results of the statistical tests to determine evidence of mispricing of borrowing terms for businesses owned by people of color after controlling for financial attributes that are used to price credit. As in prior research on this topic (e.g., Cavalluzzo et al., 2002) we use ordinary least squares (OLS) regressions to examine mispricing of loan terms. Financial theory suggests that the required return lenders demand from borrowers should be positively related to the loan's default risk. Accordingly, we use the interest rate on the loan as the measure of return charged by the lender. An alternate measure is the interest rate on the loan less the prime rate at the time the loan was granted. This is the "loan spread." We report this in our analyses, and the results using this measure are close to those using the interest rate. In this section, the standard regression framework was used to determine to what extent there is evidence of mispricing of loans to minority firm borrowers.

The following basic model provides the framework for the regressions that follow. I is the interest rate to be determined by a basic rate β_0, and there are N control variables that determine the shifts in I based on the amount of each control variable for that firm. Thus, there are N control variables considered that affect the interest rate, the β_i (i = 1 … N) represents the changes in the interest rate reflecting the value of the attributes affecting the rate, and β_R measures the effect of race of the firm's majority ownership on the interest rate. Mispricing occurs when the coefficient of race is statistically significant in a model that includes attributes measuring loan risk. This prediction is based on the information available to the lender concerning the creditworthiness of the applicant and the business activity, including the owner's credit and resources, the firm's credit and financial health, and the environment in which the firm and lender operate.

$$\boldsymbol{I = \beta_0 + \sum_{i=1}^{N} \beta_i X_i + \beta_R X_R + \varepsilon} \quad \textbf{(1)}$$

When all the N attributes describing loan risk are included in the model, then $\boldsymbol{\beta_R}$ should be zero. We cannot prove, of course, that we have controlled for every credit variable that lenders consider in evaluating applications for business loans. The information gathered in the survey makes it possible to control for a very wide range of such variables, however, thereby greatly lowering the probability that our estimates are affected by omitted variable bias. Our controls included 17 firm characteristics, five loan characteristics, and four lender characteristics (Exhibit V). As a result, we believe that our results provide credible estimates of mispricing. We assess mispricing by determining whether the interest rate on the credit received differs between the respective minority group firms and white-owned firms after controlling for the N variables that affect the interest rate. The N variables include the other features of the loan, such as whether the interest rate is fixed or variable and whether collateral is required. These are determined at the same time as the interest rate and therefore may be endogenous. We will consider this as part of our analysis, by considering the importance of this effect in our data. Exhibit V shows the control variables used in our analyses.

Our approach is to limit the sample to white-owned firms and each of the minority groups, separately. For each of these regressions, we include an indicator variable for the relevant minority group, which then captures the loan rate difference between the two groups. We then examine changes in the estimated minority-white loan pricing difference (i.e., the estimated coefficient on the indicator variable of the minority group) as we sequentially added controls.

B. Interest Rate Results

Interest Rate Results by Minority Group

Exhibit VI shows our analysis of interest rates on approved loans for firms in our sample. Groups are defined based upon controlling ownership. At least 50% ownership is by that racial/ethnic group while all other racial/ethnic groups have less than 50% combined ownership. We consider model 5 as our preferred specifications since it considers all available potentially relevant factors. The interpretation is that compared to white-owned firms, we find that after controlling for equal creditworthiness and other firm attributes, the annual interest rate paid by Hispanic-owned firms was 2.91 percentage points higher than that paid by white-owned firms. The asterisks indicate the statistical significance of the finding. We consider a result statistically significant when it is at least significant at the .10 level. Statistically significant results are also found for Black-owned firms and Asian American-owned firms, with Black-owned firms paying 3.09 percentage points higher, and Asian American-owned firms paying 2.88 percentage points higher than white-owned firms, while the indicator of Native American-owned firms was not statistically significant in model 5.

To assess the robustness of our analysis we examined the results for firms where at least 51% of the ownership is by one racial/ethnic group and no other single racial/ethnic group owns more than 49.0%. These results appear in Exhibit VII. The results for the 51% ownership definition are consistent with those of Exhibit VI. For the credit rating in the regression reported in Exhibits VI and VII, we used the self-reported credit scores of the firm. We were able to obtain the Duns credit scores for 937 of the firms. If we use the Duns credit scores instead of the self-reported scores, we obtain the results in Appendix A. These results are also consistent with the relationships using the self-reported credit scores used in Exhibits VI and VII: For Hispanic-, Asian- and Black-owned firms, the interest rate paid was higher than for comparable white-owned firms, after considering the controls for risk that determine the interest rate on loans, including the firm's industry, financial attributes, owner traits, credit history and type of loan.

Interest Rates in States of Contemporary Inequality and Racial Bias

Next, we turn to a contemporaneous measure of potential discrimination that varies regionally and possibly correlated with racial bias but not necessarily with contemporaneous business conditions. Associated with Derrick Bell's idea of the permanence of racism (Bell, 1993), "structural racism" refers to the totality of ways in which societies foster racial discrimination through mutually reinforcing systems of housing, education, employment, earnings, benefits, credit, media, health care, and criminal justice (Bailey et al., 2017). In short, structural racism is the totality of how society is organized to privilege white communities at the expense of non-white racialized communities (Gee and Hicken, 2021). The patterns and practices of structural racism in turn reinforce discriminatory beliefs, values, and distribution of resources. We adopt a measure of racial disparity that we view as a proxy of structural racism and test whether it is associated with practices of mispricing loan terms across racial groups.

We use a state-level structural racism index of the United Nations Sustainable Development Solutions Network, USA (see Lynch et al., 2021). It created a state structural racism index comprised of five dimensions: (1) residential segregation; and gaps in (2) incarceration rates; (3) educational attainment; (4) economic indicators; and (5) employment status. This information was sourced as follows.

