Bank Competition and Entrepreneurial Gaps: Evidence from Bank Deregulation*

Xiang Li†

Abstract

I analyze the effects of bank competition on gender and racial gaps in entrepreneurship. By leveraging interstate bank deregulation from 1994 to 2021, I find that stronger bank competition increases the quantity and quality of banking services offered to minority borrowers. Developing a novel measure of discrimination using narrative information in the complaints filed with the Consumer Financial Protection Bureau, I demonstrate that bank competition reduces discrimination, alleviating the financial constraints of female and minority entrepreneurs. Stronger bank competition also reduces gender and racial gaps in firm performance and business equity accumulation, promoting wealth equality and fostering equitable economic growth.

*I would like to express my sincere gratitude to my dissertation committee, Thomas Chemmanur (chair), Philip Strahan, and Hassan Tehranian for their guidance and support. For helpful comments and suggestions, I want to thank Mario Amore (discussant), Rebel Cole (discussant), Evren Damar (discussant), Sebastian Doerr (discussant), Ran Duchin, Michael Ewens, Joan Farre-Mensa, Marina Gertsberg (discussant), Marco Giacoletti (discussant), Abhinav Gupta (discussant), Isaac Hacamo (discussant), Sabrina Howell, Erica Jiang (discussant), Chandrasekhar Krishnamurti (discussant), Josh Lerner, Xiaoyang Li (discussant), Jose Lopez (discussant), Mary Ma (discussant), Song Ma, Adrien Matray, Leiza Nochebuena-Evans (discussant), Lars Norden (discussant) Rodney Ramcharan, Antoinette Schoar, Maria Semenova (discussant), Edward Shore (discussant), Xuan Tian, Virginia Traweek (discussant), Marta Troya (discussant), Lewis Warren (discussant), Joy Wilkinson (discussant), Livia Yi, Feifei Zhu (discussant), seminar participants at Boston College, and conference participants at the SFS Cavalcade NA, AEA, FIRS, EuropeanFA, UNC Conference on Market-Based Solutions for Reducing Wealth Inequality, USC Marshall Finance PhD Conference, IBEFA, American Law and Economics Association Annual Meeting, CEPR European Workshop on Household Finance, CICF, Conference on Diversity, Equity and Inclusion in Economics, Finance, and Central Banking (Bank of Canada), CEPR Workshop on Incentives, Management and Organization & Entrepreneurship Economics, Community Banking Research Conference (Federal Reserve Bank of St. Louis), HEC Paris Banking in the Age of Challenges Conference, SOLE, FDIC Bank Research Conference, Census SIPP Conference, Inter-Finance PhD seminar, WEFI Entrepreneurship PhD workshop, Law and Macro Conference (Wharton), Yale YES, LBS TADC, RES Symposium of Junior Researchers, FMA, AFBC, FMCG, Annual Boca Corporate Finance and Governance Conference, ICEF-CInSt International Finance Conference, New Zealand Finance Meeting, Conference on Asia-Pacific Financial Markets, Greater China Area Finance Conference, International Conference in Venice on Long Run Risks, China International Risk Forum, International Network for Economic Research, and Research Symposium on Finance and Economics. This paper was awarded the USC Marshall PhD Conference in Finance Best Paper Award, the New Zealand Finance Meeting Best Paper Award (First Prize), the Conference on Asia-Pacific Financial Markets Doctoral Student Best Paper, and FMCG Best PhD Paper Award.

†Finance Department, Carroll School of Management, Boston College, Chestnut Hill, MA 02467, Email: xiang.li.5@bc.edu.

1 Introduction

Entrepreneurship plays a vital role in stimulating economic growth through its significant contributions to job creation and innovation (Chemmanur and Fulghieri (2014); Haltiwanger, Jarmin, and Miranda (2013)). Despite its benefits, entrepreneurship exhibits pronounced racial and gender gaps (Gompers and Wang (2017)). Reducing these gaps can yield substantial effects on economic growth, the creation of jobs, and inequality. This underscores the importance of understanding the barriers that impede business formation among minorities and women (Ewens (2022)).

In this paper, I examine how bank competition affects women's and minorities' propensities to become entrepreneurs by mitigating financial friction. To establish a causal relationship between access to finance and gaps in entrepreneurship, I leverage interstate bank deregulation that occurred from 1994 to 2021. My paper showcases that bank deregulation narrows gender and racial disparities in entrepreneurship. It fulfills this role through three main channels: enhancing the quantity and quality of banking services and reducing discrimination within the financial market. Furthermore, equitable access to finance narrows the gaps in firm performance and thus facilitates the accumulation of business equity for female and minority entrepreneurs.

I focus on bank financing due to its pivotal role in entrepreneurial activities. The lack of startup capital has long been acknowledged as a critical factor impeding the success of businesses, particularly for minorities (Fairlie and Robb (2010)). Among different types of capital, Robb and Robinson (2014) find that entrepreneurial firms rely heavily on bank financing instead of equity financing and access to bank loans increases the size and the quality of firms. Nevertheless, various studies indicate that minorities and women are disadvantaged groups in the lending market when compared with Whites and men after controlling for creditworthiness (Alesina, Lotti, and Mistrulli (2013); Asiedu, Freeman, and Nti-Addae (2012); Blanchflower, Levine, and Zimmerman (2003); Fairlie, Robb, and Robinson (2022); Tootell (1996)), which may impose limitations on the financing capabilities of minorities and women to establish a startup. Financial frictions, such as credit rationing resulting from discrimination or bias, may be especially binding on these disadvantaged groups. Bank competition has the potential to alleviate barriers that hinder entrepreneurial opportunities for disadvantaged groups by allocating capital to these underprivileged groups

with productive projects, thus reducing inequality. Therefore, understanding the effect of bank credit supply is of paramount importance. This paper is the first to document that access to bank loans plays a pivotal role in diminishing gender and racial gaps in entrepreneurship.