- Website: https://us-inequality.sdgindex.org/map/indicators/sdg10v2_racismindex
- Methodology: https://us-inequality.sdgindex.org/methodology
- Data: https://github.com/sdsna/2021USRacialInequality

We define ***HighRacialDisparity*** as a dummy equal to 1 for states whose racism index is among the top 30%. We reran model 5 for each racial group after adding the interaction term for the ***HighRacialDisparity*** and minority-owned firms. Our results indicate that that Black-owned firms pay higher interest rates in states with higher structural racism (Exhibit VIII). The structural racism effect is not statistically significant for the other minority groups.

Interest Rate Results by Minority Group and Lender Type

The preceding analysis reports the **overall** mispricing interest rate differential relative to white-owned firms for each of the minority groups. However, the minority groups' experiences differed across lenders. Since minority-owned businesses most frequently borrowed from large banks, we used the interest rate differential with large banks as the baseline. We then determined if other lenders (i.e., small banks, FinTech, etc.) had a higher or lower interest rate differential between minority groups and white-owned firms than did large banks.

In Exhibit IX, the "Minority" line is the racial differential (minority firms minus white firms) in interest rate paid by that group at large banks. So, Hispanic-owned firms paid 3.57 percentage points higher interest rates than white-owned firms at large banks, and that difference is statistically significant at the .01 level. Moving across the Minority line, Asian American-owned firms paid 2.66 percentage points higher than white-owned firms at large banks and that difference is statistically significant. There is no statistically significant difference in the interest rates that large banks charge Black-owned and Native American-owned firms compared to white-owned firms, after considering creditworthiness and other attribute of the firms. The summary is that at large banks, Hispanic-owned firms and Asian American-owned firms pay higher rates than those predicted in our models, and for Black-owned and Native American-owned firms, mispricing by race is not indicated.

The terms with "#" are interaction terms that show the difference between that lender and large banks in the interest rate gap between minority and white-owned firms. We add the interaction term to the "Minority" term to measure if the racial gap in interest rate (minority firm – white firms) differs between that lender and large banks. Thus, Hispanic-owned firms paid (3.57 percentage points + 3.07 percentage points) higher rates than white-owned firms in small banks, meaning that the racial gap may be 3.07 percentage points larger in small banks than in large banks. However, the 3.07 percentage points are not statistically significant. So, we conclude that the difference at small banks is the same as large banks, 3.57

percentage points. Likewise, the additional .54 percentage points higher rates paid by Hispanic-owned firms over white-owned firms at credit unions compared to large banks are not statistically significant.

However, the CDFI interaction term is a statistically significant -2.91 percentage points, implying that at CDFIs, Hispanic-owned firms paid (3.57 percentage points – 2.91 percentage points) more than white-owned firms. The premium paid by Hispanic-owned firms over white-owned firms was lower at CDFIs. The fintech and nonbank finance company interaction terms are not statistically significant, meaning that the difference of 3.57% higher rate paid by Hispanic-owned firms compared to white-owned firms at large banks is not proven to differ at fintech lenders and nonbank finance companies. The same analytic approach is used for the other minority groups.

For brevity and clarity, we provide a brief overview of the remaining differences for the other minority groups, without expressing the specific numbers provided in Exhibit VIII. Black-owned firms paid the same interest rates as their white counterparts at large banks, small banks, and CDFIs, while paying higher interest rates than white counterparts at credit unions, fintech lenders and nonbank finance companies. Asian American-owned firms paid higher interest rates than their white counterparts at large banks. Because of the small sample sizes of Asian American-owned firms borrowing from the other lenders, we do not make any inferences about the results in those cases. The five lines below the interaction term indicate the difference between the lender and large banks in the interest rate paid by white-owned firms. For example, white-owned firms paid 1.19% less in small banks than large banks, but the difference is not statistically significant.

In summary, in the Hispanic firm to White firm comparisons, the rates paid by Hispanic-owned firms to each of the lender types are higher than we can explain in our statistical models. In the Black firm to White firm comparison, the rates paid by Black-owned firms to large banks are explained within our models (no mispricing indicated), and rates paid to large banks do not differ statistically from the rates Black-owned firms paid to small banks and CDFIs. However, the rates paid by Black-owned firms to credit unions, fintech lenders and nonbank finance companies are higher than those our models can explain. In

the Asian American firm to White firm comparison, we find that Asian American-owned firms pay higher interest rates to large banks than we can explain in our models. The sample of Asian American-owned firms that borrowed from other lenders is too small to make inferences.

C. Collateral & Requested vs. Granted Credit

Another key component of the credit agreement is the collateral. We analyze collateral in two statistical approaches. First, we use OLS to examine the required collateral relative to the loan amount. Second, collateral can also be framed in a binary approach: an outcome of "yes" or "no" regarding various forms of collateral committed for the loan. So, for binary collateral outcomes, we use Probit regressions of collateral required for the credit received by the borrowing firms. We estimated OLS and Probit regressions using all the control variables, to determine if, after considering the control variables, the membership in a minority group had any impact on the collateral associated with the credit.

Exhibits X-A and X-B report the results of collateral analyses. Exhibit X-A uses 50% owner definitions, while Exhibit X-B reports the robustness of those results using 51% ownership definitions. Lenders were more likely to require an outside co-signer on loans to each of the minority groups than their white counterparts, after adjusting for the full set of control variables. In addition, for Hispanic-owned firms more often the value of the collateral is higher than the loan amount (Probit) compared to white-owned firms. Regarding Black-owned firms, Exhibit II shows that 57% of Black-owned firms have blanket liens on their assets, which is the highest among all groups, while 30% of white-owned firms borrowed with blanket liens, the lowest of all groups. Exhibit X shows that the black-white differences in blanket liens are statistically significant after considering all the controls. For Asian American-owned firms, only the external party signature requirement that is higher compared to white-owned firms after considering all the controls. All other differences are not statistically significant. Native American-owned firms are less likely to have cases of both business and personal collateral, than white-owned firms, after considering all controls.

The bottom two analyses in Exhibit X-A and X-B examine the amount of credit initially requested relative to the amount of credit granted by the lender. The OLS analysis of Granted Amount/Requested Amount reports that none of the differences between each minority group and white-owned firms is statistically significant, after considering all the controls. The Probit regressions of whether Granted Less than Requested indicate that the Black-owned firms are less likely than white-owned firms to receive less credit than requested. No other minority group is found to differ from white-owned firms in this measure. Overall, we do not find consistent differences between minority groups and white-owned firms in the amount of loan granted relative to the amount requested.

D. Robustness Analyses Using Weights

We next present robustness analyses that consider the national distribution of firms by location and industry. While the more populated states tend to have more firms in our sample, our 2,784 firms do not fully mirror the U.S. distribution of minority and white-owned firms by number and industry. Above we examine the original firm data unaltered to maintain the statistical authenticity of the responses. This is our basic analysis. For the sake of verifying the robustness of our results, we include two separately weighted analyses of the relationships examined in the basic analysis. In both weighting analyses, weights are applied that mirror the national distribution of white-owned and minority-owned firms across the various states and industries.

However, we caution that the weighting process is constrained by the limitations of available data. The U.S. Census data, which is crucial for weighting, is incomplete in its state and industry-specific information, particularly for minority groups**.** In the cases where the distribution of firms for a minority group is incomplete (no information reported), we estimate based on the most recent earlier year for which there is a figure.

Exhibit XI-A and Exhibit XI-B report the results of the weighted analyses. Exhibit XI-A is calculated using the distribution across states for each of the five groups: white, Black, Hispanic, Asian

American and Native American. Exhibit XI-B also considers the national industry breakdown for each racial group in estimating the weights. These exhibits provide results of the full model, using all control variables. The loan rate and loan spread are reported for each comparison, as are all the measures of collateral used in the study. The results are consistent with those in the basic models above: The Hispanic-, Asian American- and Black-owned firms pay higher interest (as measured by the loan rate and the loan spread) than white-owned firms after controlling for the risk attributes; and regarding collateral, for each of the four minority groups the lenders are more likely than white-owned firms to require an external party signature after controlling for the risk attributes.

E. Principal Component Analysis

As mentioned above, loan terms are jointly determined and "packaged" together. For this reason, we seek to add robustness to our results above using Principal Component Analysis (PCA). PCA, originally introduced by Hotelling (1933), is a widely used technique for dimensionality reduction, and the different terms create the dimensions in the PCA analysis. PCA synthesizes a series of correlated variables into one or more composite variables, referred to as principal components, which capture the most salient sources of variation in a dataset.

Loan interest rate and collateral requirements are important outcomes related to loan quality and they are often correlated with each other. For example, bundles of various collateral values and interest rates are frequently offered as part of a loan package, and their determination is simultaneous. Focusing solely on one outcome would neglect the preferences of different racial groups in relation to the other outcome. To account for the simultaneity and correlation between these outcomes, we perform a PCA on all variables related to interest rate and collateral, encompassing a set of eight variables, including loan rate, loan spread, collateral requirement, collateral value, blanket lien requirement, business collateral requirement, personal collateral requirement, and both business and personal collateral requirements.

Using this analysis, we find that there is no evidence that racial and ethnic minority groups have greater collateral requirements than white-majority firms, and this finding is independent of the interest rate component. Hispanic, Black, and Asian minority groups have loans with higher interest rates than whites. These results align with our findings above. Appendix B details the statistical analyses related to PCA.

4. Conclusions

A. Findings

A major purpose of this study is to explore the economic impact of loan mispricing on diverse-owned companies in terms of interest rates and collateral required in obtaining credit. We found that for Hispanic-, Asian- and Black-owned firms, the interest rate paid was higher than for comparable white-owned firms, after adjusting for an extensive set of controls for risk that affect the interest rate on loans, including the firm's industry, financial attributes, owner traits, credit history and type of loan. We conducted robustness tests to verify the strength of these results.

Another component of the credit received by the firm is the collateral. We performed tests to determine if the collateral requirements were justified given the characteristics of the firm as enumerated above. We find that the only collateral requirement that has a consistent minority-white difference is that co-signatures from third parties are demanded more frequently for minority firms than is justified by our economic analysis. Unfortunately, the survey data do not have sufficient detail for us to pursue an estimate of the economic loss associated with the greater requirement for third party signatures across the minority firm borrowers. This is an important topic for future research.

Also, previous studies have found that minority borrowers are rejected for loans at a higher rate than white-owned firms of the same creditworthiness (e.g. Asiedu et al., 2012 and Blanchard et al., 2008). We did not examine and compare loan rejections for minority and white-owned firms. This is another important topic for future research. Such an analysis would update the 2003 relationships. We need to

understand the issues that minority firms face in financing their growth and seek to eliminate impediments to their growth that should not exist.

B. Estimates of Costs to Affected Businesses

Using a back-of-the-envelope calculation, we were able to estimate the additional amount in interest the minority firms paid over and above the rates that comparable white-owned firms paid for credit, after considering our controls. We find that the interest rate amount differential due to the race of the business owner totals $9.1 billion annually (Exhibit XII). The difference in the costs to each minority group is a result of the number of businesses that obtain loans annually, the average loan size of the group, and the mispricing differential estimated in this study. To place this gap into context, according to the Bureau of Labor Statistics (BLS), the median annual earnings for full-time workers in the US in 2023 were $58,019. Divide $9.1 billion by this amount and this translates into 156,845 job equivalents that the minority firms were unable to directly provide to their communities.