My study comprises three parts. In the first part of my paper, I establish that the relaxation of regulation reduces entrepreneurial gaps by instigating an exogenous improvement in credit accessibility for women and minority entrepreneurs. First, following Rice and Strahan (2010), I construct a time-varying index to capture exogenous shocks to the supply of banking credit from 1994 to 2021 based on the 1994 Interstate Banking and Branching Efficiency Act (IBBEA) and the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act). Effective in 1994, the IBBEA legalized interstate bank branching but allowed states to establish barriers to the entry of out-of-state banks. Over the subsequent years, several states gradually reduced these barriers. In 2010, the Dodd-Frank Act further eliminated the de novo interstate branching restrictions on a nationwide scale. Using this index and detailed household-level data from the Survey of Income and Program Participation (SIPP), I discover that the deregulation of interstate branching contributes to the reduction of gender and racial gaps in entrepreneurship due to a decrease in discrimination. After a state undergoes full deregulation, relative to their fully regulated counterparts, the probability of women or members of minority groups becoming entrepreneurs increases by 1.2%, which is equivalent to a 40% reduction in the gender gap and a 55% reduction in the racial gap in entrepreneurship. I also find that economies characterized by high levels of discrimination or bias against women and minorities witness a more substantial reduction in gaps in business formation after bank deregulation. This piece of evidence complements Becker's (1957) argument that financial sector deregulation is expected to reduce discrimination due to the intensification of competition. Besides, the deregulation exhibits a greater strength effect in industries with higher dependence on external financing, suggesting that the relaxation of financial constraints narrows these gaps.

Second, I provide evidence demonstrating that bank deregulation reduces the gaps in startup capital between entrepreneurs, thus corroborating that bank competition can eliminate the financial barriers to entry for aspiring women and minority entrepreneurs who were previously subject to loan rationing by banks before deregulation.

In the second part, I identify channels in which bank deregulation reduces en-

trepreneurial financing gaps. I provide evidence by demonstrating that bank deregulation reduces racial gaps in access to the financial market by improving the quantity and quality of banking services. First, exploiting the deregulation index and the data from the Federal Deposit Insurance Corporation (FDIC), I find that bank deregulation leads to an increase in the density of bank branches in counties with high proportions of minority borrowers. Furthermore, by integrating this index with the household-level data I show that bank competition increases the probability of financial inclusion for minorities in comparison to their White counterparts. This result suggests that bank competition enhances the quantity of banking services for minorities who were previously underserved by mainstream financial service providers.

Second, I utilize data from the Consumer Financial Protection Bureau (CFPB) to assess the quality of banking services using the total number of consumer complaints against banks about fraud, poor customer service, and misselling (Begley and Purnanandam (2021)). The findings reveal that deregulation improves the quality of banking services in zip codes with high minority shares of the population.

Third, I introduce a novel measure of discriminatory treatment using the narrative information along with the complaints provided by the CFPB dataset based on the textual analysis method. The analysis conducted using this novel measure shows that increased competition diminishes the occurrence of discrimination complaints, especially in regions with a high proportion of minority consumers. Overall, my paper indicates that competition can improve the quantity and quality of bank services within minority communities.

In the last part, I find the effect of bank deregulation on firms' performance and business equity accumulation. First, I document the existence of gender and racial gaps in entrepreneurial firm performance, which aligns with previous findings (Fairlie and Robb (2007), Fairlie and Robb (2009)). Then, I demonstrate that the deregulation of interstate branching reduces the performance gap between firms owned by privileged entrepreneurs (male and White entrepreneurs) and underprivileged group-owned firms (female and minority entrepreneurs). This effect was particularly prominent during the financial crisis when financial frictions were exceptionally high and credit was in short supply.

Second, I find that the narrowing of entrepreneurial gaps in firm performance leads to a reduction in the inequality of business equity accumulation and wealth. My analysis highlights the economic significance of entrepreneurial gaps in the context of business equity

accumulation. The gender and racial gaps in business equity account for 49% and 26%, respectively, of the gaps in wealth accumulation. In fully deregulated states, wealth gaps can be reduced by 12% as a result of narrowed gaps in business equity in comparison to fully regulated states.

Overall, I document that the marginal benefits of financial inclusion for female and minority entrepreneurs who are shocked by changes in supply-side credit are significant. My results suggest that female and minority entrepreneurs face financial constraints and stand to gain from equitable access to finance.

To rule out alternative hypotheses, I conduct several tests. I first try to mitigate selection bias and the concern of reverse causality. I do not find evidence that women or minorities are more likely than men and Whites to reside in or relocate to states with fierce bank competition. As for reverse causality, I do not find evidence supporting the notion that the implementation of bank deregulation is correlated with state-level entrepreneurial gaps. Second, I demonstrate the robustness of my entrepreneurship findings by controlling for metropolitan statistical areas (MSA)-income decile-year joint fixed effects. By construction, MSAs cluster adjacent territories with similar social and economic conditions. Therefore, to ensure that localized economic shocks do not drive the results, I compare the entrepreneurial gaps within the same MSA that spans the border of two states with different levels of bank deregulation. Finally, I adopt an approach informed by the works of Scharfstein and Sunderam (2016) and Buchak and Jørring (2021), crafting a quasi-random identification strategy based on incidental mergers and acquisitions (M&A) among local banks and find robust results.

The rest of the paper is organized as follows. Section 2 relates my paper to the existing literature and its contribution relative to this literature. Section 3 provides a comprehensive description of the institutional setting, as well as details regarding the data and variable construction. Section 4 outlines my empirical tests and results on the effects of bank deregulation on entrepreneurial activity gaps. Section 5 presents my empirical tests and results on the effects of bank deregulation on both the quantity and quality of financial services offered in minority communities. Section 6 reports the effects of bank deregulation on entrepreneurial firm performance gaps. Section 7 concludes.

2 Related Literature and Contribution

My paper contributes to the literature on bank deregulation and entrepreneurship in several ways. First, my paper provides new insight into the determinants of gender and racial gaps in entrepreneurship. Recent articles explore how to motivate female entrepreneurs from the following perspectives: reproductive rights (Zandberg (2021)), equal inheritance rights (Naaraayanan (2019)), network frictions (Howell and Nanda (2022)), career risk (Gottlieb, Townsend, and Xu (2022)), and gender stereotypes of venture capital investors (Ewens and Townsend (2020); Hebert (2020)). However, despite bank loans being the primary source of capital for entrepreneurial firms, the role of bank financing is under-researched. My paper fills in the gap and provides evidence that local bank competition also matters for both gender and racial gaps and underscores the necessity for policy interventions aimed at promoting financial inclusion as a means to reduce these gaps.

Second, my paper makes a dual contribution to the existing literature that investigates the impact of bank competition on discrimination in two ways. To start with, using the unexplained racial gap in outcome variables as an indirect measure of discrimination to detect discriminatory treatment is challenging due to the omitted variables.[1] To the best of my knowledge, my paper is the first to develop a novel and direct measure of discrimination by employing textual analysis of the narrative information derived from complaints against banks. This method has the potential for application in other settings, considering the widespread availability of unstructured textual data.[2] Second, my results complement previous studies that demonstrate the capacity of competition to mitigate discrimination. Financial economists typically focus on the effect of bank competition on wage inequality and labor participation ratio through the standard Beckerian framework that predicts financial sector deregulation will lead to a reduction in labor market discrimination because of intensified competition (Becker (1957)). Black and Strahan (2001) find that bank deregulation diminishes the wage gap between men and women, which can be attributed to

[1] Bartlett et al. (2022) find the unexplained racial gaps in interest rates after controlling for credit risks of borrowers and argue that banks discriminate in the mortgage lending market. However, Bhutta and Hizmo (2021) conjecture that differences in discount points offset these racial gaps in interest rates. Their results do not support that minorities are discriminated against by banks after controlling for discount points.

[2] For example, we can use reviews from consumers (such as the complaints filed to the Better Business Bureau (BBB)), employees (Glassdoor provides company reviews from current and former employees), and other stakeholders to detect discriminatory or unfair treatment.

the increased cost associated with discrimination against female bank employees. Levine, Rubinstein, and Levkov (2014) document that bank competition reduces the wage gap between Black workers and White workers by boosting the entry of entrepreneurial firms and reducing racial discrimination in the labor market. There is, however, little evidence on how bank competition reduces discrimination or bias in the financial market. My paper is the first one to utilize the CFPB complaint data to show how bank competition reduces discrimination complaints within the financial market.

Third, my paper complements the literature on the real effect of bank deregulation. So far, this literature documents that bank reform enhances the efficiency of capital allocation and thus boosts economic growth and entrepreneurial activities (Amore, Schneider, and Žaldokas (2013); Bai, Carvalho, and Phillips (2018); Black and Strahan (2002); Cetorelli and Strahan (2006); Chatterji and Seamans (2012); Cornaggia et al. (2015); Fonseca and Matray (2022); Hombert and Matray (2017); Jayaratne and Strahan (1996); Kerr and Nanda (2009); Krishnan, Nandy, and Puri (2015)). However, there is a lack of comprehensive understanding regarding whether or how bank deregulation contributes to economic growth with equity and inclusion. My paper shows that deregulation serves as a catalyst for equitable development by securing equal rights to access finance. In addition to the well-established improved capital allocation channel, I find that bank competition can influence economic growth through talent allocation by expanding the range of career choices available and shaping economic opportunities for disadvantaged yet talented groups.[3]

Fourth, my paper also adds to the literature that explores the impact of deregulation on income inequality. Unequal access to finance has long been acknowledged as a prominent driver of persisting income inequality. Financial deregulation can reduce inequality in many ways (see Beck, Demirgüç-Kunt, and Levine (2007) for a detailed survey of this strand of literature). Access to finance can help poor people invest in physical and human capital (Célerier and Matray (2019); Sun and Yannelis (2016)). Beck, Levine, and Levkov (2010) find that bank deregulation reduces income inequality by boosting the labor demand and wage rates of low-skilled workers. Despite witnessing the participation rate of the

[3]Financial friction has the potential to decrease economic efficiency when the productive projects of underprivileged individuals are not pursued, leading to a misallocation of their talents caused by financial constraints (Piketty (2000)). Hsieh et al. (2019) construct a model and estimate that a significant portion, ranging from 20% to 40%, of growth in aggregate market output per person can be explained by minorities and women opting for highly skilled occupations and the accompanying improved talent allocation.

disadvantaged group (women and minorities) in the labor market approaching that of the advantaged group (men and Whites) over the past 50 years, there continues to be an underrepresentation of disadvantaged groups in highly skilled occupations, particularly in the field of entrepreneurship. Theory shows that financial friction may lead to persistent income and wealth inequality when talented individuals, who are financially constrained, are impeded from becoming entrepreneurs (Banerjee and Newman (1993)). My paper empirically tests and validates these theoretical predictions. It provides a crucial yet relatively underexplored mechanism by which access to finance can contribute to reducing inequality through its effects on the convergence in occupational distribution, especially in entrepreneurial career choices.

Finally, I update the bank deregulation index developed by Rice and Strahan (2010). Their index is limited to data up until 2005. I extend the bank competition index to 2021 to track the changes in bank deregulation in recent years. Researchers may utilize the extended index to investigate the impact of bank competition within a broader context (e.g., during the period of financial crisis and the COVID-19 pandemic). My index may hold potential for studying the effect of the new generation of bank regulation law- the Dodd-Frank Act- whose influence is still controversial and debatable.[4]

3 Institutional Setting and Data

In this section, I provide an overview of the legislative history of bank deregulation spanning from 1994 to 2021 and construct the bank branching deregulation index. Subsequently, I describe the data utilized in my analysis to examine the effect of bank deregulation on entrepreneurial gaps.

[4]The Dodd-Frank Act aims to mitigate systematic risks in the financial system, which are believed to be responsible for the financial crisis of 2008. However, the efficacy of this act is challenged, and there are growing concerns about its negative impact on small businesses and banks. For example, Bordo and Duca (2018) find that the Dodd-Frank Act reduced small business formation by reducing banks' incentive to extend loans to small businesses.

3.1 Bank Deregulation Index

There have been two important deregulatory laws in U.S. history which I exploit in my empirical analysis: The Riegle-Neal Interstate Banking and Branching Efficiency Act (IBBEA) and the Dodd-Frank Wall Street Reform and Consumer Protection Act (the Dodd-Frank Act). In this subsection, I discuss each of these acts in turn and elucidate their role in my empirical analysis.

3.1.1 The Riegle-Neal Interstate Banking and Branching Efficiency Act (IBBEA) of 1994

Before the Riegle-Neal Interstate Banking and Branching Efficiency Act (IBBEA) of 1994, banks were prohibited from branching across state lines. However, with the passage of this act, banks located outside the state may become eligible to open branches across state lines without requiring prior permission. Although IBBEA enabled interstate branching, states have the discretion to use the four important provisions within the act to either restrict or increase the cost of out-of-state entry: (1) the minimum age requirement for the target bank of interstate acquirers, (2) the state permission of de novo interstate branching, (3) the state permission of interstate branching by acquiring a single branch or portions of an institution, (4) the statewide deposit cap on branch acquisitions. Following the implementation of the IBBEA, states retained the authority to revise each provision. Between 1994 and 2021, 47 states relaxed their banking regulation constraints, and 39 states modified their provisions more than once, showing that the deregulation process is gradual and mild (see Table 1).