Exhibits

Exhibit I Summary Statistics on Loan Rate by Race

Panel A: Race	White	Hispanic	Asian	Black	Native	Total
Loan Rate (%)	6.74	8.74	9.16	8.60	7.33	7.86
Standard deviation	(4.36)	(9.10)	(8.02)	(6.81)	(5.91)	(6.82)
N	992	649	320	434	389	2,784

Exhibit II Other Loan Outcome Variables	Race					
	White	Hispanic	Asian	Black	Native	Total
Mean Values:						
Loan Spread (Loan Rate - Prime Rate) percent	1.722	3.121	3.866	3.374	2.089	2.603
Required Collateral Value Relative to Loan (Intervalled)	1.490	1.992	1.869	1.841	1.643	1.727
Granted Amount / Requested Amount	0.847	0.873	0.863	0.873	0.819	0.853
Fractions Yes:						
Required Collateral vs. Not	0.737	0.741	0.784	0.719	0.679	0.732
Required More Collateral than Loan Amount	0.057	0.191	0.106	0.180	0.121	0.122
Required Blanket Lien	0.296	0.507	0.431	0.565	0.265	0.398
Required Business Assets as Collateral	0.735	0.490	0.734	0.712	0.440	0.633
Required Personal Assets as Collateral	0.536	0.589	0.581	0.567	0.450	0.546
Required both Business and Personal Assets as Collateral	0.528	0.367	0.550	0.560	0.270	0.462
Granted Less than Requested	0.586	0.621	0.622	0.449	0.650	0.586
Lender Required External Party to Sign	0.387	0.676	0.731	0.829	0.730	0.611
N	992	649	320	434	389	2,784

Exhibit III Firm Characteristics	Race					
	White	Hispanic	Asian	Black	Native	Total
Business Age (years)	10.036	13.448	11.709	11.251	9.882	11.192
	(6.728)	(6.225)	(4.964)	(5.855)	(4.113)	(6.131)
Most Responsible Owner's Experience (years)	8.823	9.442	10.131	11.501	10.064	9.709
	(5.727)	(4.821)	(5.306)	(5.072)	(4.345)	(5.272)
Most Responsible Owner's Age (years)	42.392	43.846	48.184	41.180	41.460	43.078
	(7.224)	(9.930)	(9.915)	(8.218)	(7.398)	(8.670)
Most Responsible Owner's Ownership Percentage	77.505	42.542	54.975	53.901	65.388	61.392
	(31.614)	(21.861)	(21.101)	(21.493)	(26.280)	(29.622)
Sales Value (in $10,000)	897.157	1308.918	906.117	748.324	1390.479	1039.904
	(1271.8)	(1922.4)	(2372.8)	(1793.6)	(2217.1)	(1823.3)
Asset Value (in $10,000)	1608.683	1619.476	799.648	1583.986	2079.251	1580.108
	(2072.7)	(2092.9)	(1501.8)	(2811.0)	(2656.0)	(2264.2)
Firm Incurred Loss in 2021	0.085	0.180	0.147	0.237	0.111	0.142
Revenue stayed the same or grew from 2021 to 2022	0.762	0.613	0.688	0.629	0.674	0.686
# Employed stayed the same or grew from 2021 to 2022	0.783	0.613	0.597	0.664	0.681	0.689
Firm is in Good or Better Condition at yearend 2022	0.697	0.773	0.822	0.793	0.763	0.753
Limited Liability Company	0.435	0.670	0.756	0.624	0.519	0.568
Family Business	0.071	0.381	0.166	0.113	0.093	0.163
High Credit Score	0.766	0.407	0.463	0.320	0.496	0.540
Medium Credit Score	0.224	0.512	0.497	0.597	0.414	0.407
Low Credit Score	0.010	0.082	0.041	0.083	0.090	0.053
N	992	649	320	434	389	2,784
Standard deviations in parentheses						

Exhibit IV-A Summary Statistics: Lender Characteristics by Race

	Race					
	White	**Hispanic**	**Asian**	**Black**	**Native**	**Total**
Large Bank	0.128	0.622	0.925	0.776	0.853	0.537
Small Bank	0.090	0.046	0.013	0.023	0.010	0.049
Credit Union	0.272	0.092	0.028	0.092	0.039	0.142
CDFI	0.223	0.128	0.019	0.046	0.039	0.124
Fintech Lender	0.193	0.082	0.016	0.041	0.044	0.102
Nonbank Finance Company	0.095	0.029	0.000	0.021	0.015	0.046
Total	1.000	1.000	1.000	1.000	1.000	1.000
Length of Relationship with Borrower	3.057	5.284	4.672	4.980	4.868	4.315
	(3.051)	(4.103)	(3.640)	(4.911)	(4.526)	(4.034)
Deposit Concentration Index in County	0.176	0.180	0.178	0.177	0.205	0.181
	(0.101)	(0.107)	(0.099)	(0.119)	(0.139)	(0.112)
Number of Bank Branches in County	341.057	272.438	290.534	426.373	380.725	338.096
	(413.511)	(360.715)	(346.877)	(496.284)	(471.221)	(420.706)
N	992	649	320	434	389	2,784

Standard deviations in parentheses

Exhibit IV-B Summary Statistics: Loan Rate by Race and Lender Type

	Race					
Percent	**White**	**Hispanic**	**Asian**	**Black**	**Native**	**Total**
Large Bank	6.90	8.84	8.93	7.26	6.97	7.92
Standard deviation	6.32	9.06	7.94	5.19	5.28	7.14
N	127	404	296	337	332	1496
Small Bank	5.89	12.15	11.25	11.46	21.50	8.28
	4.27	11.89	12.84	11.33	9.15	8.31
N	89	30	4	10	4	137
Credit Union	7.12	11.04	12.50	11.70	11.65	8.48
	4.61	11.27	4.97	8.28	11.22	7.04
N	270	60	9	40	15	394
CDFI	7.38	7.66	13.65	11.37	6.71	7.76
	4.10	8.23	13.37	4.86	6.56	5.84
N	221	83	6	20	15	345
Fintech Lender	6.04	6.38	10.04	21.88	8.16	7.30
	3.37	5.94	4.46	11.17	5.84	6.22
N	191	53	5	18	17	284
Nonbank Finance Company	6.13	5.33	.	9.17	6.45	6.24
	1.66	4.43	.	5.23	1.86	2.72
	94	19	0	9	6	128
Total	6.74	8.74	9.16	8.60	7.33	7.86
	4.36	9.10	8.02	6.81	5.91	6.82
N	992	649	320	434	389	2784

Exhibit IV-C Loan Characteristics by Race

	Race					
	White	**Hispanic**	**Asian**	**Black**	**Native**	**Total**
Fraction:						
Loan vs. Line of Credit	0.917	0.826	0.800	0.823	0.830	0.856
New vs. Renewal	0.892	0.593	0.572	0.724	0.625	0.722
Purpose of Loan is Debt Consolidation	0.270	0.477	0.437	0.421	0.404	0.355
Fixed Rate Loan	0.906	0.629	0.759	0.855	0.879	0.813
Term of the loan (Months)	27.882	39.156	23.303	22.942	22.961	28.526
N	992	649	320	434	389	2,784