[Insert Table 1 about here]

Following Rice and Strahan (2010), I construct the bank competition index ranging from 0 to 4 based on these four provisions. If a state has no interstate branching restrictions, the index is set to zero. If a state has any of the four restrictions, I add one to the index. For example, one will be added to the index: (1) if the minimum age requirement on target banks of interstate acquisition is three years or more; (2) if de novo interstate branching is not allowed in a state; (3) if an out-of-state bank cannot enter the local market via the acquisition of branches instead of buying the whole bank; (4) if the deposit cap imposed by the state is less than 30%. By definition, a smaller index value indicates greater competition due to relaxed restrictions on the entry of out-of-state banks, which poses a challenge to

local and community banks.

3.1.2 The Dodd-Frank Wall Street Reform and Consumer Protection Act

Section 613 of the Dodd-Frank Act grants out-of-state banks the authority to establish a de novo branch in any other state as if they were chartered in that state. The enactment of the Dodd-Frank Act in 2010 removed the barrier to de novo interstate branching, granting banks greater access to and the ability to compete within national markets. The introduction of the Dodd-Frank Act was primarily motivated by the Great Recession, and its principal aim was to foster financial stability and safeguard consumers against abusive financial services and products. This nationwide change in law was beyond the control of any state government and, therefore, can be considered plausibly exogenous to the local economic conditions and entrepreneurial financing needs. I subtract one from the bank deregulation index if a state did not allow de novo branching before the Dodd-Frank Act to measure the effect of this law shock.

Prior to my study, scholars studying the real effect of bank deregulation or competition, simply rely on the bank deregulation index developed by Rice and Strahan (2010). However, their index only covers the period until 2005, capturing 61% of regulation changes that occurred from 1994 to 2021. To take advantage of their index, scholars either restrict their sample period to years before 2005 or assume no further deregulation occurred after 2005, which may partially capture or potentially introduce bias to the true effect of bank competition. In this study, I extend the bank competition index to the year 2021 by using the legal research database Westlaw to examine the changes in bank deregulation in recent years (see Table 1 for the deregulation index and Table A2 in the Appendix for the underlying detailed law changes after 2005).[5] Researchers can exploit my comprehensive index to evaluate the overall impact of bank competition without bias. My index's long track record of regulation can be applied in a wide range of contexts (e.g., the effect of bank regulation during the financial crisis period and the COVID-19 pandemic period).

To validate the extended bank deregulation index, I check whether interstate branching deregulation has boosted the growth of interstate branches. Bank branch information is

[5]Westlaw is an online legal research data and service provider widely utilized by lawyers, legal professionals, and researchers. In this study, I collect information on the changes and effective dates of state and federal statutes related to bank deregulation from this database.

collected from the Summary of Deposits (SOD) provided by the FDIC. Figure 1 illustrates the trend of total interstate branches from 1994 to 2021. During this period, the total number of interstate branches increased. Although the number of total branches declined after the financial crisis, the share of interstate branches actually increased, which has created pressure on local non-interstate branches.

[Insert Figure 1 about here]

3.2 SIPP Data

To investigate whether bank deregulation reduces entrepreneurial gaps, I use household-level survey data from the SIPP covering the 1990-2019 period.[6] This dataset is well-suited for my research because of its three unique characteristics. First, its longitudinal survey enables me to analyze the dynamic transition of households to entrepreneurs and the corresponding capital accumulation process. The longitudinal feature is essential in the context of my study, given that the effect of credit accessibility on entrepreneurial activities may take time to materialize. Second, the comprehensive nature of this survey makes it possible for researchers to collect multi-dimensional information at the individual level, including demographic characteristics, job status, financing conditions, and linked entrepreneurial business performance. The extensive historical coverage of this dataset allows me to examine the long-term and overall effects of bank deregulation without bias. I exclude individuals younger than 22 years old (individuals currently in school) and older than 60 years old (individuals nearing retirement). This filtering process results in a final sample of 326,809 unique individuals.

Table 2 presents summary statistics for the main variables and control variables used in the analysis. The sample consists of 326,809 individuals, with 51% being male and 29% belonging to minority groups (nonwhites). Panel A shows that the unconditional likelihood of transition into entrepreneurs within three years is 6.1% for men and 4.0% for women.

[6] I use the following panels: 1990, 1991, 1992, 1993, 1996, 2001, 2004, 2008, 2014, 2018, 2019. In each running panel, the SIPP surveyed approximately 30,000 households over several waves (4 to 16 waves) for 2 to 4 years. From 1990 to 2008, each wave comprises core surveys that gather sociodemographic and income information on households and topical surveys that cover information on various topics. After the 2008 panel, the SIPP combines the topical surveys with the core surveys. I take advantage of the core surveys to obtain household employment status and sociodemographics and the Asset and Liabilities topical survey to collect balance sheet information for each household.

Additionally, I document a 1.4% racial gap in the probability of starting a business. In terms of other sociodemographic features, minorities exhibit a lower likelihood of homeownership and possess less education and employment history compared to their White counterpart. Panel B of Table 2 illustrates the economic conditions and financial well-being of these individuals. In most cases, men and Whites tend to have higher labor incomes and better access to finance than women and minorities. Especially the average secured business debt owed by male entrepreneurs is three times as large as that owed by female entrepreneurs. The business debt used to support entrepreneurship raised by minority entrepreneurs is also less than half of the business debt borrowed by White entrepreneurs. However, this does not necessarily suggest that men and Whites are overindebted, as their business equity is two times larger than that of women and minority business owners. These gaps in business equity are significant and account for 49% of the gender gap and 26% of the racial gap in household net worth. Panel C of Table 2 summarizes the data concerning the characteristics of firms founded by households that already operate businesses when they enter the sample and participate in the interviews. The majority of the firms in my sample have fewer than 25 employees, indicating that the average size of businesses in my sample is small. In line with previous literature (Fairlie and Robb (2007), Fairlie and Robb (2009)), I present the evidence of performance gaps based on firm size and profit amount between male (White) entrepreneurs and female (minority) entrepreneurs. Table A1 in the Appendix gives detailed definitions of variables.

[Insert Table 2 about here]

3.3 CFPB Complaint Data

The CFPB is a regulatory agency created under the Dodd-Frank Act in 2010. As an independent watchdog agency, its primary goal is to protect consumers from unfair, deceptive, or abusive practices and pursue legal action against companies that violate the law. The CFPB has established a mechanism for consumer grievances, allowing individuals to file complaints against financial institutions through an online system accessible on the CFPB website. The complaint database encompasses various financial products and serves as a tool the CFPB uses for its enforcement actions against banks.[7] The CFPB discloses the

[7]For further information regarding the complaint dataset, see Begley and Purnanandam (2021).

narrative information alongside the complaints on its website, which enables me to measure the quality of banking services and identify any discriminatory practices within the financial system using textual analysis.