Exhibit V Control Variables

Firm Characteristics:	**Loan Characteristics:**
State of Firm's Headquarters	Year and Month of Loan
Industry	Loan vs. Line of Credit
Business Age	Purpose of Loan is Debt Consolidation
Most Responsible Owner's Experience	Fixed Rate vs. Variable Rate Loan
Most Responsible Owner's Age	Term of the loan (in months)
Most Responsible Owner's Percentage Ownership	
Sales Level (categories)	**Lender Characteristics:**
Assets Level (categories)	Lender type (category):
Firm Suffered Loss in 2021	Large Bank (Base category)
Revenue stayed the same or grew from 2021 to 2022	Small Bank
Employees stayed the same or grew from 2021 to 2022	Credit Union
In Good or Very Good Condition at yearend 2022	CDFI
Limited Liability Protection Firm	Fintech Lender
Family Business	Nonbank finance company
Credit score	Years of relationship with firm
Duns credit rating	Bank deposit concentration index in county
Woman-majority-owned	Number of bank branches in county

Exhibit VI Regressions Controlling for Different Characteristics. Minority vs. White Firms

Dep Var: Loan Rate	Model 1	Model 2	Model 3	Model 4	Model 5
Panel A					
Hispanic vs. White	2.0026**	2.3430**	2.6620**	2.8372***	2.9087***
	(0.9234)	(1.0678)	(0.9907)	(0.9854)	(0.9956)
Adjusted R^2	0.0206	0.0942	0.1544	0.2018	0.2123
N	1,641	1,641	1,641	1,641	1,641
Panel B					
Black vs. White	1.8639***	1.9852***	2.1188***	2.0053***	3.0893***
	(0.4687)	(0.5124)	(0.7415)	(0.6930)	(0.8492)
Adjusted R^2	0.0256	0.0444	0.1211	0.1463	0.1710
N	1,426	1,426	1,426	1,426	1,426
Panel C					
Asian vs. White	2.4219***	3.1231***	3.1949***	2.8458***	2.8815***
	(0.7679)	(0.9138)	(1.0042)	(0.9661)	(0.8325)
Adjusted R^2	0.0341	0.1077	0.1717	0.1971	0.2001
N	1,312	1,312	1,312	1,312	1,312
Panel D					
Native vs. White	0.5918	1.0220**	0.7642*	0.6510	1.1290
	(0.4708)	(0.4383)	(0.4459)	(0.4468)	(1.0911)
Adjusted R^2	0.0023	0.0583	0.1225	0.1451	0.1521
N	1,381	1,381	1,381	1,381	1,381
Control Variables					
State and Time Fixed Effects		x	x	x	x
Firm Characteristics			x	x	x
Loan Characteristics				x	x
Lender Characteristics					x
Standard errors in parentheses. Statisical significance: * .10 ** .05 ***.01					

Exhibit VII Robustnes Checks Using Firm 51% Ownership Definitions

Dep Var: Loan Rate	Model 1	Model 2	Model 3	Model 4	Model 5
Panel A					
Hispanic vs. White	1.2543	1.8299	2.1934	2.1405	2.5805*
	(0.9904)	(1.1599)	(1.3299)	(1.3711)	(1.4463)
N	1039	1039	1039	1039	1039
Panel B					
Black vs. White	1.4694***	1.6144***	1.4089	1.2733	4.1872***
	(0.5414)	(0.5760)	(0.8524)	(0.7701)	(0.9947)
N	964	964	964	964	964
Panel C					
Asian vs. White	2.2218***	2.8418***	2.5963**	2.4024**	3.5851***
	(0.8110)	(0.9677)	(1.1699)	(1.1840)	(0.8868)
N	945	945	945	945	945
Panel D					
Native vs. White	0.1718	0.5207	0.2200	0.1383	2.6105*
	(0.4746)	(0.4568)	(0.4542)	(0.4585)	(1.3074)
N	976	976	976	976	976
Control Variables					
State and Time Fixed Effects		x	x	x	x
Firm Characteristics			x	x	x
Loan Characteristics				x	x
Lender Characteristics					x
Standard errors in parentheses. Statisical significance: * .10 ** .05 ***.01					

Exhibit VIII Analyses by states that have the top 30% racial disparity index				
Dep var	**Hispanics vs. Whites**	**Blacks vs. Whites**	**Asians vs. Whites**	**Natives vs. Whites**
Minority	2.2304**	2.4279***	3.2919***	1.1301
	(0.9873)	(0.7236)	(0.9760)	(1.2149)
HighRacialDisparity*Minority	2.2636	1.8058***	-1.0410	-0.0032
	(1.7059)	(0.6280)	(1.4920)	(0.8317)
HighRacialDisparity	-2.1982**	0.0736	-2.2573**	1.6395***
	(1.0199)	(0.4002)	(0.8879)	(0.6040)
Adjusted R^2	0.2170	0.1751	0.2007	0.1514
N	1,641	1,426	1,312	1,381

Exhibit IX Lender Interaction Effects Added to Basic Model

Dep Var: Loan Rate	Hispanics vs. Whites	Blacks vs. Whites	Asians vs. Whites	Natives vs. Whites
Minority	3.5731***	0.5895	2.6551***	0.7244
	(1.2329)	(1.0616)	(0.8840)	(1.1117)
Small Bank*Minority	3.0689	4.5001	1.4790	14.0013***
	(2.3661)	(3.3365)	(2.6590)	(1.5123)
Credit Union*Minority	0.5382	3.1969*	0.3149	2.3315
	(1.5683)	(1.6556)	(2.8489)	(3.5924)
CDFI*Minority	-2.9093**	1.9211	2.3406	-1.0608
	(1.3765)	(1.5238)	(4.2601)	(2.9209)
Fin Tech*Minority	-2.3932	12.7471***	0.1324	-0.7767
	(1.9775)	(2.6414)	(1.7479)	(2.0745)
Nonbank*Minority	-1.7110	2.6211**	0.0000	-0.3626
	(2.0830)	(1.0503)	(.)	(1.6183)
Small Bank	-1.1966	-0.6502	-0.4056	-0.7949
	(1.0390)	(1.0416)	(1.0043)	(1.0872)
Credit Union	0.6901	0.3698	0.1200	0.7708
	(1.3782)	(1.1166)	(1.2815)	(1.2329)
CDFI	1.2188	0.3318	0.4417	0.8032
	(1.5536)	(1.2534)	(1.4485)	(1.3080)
Fin Tech	-0.3280	-0.7206	-0.6710	-0.2777
	(1.5190)	(1.2000)	(1.3808)	(1.2970)
Nonbank	-0.2984	-0.6880	-0.6369	-0.3348
	(1.6459)	(1.2758)	(1.5674)	(1.3959)
Control Variables	All			
Adjusted R^2	0.2195	0.2152	0.1983	0.1722
N	1,641	1,426	1,312	1,381

Standard errors in parentheses. Statisical significance: * .10 ** .05 *.01**

Exhibit X-A Collateral Comparisons: Minority vs. White Firms

Dependent Variable	Hispanic vs. White	Black vs. White	Asian vs. White	Native vs. White
Required Collateral Value Relative to Loan (Intervalled)	0.2898**	0.1488	0.2860	0.0967
	(0.1140)	(0.2016)	(0.2131)	(0.1785)
Required Collateral vs. Not	-0.0248	-0.0107	0.0311	-0.0136
	(0.0430)	(0.0652)	(0.0810)	(0.0493)
Require More Collateral than Loan Amount	0.0753***	0.0504	0.0282	-0.0264
	(0.0276)	(0.0385)	(0.0471)	(0.0358)
Required Blanket Lien	0.0109	0.1020*	-0.1180	-0.0953*
	(0.0453)	(0.0600)	(0.1016)	(0.0527)
Required Business Assets as Collateral	-0.2607***	-0.0270	-0.0173	-0.2427***
	(0.0536)	(0.0722)	(0.0887)	(0.0445)
Required Personal Assets as Collateral	0.0103	0.0145	0.0165	-0.0135
	(0.0474)	(0.0814)	(0.0845)	(0.0500)
Required both Business and Personal Assets as Collateral	-0.1814***	0.0002	-0.0046	-0.1756***
	(0.0602)	(0.0836)	(0.0890)	(0.0437)
Lender Required External Party to Sign	0.1184**	0.2589***	0.2069***	0.2609***
	(0.0510)	(0.0350)	(0.0413)	(0.0393)
Granted Amount / Requested Amount	0.1942	0.0180	0.0759	-0.0164
	(0.1519)	(0.0232)	(0.0512)	(1.2461)
Granted Less than Requested	0.0053	-0.1441***	-0.0528	-0.0545
	(0.0440)	(0.0320)	(0.0847)	(0.0655)
N	1641	1426	1312	1381
Control Variables	All	All	All	All
Standard errors in parentheses. Statistical significance: *.10 **.05 ***.01				

Exhibit X-B Collateral Comparisons: Minority vs. White Firms Robustness checks using 51% Ownership

Dependent Variable	Hispanic vs. White	Black vs. White	Asian vs. White	Native vs. White
Required Collateral Value Relative to Loan (Intervalled	0.1751	0.1028	-0.0703	-0.0270
	(0.1724)	(0.2848)	(0.2652)	(0.3166)
Required Collateral vs. Not	0.0087	0.0569	0.0262	0.0373
	(0.0483)	(0.0761)	(0.0810)	(0.0798)
Require More Collateral than Loan Amount	0.0687**	0.0435	-0.0005	-0.0400
	(0.0296)	(0.0510)	(0.0383)	(0.0450)
Required Blanket Lien	0.0309	0.0919	-0.1898**	-0.1134
	(0.0558)	(0.0637)	(0.0960)	(0.0853)
Required Business Assets as Collateral	-0.0004	0.0420	-0.0175	-0.1643*
	(0.0483)	(0.0775)	(0.0772)	(0.0849)
Required Personal Assets as Collateral	-0.0118	0.0936	0.0064	-0.0395
	(0.0522)	(0.0681)	(0.0861)	(0.0915)
Required both Business and Personal Assets as Collater	-0.0125	0.0820	0.0119	-0.1819*
	(0.0522)	(0.0671)	(0.0836)	(0.0950)
Lender Required External Party to Sign	0.1273**	0.2538**	0.2587**	0.3500**
	(0.0511)	(0.0424)	(0.0445)	(0.0818)
Granted Amount / Requested Amount	-0.0116	0.0071	-0.0156	0.1334
	(0.0435)	(0.0463)	(0.0493)	(0.1041)
Granted Less than Requested	0.1149**	0.0394	0.0432	0.2173**
	(0.0452)	(0.0427)	(0.0921)	(0.0665)
N	1039	964	945	976
Control Variables	All	All	All	All
Standard errors in parentheses. Statistical significance: *.10 **.05 ***.01				