4 Bank Deregulation and Entrepreneurial Activity Gaps

4.1 Startup Creation

4.1.1 Specification

I commence my analysis by examining the change in relative entrepreneurial choices of minorities and women after deregulation, comparing them with those of Whites and men. These staggered shocks are crucial in comparing individual entrepreneurial choices before and after deregulation, as they enable better isolation of the effects of these events from other potentially confounding changes that may impact economic conditions in a state. I test how bank competition affects startups in their creation in this section and test its impact on startups' development in section 6.[8]

I begin my investigation of the effects of bank competition on entrepreneurship by fitting the following linear probability econometric model:

$$\begin{aligned} Entrepreneur_{i,s,(t+1,t+3)} =& \beta_1 Dereg_{s,t} \times Minority_i + \beta_2 Dereg_{s,t} \times Gender_i + \\ & \gamma_1 Minority_i + \gamma_2 Gender_i + FEs + \alpha_{s,t} + \varepsilon_{i,s,t} \end{aligned} \tag{1}$$

where $Entrepreneur_{i,s,(t+1,t+3)}$ is a dummy variable that takes the value of 1 if a resident i in state s establishes a startup within three years after the first interview (startup creation period: year $t+1$ to year $t+3$).[9] $Dereg_{s,t}$ is the time-varying deregulation index at the state level. To facilitate the interpretation of my results, I reverse the bank competition index ranging from 0 to 4. In this reversed scale, 0 is assigned to fully regulated states, while 4

[8] I build a cross-sectional sample based on the SIPP data since households are surveyed and tracked for less than four years. Due to the limited time variations at the individual level, I am unable to create a panel dataset.

[9] Parker (2018) reports that the median time required by an entrepreneur to initiate a business exceeds one year. For robustness, I change the time horizon of the startup creation period to one year or two years and find similar results.

represents fully deregulated states. Therefore, a smaller index value implies more stringent regulation in my specification.[10] The indicator variable $Minority_i$ ($Gender_i$) is equal to one if households are minorities (women). Joint state-time fixed effects $\alpha_{s,t}$ are included to capture local economic and political conditions that may impact entrepreneurship. I include numerous fixed effects as in equation (1): income deciles fixed effects, family structure, age, homeownership, education, marital status, and employment conditions.[11] I interact state-year joint fixed effects with income deciles fixed effects to absorb every unobserved heterogeneous time-varying local shock across different income groups. The inclusion of these fixed effects allows me to better control for confounding factors that influence entrepreneurial career choices. Standard errors are two-way clustered by state and year to control correlation within states and over time.[12] To identify my key coefficients β, I rely on comparing the entrepreneurial gaps between advantaged households and disadvantaged households with similar sociodemographic features and income in a treated state before and after bank deregulation, relative to a group of control states that do not experience regulatory changes. Positive coefficients on the interaction terms between demographics and the bank deregulation index imply that in states more open to branching, disadvantaged groups are more likely to engage in entrepreneurship compared to their privileged counterparts.

4.1.2 Bank Deregulation and Startup Creation

Table 3 reports the results of my baseline regressions, which show the positive, significant, and robust effect of bank deregulation on reducing the gender and racial gaps in entrepreneurship.

[Insert Table 3 about here]

In Column (1) of Table 3, I include two indicators for gender and race of individuals and state-year joint fixed effects. Controlling for state-year joint fixed effects enables me to compare individuals in the *same* state-year. The coefficients on the variables *Female* and *Minority* are -0.022 and -0.014 respectively, each significant at the 1% level. These results suggest that women and minorities are 44% and 28% less likely, respectively, to become

[10] The reversion of the bank deregulation index does not impact my main results. Even if I do not reverse the index, my economic conclusion still holds.

[11] Unemployed individuals are less inclined to start big-scale firms because their start-up capital is limited (Hombert et al. (2020)).

[12] I find similar results by clustering standard error at the state level.

entrepreneurs compared to their counterparts, men and Whites. The economic magnitudes are derived from the ratio of each coefficient to 0.050.[13] In Column (2), I introduce the interaction terms between the bank deregulation index and gender or race to study the effect of bank deregulation. The coefficients on the interaction terms are 0.3% and 0.4% for gender and race, respectively. Given that the mean value of transition into entrepreneurs is 5%, these coefficients suggest that each step of bank deregulation enhances the probability of women and minorities becoming entrepreneurs by 6% and 8% respectively, relative to their privileged counterparts. The coefficients are also economically significant regarding the gender and racial gaps: a one-unit increase in bank competition can diminish the gender and racial gaps by 12% and 20%, respectively.[14]

In Columns (3) to (4), a large set of household-level fixed effects and state-year-income decile joint fixed effects are introduced to control demand for bank credit and confounding factors that may impact entrepreneurship. The results are stable and robust, suggesting that deregulation reduces gender and racial gaps even after accounting for household-level characteristics. The inclusion of these stringent fixed effects allows for the computation of entrepreneurial gaps by comparing individuals within the same income decile-state-year. In this case, each step of bank deregulation diminishes the entrepreneurial gaps between individuals within the same income-decile-state-year relative to the entrepreneurial gaps between individuals with the same sociodemographics and income level in the same year but residing in a state that does not undergo deregulation.

Column (5) introduces MSA-year-income decile fixed effects and excludes observations with unavailable MSA information.[15] MSAs are integrated geographical regions characterized by relatively high population density, including at least one core area and adjacent territory that shares economic and social connections with the core. I include MSA-year-income decile joint fixed effects to control time-varying unobservable factors across MSAs, such as the local labor market conditions that are intertwined with entrepreneurship. MSAs are considered representative of the local labor market due to the close commuting ties within MSAs. By including these fixed effects, I can identify the effect of bank deregulation by comparing individuals who reside in the same MSA but are located in two different states.

[13] 0.050 is the mean value of my dependent variable, reported in the last row in Table 3.

[14] The reduced gender gap = the coefficient on $Dereg \times Female(\beta_2)$ / the coefficient on $Female(\gamma_2)$. Similarly, the reduced racial gap = the coefficient on $Dereg \times Minority(\beta_1)$ / the coefficient on $Minority(\gamma_1)$.

[15] Starting from the 2004 wave, the MSA information is not reported in the SIPP dataset.

My results imply that within the same MSA, entrepreneurial gaps in a deregulated state are smaller compared to those in an adjacent state but in the same MSA. These findings indicate the robustness of my results even when controlling for fine local economic conditions.

To further analyze the heterogeneous impact of bank deregulation on different minority groups, I divide the minority into Black, Hispanic, and other (such as Asians). The results in Table A13 show that bank deregulation has a significant effect on Black and Hispanic populations.

Recent scholarly works have highlighted potential issues in dynamic difference-in-differences designs. In particular, when heterogeneous treatment effects exist, some units might be assigned negative weights when their outcomes contribute to the calculation of treatment effects. This situation has the potential to introduce bias to the estimated values (De Chaisemartin and D'Haultfœuille (2020); Goodman-Bacon (2021); Borusyak, Jaravel, and Spiess (2023)).

To deal with this potential issue, I apply the estimation methodology recommended by Borusyak et al. (2023), as detailed in the Appendix.[16] The obtained estimates maintain a high level of consistency with the standard OLS estimates, providing additional support to the robustness of my key findings (See Table A14). Furthermore, in the Appendix, I present the analysis of a single time shock test, where the outcomes still exhibit solidity, using the enactment of the Dodd-Frank Act as the exogenous shock to validate my findings. This one-time shock grants banks the ability to establish a de novo branch in any state as if they were chartered in that state in 2010. This nationwide change in legislation is not within the control of any state government and thus plausibly exogenous to the local economic conditions and entrepreneurial financing needs. This approach mitigates potential issues associated with staggered treatment groups in the identification strategy. Consequently, I persist in using the standard OLS method for the remainder of the paper.

Figure 2 displays the dynamics of the reduced gender and racial gap in entrepreneurship around interstate bank deregulation. The specifications used in these two figures are identical to that in equation (1), except that I substitute the bank deregulation index with a set of

[16]The method formulated by Borusyak et al. (2023) offers an efficient estimator that addresses this problem by employing a straightforward "imputation" format when there's no restriction on treatment-effect heterogeneity. It's worth mentioning that their method is versatile enough to work with time-varying controls, triple-difference designs, and certain non-binary treatments, making it well-suited for the research design of this study.

dummy variables representing the years relative to bank deregulation and estimate the effect on gender and racial gaps separately. The gender and racial gaps exhibit a narrowing trend following deregulation, and no discernible pattern is observed before the deregulation year, suggesting that I can verify the parallel trend assumption.

[Insert Figure 2 about here]

I decompose the sample into two subsamples based on several sociodemographic characteristics and estimate the heterogeneous effect of bank competition on racial and gender gaps. By testing the significance level of difference between two coefficients estimated from two subsamples, I find that coefficients are quite similar across different subsamples. These heterogeneity analyses suggest that specific components of my sample do not drive my findings. For instance, I observe similar effects for both renters and homeowners, which suggests that the house prices appreciation channel discovered by Favara and Imbs (2015) may not fully explain the overall effect of bank competition on entrepreneurial gaps due to renters' inability to benefit from the housing price appreciation brought by bank deregulation. The only exception is that the impact of bank competition is significantly stronger for minorities with low income. One possible reason why low-income minorities benefit more from the relaxation of credit constraints than wealthy minorities is that they are more likely to be financially constrained and lack startup capital to be entrepreneurs.

My results remain robust when I use different specifications and control variables: (1) I use different fixed effects, including state-year-industry jointed fixed effects to control unobserved state-industry performance, such as local natural resources and industry shocks (e.g., technological innovation). Additionally, I can include family fixed effects as family characteristics and resources matter for entrepreneurship (Naaraayanan (2019); Zandberg (2021)). (2) I drop the financial crisis period. (3) I do not find significant results in placebo tests by randomly assigning deregulation years other than the actual years while maintaining the overall distribution of deregulation years unchanged. These placebo tests prove that my results are not driven by unobservable factors coinciding with my deregulation events. (4) Weighted least squares (WLS) regressions are used because low-income people are oversampled in the SIPP data.

Finally, I try to mitigate concerns related to selection bias and reverse causality, finding no evidence showing that women or minorities are more likely to reside in or relocate to states with high bank competition than men and Whites to get access to finance. Another

concern is that staggered deregulation timing is not exogenous and is caused by omitted factors that drive or correlate with both bank deregulation and entrepreneurial gaps. For example, if states are worried about gender or racial inequality and lift the restrictions on interstate branching to improve minorities' and women's access to credit, my results may be driven by a mechanical decrease in entrepreneurial gaps after deregulation. The alternative scenario is that states may relax regulations when the economic conditions are favorable and require financial support. In such a scenario, the underlying economic conditions may impact both bank deregulation and entrepreneurial gaps simultaneously. To address this concern, I follow Kroszner and Strahan (1999) and utilize various factors that may influence or correlate with entrepreneurial gaps to predict the timing of deregulation. I do not find any evidence indicating a correlation between the timing of bank deregulation and the gender or racial gap. In Column (1) of Table A3, I regress the bank deregulation index on the female and minority ratio at the state level. The results do not support that the fractions of women or minorities are correlated with bank competition level. In Column (2), I include entrepreneurial activities and gaps and still do not find any significant relationships. It seems that the concern regarding states having motives to deregulate in order to reduce the gender or racial gap when there is a high gender or racial imbalance can be ruled out. The lack of significance in my results is not surprising, given that a large part of bank deregulatory changes is driven by the Dodd-Frank Act, whose time of implementation is solely determined by the federal government as a response to the financial crisis, making it beyond the control of a single state government.

4.1.3 Discrimination (Bias) Channel

A consistent finding across the results depicted in Table 3 is that minorities and women are less likely to become entrepreneurs compared to their counterparts even after controlling for granular fixed effects. However, bank deregulation can alleviate this inequality issue. One potential channel explaining these results is the presence of discrimination or bias against Black and female entrepreneurs in the financing market. To explore the role of prejudice or bias in the financing market, I examine whether the impact of bank deregulation differs for female and Black entrepreneurs in states with a history of gender imbalance or discrimination.