Exhibit XI-A Weighted Regressions: Using Race-State Weights

Dep var	Hispanics vs. Whites	Blacks vs. Whites	Asians vs. Whites	Natives vs. Whites
Loan Rate	3.7351***	3.3082***	3.9554***	1.3963
	(1.2385)	(0.6926)	(0.9551)	(0.9967)
Loan Spread (Loan Rate - Prime Rate)	3.7083***	3.3057***	3.9850***	1.4255
	(1.2287)	(0.6889)	(0.9594)	(1.0062)
Required Collateral Value Relative to Loan (Intervalled)	0.1844	0.1829	0.4239**	0.2403
	(0.1342)	(0.1628)	(0.2051)	(0.1715)
Granted Amount / Requested Amount	0.3908	0.0180	0.0899**	-0.0192
	(0.2423)	(0.0258)	(0.0435)	(0.5446)
Required Collateral vs. Not	-0.0502	0.0113	0.0994	0.0280
	(0.0476)	(0.0639)	(0.0746)	(0.0532)
Requird More Collateral than Loan Amount	0.0631**	0.0513*	0.0650	0.0157
	(0.0295)	(0.0256)	(0.0506)	(0.0345)
Required Blanket Lien	-0.0342	0.1129**	-0.0924	-0.0571
	(0.0505)	(0.0477)	(0.0913)	(0.0550)
Required Business Assets as Collateral	-0.2759***	-0.0091	0.0602	-0.2056***
	(0.0679)	(0.0695)	(0.0805)	(0.0453)
Required Personal Assets as Collateral	-0.0414	0.0597	0.0909	0.0317
	(0.0590)	(0.0692)	(0.0895)	(0.0497)
Required both Business and Personal Assets as Collateral	-0.2024**	0.0381	0.0786	-0.1556***
	(0.0777)	(0.0669)	(0.0933)	(0.0425)
Granted Less than Requested	0.0281	-0.0913*	-0.0276	0.0151
	(0.0430)	(0.0524)	(0.0843)	(0.0572)
Lender Required External Party to Sign	0.1114***	0.3084***	0.1926***	0.2331***
	(0.0411)	(0.0449)	(0.0534)	(0.0449)
N	1622	1404	1294	1360
Control Variables	All	All	All	All
Standard errors in parentheses. Statistical significance: *.10 ** .05 ***.01				

Exhibit XI-B Weighted Regressions: Using Race-State-Industry Weights

Dep var	Hispanics vs. Whites	Blacks vs. Whites	Asians vs. Whites	Natives vs. Whites
Loan Rate	3.3733***	2.0552***	5.0559***	1.3299
	(0.9317)	(0.6055)	(1.3493)	(1.1203)
Loan Spread (Loan Rate - Prime Rate)	3.3252***	2.0654***	5.0960***	1.3689
	(0.9157)	(0.5957)	(1.3591)	(1.1335)
Required Collateral Value Relative to Loan (Intervalled)	0.1977	0.2020	0.5725**	0.0752
	(0.1896)	(0.1957)	(0.2322)	(0.1777)
Granted Amount / Requested Amount	0.1535	-0.0156	0.0729**	0.0264
	(0.1326)	(0.0249)	(0.0358)	(0.3500)
Required Collateral vs. Not	-0.0329	0.0104	0.1294	0.0125
	(0.0670)	(0.0735)	(0.0842)	(0.0683)
Require More Collateral than Loan Amount	0.0452	0.0421	0.0771	-0.0451
	(0.0279)	(0.0292)	(0.0575)	(0.0304)
Required Blanket Lien	-0.0018	0.0338	-0.1027	-0.0804
	(0.0635)	(0.0512)	(0.1020)	(0.0609)
Required Business Assets as Collateral	-0.2248**	-0.0092	0.0961	-0.2357***
	(0.0858)	(0.0787)	(0.0884)	(0.0463)
Required Personal Assets as Collateral	-0.0386	0.0242	0.1257	-0.0109
	(0.0787)	(0.0871)	(0.0789)	(0.0595)
Required both Business and Personal Assets as Collateral	-0.1641	-0.0003	0.1193	-0.2134***
	(0.1001)	(0.0849)	(0.0805)	(0.0398)
Granted Less than Requested	0.0370	-0.0288	0.0580	0.0700
	(0.0502)	(0.0634)	(0.1172)	(0.0553)
Lender Required External Party to Sign	0.1523***	0.2703***	0.1563***	0.2693***
	(0.0333)	(0.0486)	(0.0487)	(0.0478)
N	1622	1404	1294	1360
Control Variables	All	All	All	All
Standard errors in parentheses. Statistical significance: *.10 ** .05 ***.01				

Exhibit XII Additional Interest Paid From Mispricing

	A	B	C	D	E	F	G
				A X B X C			D X E X F
	2021	2022	2022	2022		Survey	
	Census ABS	Fed Res SBCS	Fed Res			Estimated	$000
	U.S. Total	Fraction	SBCS	Number of	$ Estimated	Mispriced	Total Annual
	Employer	Applied	Fraction	Approved	Average	Interest Rate	Difference
	Firms	For Credit	Approved*	Loans	Loan Size**	Difference	in Interest
White	4,409,715	0.40	0.820	1,446,387	414,796		
Hispanic	406,086	0.44	0.680	121,501	336,158	0.0355	1,451,660
Asian	637,539	0.48	0.690	211,153	776,816	0.0453	7,423,286
Black	149,326	0.40	0.500	29,865	276,518	0.0268	221,462
Native	28,338	0.46	0.560	7,300	489,811	0.0000	0
							9,096,408
	*Partially approved plus fully approved						
	**Fiscal year 2023 average SBA 7(A) loan for each racial group						

The annual business survey (ABS) of the US Census Bureau provides the number of small businesses by race/ethnicity in column A. The latest figures refer to 2021. Column B is from the Small Business Credit Survey (SBCS) of the Federal Reserve for 2023It shows the fraction of each group that applied for credit in 2022 (Misera, 2023, p. 23). It also shows, in column C, the fractions that were approved for loans in each of the groups (Misera, 2023, p. 38). Note that the fraction approved includes those credits that were fully approved and those that were partially approved. By multiplying through each of the foregoing columns, we obtain the estimated number of approved loans for each group, as show in column D. The average loan size is estimated based on the fiscal year 2023 average size of SBA 7(A) loans for each group sourced from:

https://careports.sba.gov/views/7a504Summary/Report?%3Aembed=yes&%3Atoolbar=no

These small business loans are often competitors with the conventional small business loans that we consider in this study. The average loan size for each group is in column E. Columns F shows the interest rate differential we estimated in the study, and column G reports the estimated annual total dollars paid in mispricing by each of the minority groups.