Following Charles and Guryan (2008), Chatterji and Seamans (2012), and Levine et al. (2014), I employ several state-level racial discrimination indexes: three state-level historical

racial discrimination dummy variables and an intermarriage racial bias index. To test this hypothesis, I introduce a triple interaction term, $Dereg_{s,t} \times Black_i \times High\ Discrimination_{s,t}$ in equation (1). The *High Discrimination* dummy equals one if the state: (1) is a former slave state one year before the Civil War; (2) did not repeal anti-miscegenation law until after the U.S. Supreme Court made the decision in Loving v.Virginia in 1967; (3) has an interracial marriage bias index above the median; or (4) lacked fair housing law until the passage of Fair Housing Act of 1968 by the federal government. Consistent with Becker's argument (Becker (1957)), my finding suggests that bank competition has a greater impact on reducing financial imperfections and improving Black entrepreneurs' banking access in states with higher taste-based discrimination. Table 4 illustrates that in states with historically discriminatory environments against Black entrepreneurs, bank deregulation can reduce the racial gap by around 10% in terms of the sample mean, compared with states without such historically discriminatory social norms. However, I find that this effect is not significant in states with a lower inclination towards discrimination as the coefficient of the interaction term $Dereg_{s,t} \times Black_i$ is insignificant. An alternative hypothesis is that reduced gaps are driven by concurrent cultural or social norm trends. If so, inclusive states more likely to implement bank deregulation should witness a larger reduction in the gap. My heterogeneous analysis may help to rule out this hypothesis.

[Insert Table 4 about here]

Similarly, I construct four state-level gender imbalance indexes following Duchin, Simutin, and Sosyura (2021) using the SIPP dataset. *Income Imbalance* is constructed as the state-level average income difference between employed men and employed women in 1990 before the bank deregulation. Likewise, I build *Earning Imbalance*, *Education Imbalance*, and *Employment Imbalance* indexes using the gender gap in earnings, years of received education, and the labor participation ratio, respectively. Duchin et al. (2021) find that environmental and educational factors influence CEOs' bias on gender issues, with CEOs highly exposed to gender inequality being less likely to allocate capital or resources to female division managers. In the same vein, I argue that bank deregulation is more effective in the community where bankers exhibit strong bias against female entrepreneurs. To test whether the bias channel operates, I introduce an interaction term $Dereg_{s,t} \times Gender_i \times High\ Bias_{s,t}$ in the regressions. The variable *High Bias* is equal to one if the corresponding imbalance measure exceeds the median value. In Panel B of Table 4, the results indicate a positive correlation between the

impact of bank competition and gender bias. I contend that bank competition can assist female entrepreneurs in mitigating bias against them in the financial market.

4.1.4 Heterogeneity Analysis by External Financing Dependence

I examine the rates of entrepreneurial entry based on external financing dependence of starting a business. If bank deregulation effectively eases financial constraints for minorities and women, I would expect to observe the highest increase in entrepreneurial transitions in industries that heavily rely on external financing. Conversely, in industries with low external financing dependence, the effect of bank deregulation might be moderate since the barriers to entry to these industries are small. Motivated by this theoretical prediction, I investigate whether the effects of bank deregulation on entrepreneurial gaps differ between industries with high and low external financing dependence.

Table 5 reports the results of the heterogeneity analysis based on external financing dependence. Industries are categorized as *High Dependence* based on the proportion of capital expenditure funded by external financing. Following the procedures in Cetorelli and Strahan (2006), I construct the external financing dependence as the fraction of capital expenditure funded by external financing. Negative values indicate that firms do not rely on external financing and have free cash flow, while positive values suggest that firms rely on issuing equity or debt to support investment. This measure is based on the Compustat database. The two-digit SIC industry classifications in the Compustat database are matched with those used in the SIPP dataset. *High Dependence* is equal to one for industries with positive external financing dependence and zero otherwise. The estimates imply that the increase in female and minority business formation rates is positively correlated with external financing dependence. This finding aligns with the empirical results reported by Bertrand, Schoar, and Thesmar (2007), who conjecture that bank deregulation triggers more entry into sectors that are more reliant on banks. My findings indicate that improved access to finance for female and minority entrepreneurs enables them to pursue entrepreneurial opportunities in capital-intensive industries.

[Insert Table 5 about here]

4.2 Startup Capital

Bank deregulation can reduce entrepreneurial gaps as it provides entrepreneurs with access to financial services. This access enables the use of varied financing sources: (1) business loans and (2) personal loans, including secured home equity loans and unsecured credit card debt. I examine which financing channel supports entrepreneurs by investigating changes in all types of debt after bank deregulation. For instance, if business loans are indeed efficient sources of startup capital, a new business owner will likely support her business by borrowing money from banks and increasing her business debt. If not, it is difficult to argue for the existence of a business loan channel. My dataset allows me to observe the behavior pattern of entrepreneurs in terms of variations in all kinds of debt.

To explicitly test the underlying channel, I run the following regression:

$$\begin{aligned} Bank\ Debt_{i,s,t+1} =& \beta_1 Minority_i + \beta_2 Dereg_{s,t} \times Minority_i + \\ & \gamma_1 Female_i + \gamma_2 Dereg_{s,t} \times Female_i + FEs + \alpha_{s,t} + \varepsilon_{i,s,t} \end{aligned} \tag{2}$$

where the dependent variable $Bank\ Debt_{i,s,t+1}$ is an entrepreneur-level bank debt outcome variable that measures access to business loans and home equity loans in year $t+1$ for entrepreneur i in state s. I control the same set of fixed effects as in equation (1). The parameters β_1 and γ_1 estimate the racial and gender gaps in initial bank debt employed as startup capital, respectively. Similarly, β_2 and γ_2 evaluate whether bank deregulation can mitigate these racial and gender gaps, respectively.

Table 6 presents the impact of bank deregulation on the racial gaps and gender gaps in access to finance. It is observed that minority and female entrepreneurs have less secured business debt compared to White entrepreneurs, indicating that this gap is not trivial in Column (1). A one-unit increase in bank deregulation is associated with a reduction of 24.8% in the racial gap in business debt. My results are broadly consistent with Blanchflower et al. (2003), who document the existence of racial disparities in the business lending market, and the finding of Chen, Lin, and Sun (2021), who argue that bank deregulation can mitigate racial disparities in the small business lending market through intensified competition. Female entrepreneurs also benefit from bank deregulation in financing their businesses through secured business debt.