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Appendix A
Supplemental Robustness Tests

Exhibit A-1 Using D&B credit score control

Dep Var: Loan Rate	
Panel A	
Hispanics vs. Whites	8.4738***
	(1.4680)
Adjusted R^2	0.3210
N	420
Panel B	
Blacks vs. Whites	5.4778**
	(2.0598)
Adjusted R^2	0.2566
N	384
Panel C	
Asians vs. Whites	3.7748***
	(1.0069)
Adjusted R^2	0.2795
N	376
Panel D	
Natives vs. Whites	1.3870
	(1.0900)
Adjusted R^2	0.2942
N	393
Control Variables	
State and Time Fixed Effects	x
Firm Characteristics	x
Loan Characteristics	x
Lender Characteristics	x
D&B credit score	x

Appendix B

Using Principal Component Analysis to Consider the Joint Determination of Loan Terms

As mentioned above, loan terms are jointly determined and "packaged" together. For this reason, we seek to add robustness to our results above using Principal Component Analysis (PCA). PCA, originally introduced by Hotelling (1933), is a widely used technique for dimensionality reduction, and the different terms create the dimensions in the PCA analysis. PCA synthesizes a series of correlated variables into one or more composite variables, referred to as principal components, which capture the most salient sources of variation in a dataset. This method has found broad applications in constructing composite indices and summarizing complex data, including those related to economic development, quality of life, well-being (e.g., Dunteman, 1989; Ram, 1982; Slotted, 1991; Biswas and Caliendo, 2002; McGillivray, 2005; Haq and Zia, 2013)

The principal components are linear combinations of the original variables and are ranked according to the proportion of variance they account for. The first principal component explains the most substantial portion of the variance in the original variables, while the second captures the largest portion of the remaining variance, and so forth. These components are orthogonal to each other and provide a more concise representation of the original variables.

Loan interest rate and collateral requirements are important outcomes related to loan quality and they often correlated with each other. For example, bundles of various collateral values and interest rates are frequently offered as part of a loan package, and their determination is simultaneous. Focusing solely on one outcome would neglect the preferences of different racial groups in relation to the other outcome. To account for the simultaneity and correlation between these outcomes, we perform a PCA on all variables related to interest rate and collateral, encompassing a set of eight variables, including loan rate, loan spread, collateral requirement, collateral value, blanket lien requirement, business collateral requirement, personal collateral requirement, and both business and personal collateral requirements.

In Panel A of Exhibit B-1, the principal components derived from the original variables are presented. Given that eight original variables are utilized, the PCA generates eight components. Following the Kaiser rule, only components with high eigenvalues (typically exceeding 1) are deemed significant and selected as principal components (PCs). In our case, the first two components meet this criterion. As indicated in the "proportion" column, the first component explains 46.28% of the variance in the eight variables, followed by the second component, which explains 24.78% of the variance. Together, these two components account for 71.06% of the variance.

Panel B of Exhibit B-1 shows the loadings on the principal components, which provides information on which original variables contribute most to the first and second principal components. It is evident that the first component heavily loads on collateral-related variables, allowing us to define it as the collateral component of the loan quality. The second component exhibits significant loadings on loan rate-related variables; thus, we can define it as the loan rate component of loan quality. Due to the orthogonality of the PCs, the second PC (the loan rate component) is independent of the first PC (the collateral component). This feature allows us to examine the racial disparities in each component separately without concern for the correlation between the two. Consequently, we use these two principal components as dependent variables instead of the original variables to assess racial differences. Because the principal components represent composite indices of the original variables, our focus centers on the direction of the effect and its statistical significance in interpreting the results.

In Exhibit B-2, Panel A shows the results using the first principal component (the collateral component) as the dependent variable. There is no evidence that racial and ethnic minority groups have greater collateral requirements than white-majority firms, and this finding is independent of the interest rate component. However, majority woman owned firms do exhibit higher collateral requirements. Panel B shows the results using the second principal components as the dependent variable, especially focusing on the loan rate component, which is independent of collateral. All minority racial and ethnicity groups (Hispanic, Black,

Asian, Native) have loans with higher interest rates than whites. These results align with our previous findings.

Exhibit B-1 Principal Component Analysis: Use of PCA to Summarize Loan Quality

Panel A: Components				
Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.7025	1.7200	0.4628	0.4628
Comp2	1.9826	1.0577	0.2478	0.7106
Comp3	0.9249	0.1560	0.1156	0.8262
Comp4	0.7688	0.4008	0.0961	0.9224
Comp5	0.3681	0.1511	0.0460	0.9684
Comp6	0.2170	0.1941	0.0271	0.9955
Comp7	0.0229	0.0097	0.0029	0.9983
Comp8	0.0132	.	0.0017	1.0000
Panel B: Loadings on the Principal Components				
Variable	Comp1	Comp2	Unexplained	
Loan Rate	0.0669	0.7010	0.0091	
Loan Spread	0.0689	0.6980	0.0164	
Required Collateral vs. Not	0.4620	-0.0470	0.2055	
Required Collateral Value relateive to Loan (Intervall	0.3946	0.0022	0.4236	
Required Blanket Lien	0.2901	0.0520	0.6831	
Required Business Assets as Collateral	0.4165	-0.0927	0.3405	
Required Personal Assets as Collateral	0.4333	-0.0417	0.3015	
Required both Business and Personal Assets as Colla	0.4199	-0.0776	0.3352	
Panel B:				
Comp1 loads heavily on coll related variables				
Comp2 loads heavily on loan rate				
Panel A:				
Proportion of variation in the data explained by each component				
Kaiser Rule:eigenvalue>1				
There is significant break between 2 and 3. keep 2.				

Exhibit B-2: Regression Models using PCA

	Hispanics vs. Whites	Blacks vs. Whites	Asians vs. Whites	Natives vs. Whites	Woman Owned vs. Man Owned
Panel A: PC1-Collateral Component					
Minority	-0.2397	0.1332	0.1013	-0.3886*	1.3313***
	(0.2075)	(0.3432)	(0.3933)	(0.2013)	(0.3003)
Panel B: PC2 - Loan Rate Component					
Minority	0.7691***	0.5437***	0.6106***	0.3072	1.5253***
	(0.2395)	(0.1568)	(0.1643)	(0.1936)	(0.2780)
	1641	964	1312	1381	2392