[Insert Table 6 about here]

As for personal debt, I find that only home equity loans matter for entrepreneurship, and bank deregulation has the potential to reduce the financing gap in home equity loans. Notably, minority entrepreneurs exhibit limited reliance on mortgage debt for business financing compared to White entrepreneurs, even after controlling for many sociodemographic fixed effects. One-step bank deregulation is found to narrow the gap in mortgage debt by approximately 32.2%. It is well established that home equity plays an important role in supporting their businesses (Adelino, Schoar, and Severino (2015); Corradin and Popov (2015); Schmalz, Sraer, and Thesmar (2017)). Herkenhoff, Phillips, and Cohen-Cole (2021) find that self-employment without employees and employer business ownership is positively associated with higher personal credit limits and credit scores. My findings complement their results by showing that bank deregulation can reduce the racial gap in entrepreneurship because of equal access to the mortgage lending market. Furthermore, I investigate the effect of bank deregulation on other kinds of debt. My paper does not find evidence of racial gaps in unsecured consumer credit.[17] Overall, my results show that bank deregulation has the potential to diminish financing gaps in entrepreneurship. Minority and female entrepreneurs in deregulated states can raise more money to fund their businesses. However, it is important to note that this does not automatically mean an unconstrained increase in their leverage and associated risks since I do not find any significant results in terms of unsecured debt.[18]

4.3 Startup Firms' Quality

Thus far, my results demonstrate a robust association between bank deregulation and female or minority entrepreneurship but say less about the quality of business formation. I next

[17] One possible explanation is that Black entrepreneurs tend to rely on personal credit cards as a means of financing their businesses because of the limited availability of alternative cheaper financing channels for them (2014 Annual Survey of Entrepreneurs). My evidence does not indicate that bank deregulation impacts the usage of credit card debt, primarily due to the exceptionally high interest rates compared to other funding sources. When bank deregulation ensures equal opportunities in other financing markets, such as the mortgage lending market, the expensive credit card might be abandoned as a channel of entrepreneurial financing.

[18] The insignificant results for the credit card debt suggest that my findings are not driven by liquidity shocks or relaxation of financial constraints. If some omitted variables influence both entrepreneurial career choice and financing capacity, I would expect to observe an increase in debt unrelated to entrepreneurial financing, rather than just the accumulation of business debt and mortgage debt.

examine the characteristics of businesses established by these individuals. Do they found small, transitory ventures that have a negligible impact on economic development? To further investigate the quality of these new ventures, I decompose the entrepreneurship variable into two mutually exclusive variables: a dummy variable equaling one for ventures hiring no less than 25 employees and an indicator variable equaling one for ventures hiring fewer than 25 employees. The cutoff of firm size is constrained by data limitations. In Column (1) of Table 7, I first document that women and minorities are less likely to own large firms. However, the interaction terms between deregulation and female (minority) suggest that bank deregulation assists women and minorities in founding big firms, indicating that bank deregulation can remove entry barriers without worsening new firm quality. Column (2) shows that bank deregulation has a weaker effect on small business formation. In Columns (3) and (4), I examine the profit amount. In that case, I define two dummy variables, a profitable firm dummy that equals one if the firm has positive profit and an unprofitable firm dummy that equals one if the firm earns zero or negative profit. I find that bank deregulation increases profitable firms, but does not change unprofitable firm formation. Thus, the main finding from Table 7 indicates these new ventures started by female and minority entrepreneurs are not trivial.

[Insert Table 7 about here]

5 Effect of Deregulation on Financial Services in Minority Communities

In this section, I pinpoint channels in which bank deregulation reduces entrepreneurial financing gaps. I present evidence to demonstrate that minorities are underserved by banks, and branching deregulation improves the quantity and quality of financial services in minority communities. Subsequently, I construct a discrimination index and find that competition reduces discrimination against minority groups.

5.1 Effect of Deregulation on the Quantity of Banking Services and Financial Inclusion

Panel A of Figure 3 illustrates a negative correlation between bank branch density and minority ratio at the county level, based on data from the FDIC. Bank branch density is measured by the number of branches per 10,000 inhabitants. The minority ratio refers to the proportion of nonwhite residents in a county. A one standard deviation increase in the minority share of the population is associated with an 18% decrease in bank branch density.

[Insert Figure 3 about here]

I estimate the following model to examine whether bank deregulation increases the quantity of financial services, measured by bank branch density:

$$\begin{aligned} Log(BranchDensity_{c,t+1}) = & \beta_1 Dereg_{s,t} \times Minority_{c,t} + \beta_2 Minority_{c,t} + \\ & \gamma CountyControl_{c,t} + \alpha_{s,t} + \delta_c + \varepsilon_{c,t} \end{aligned} \tag{3}$$

where $BranchDensity_{c,t+1}$ is the number of branches divided by the number of residents in county c. $Dereg_{s,t}$ is the time-varying deregulation index at the state level. $Minority_{c,t}$ is the minority share of the population in county c. I also use a dummy variable $Minority\ Dummy_{c,t}$ indicating whether a county is in the top quartile of the distribution in terms of minority ratio as an alternative measure. Log population, unemployment rate, log personal income per capita, and the growth rate of personal income per capita are included as control variables $CountyControl_{c,t}$. I include state-year joint fixed effects $\alpha_{s,t}$ and county fixed effects δ_c. Furthermore, to address the remaining concerns regarding serial correlation, I cluster the standard errors at the state level.[19]

Célerier and Matray (2019) find that bank branch density increases as a result of deregulation. Panel A of Table 8 shows the effect of bank deregulation is more pronounced in counties with a high minority ratio. The coefficient of the interaction term $Deregulation\ Index \times Minority\ Dummy$ implies that counties in the top quartile of the distribution in terms of minority ratio experienced a 12% ($4 \times 3\% = 12\%$) increase in the bank branch density if a state is fully deregulated (Columns (3) and (4) of Table 8).

[Insert Table 8 about here]

[19] I find similar results by double clustering standard error at the state and year level.

To rule out demand-based explanations, I divide the commercial banks into two categories: local in-state banks and interstate banks based on the location of bank branches. Out-of-state banks, headquartered outside of the deregulating state, are poised to gain advantages from the deregulation as they can now establish new branches within the state. However, the lending operations of in-state banks, with their headquarters in the deregulating state, will remain unaffected by the deregulation. The regression results in Table A4 indicate that deregulation primarily affects interstate banks by reducing entry costs, while local banks remain unaffected. These distinct responses eliminate demand-based explanations. If there had been an increase or expectation of increased demand for credit because of economic expansion, all commercial banks, whether in-state or out-of-state, would have expanded lending, regardless of branch location. The evidence indicates that deregulation caused a credit supply shock specifically for banks in the deregulated states.

Additionally, the suitability of a linear representation of the deregulation index is also an important question. To address this concern, I conduct regressions using equation (3), except for replacing the index with dummy variables for each level from one to four, with zero as the reference group. The results presented in Table A5 indicate a monotonic impact of the level of deregulation on bank branch density. As the deregulation index increases, the effect on bank branch density becomes more pronounced. While the relationship does not exhibit perfect linearity, using a linear specification appears to be a reasonable approximation to capture the overall trend and direction of the relationship.

To thoroughly confirm that the observed effects are not driven by underlying trends, I conduct a detailed decomposition of the deregulation index. Specifically, I create four dummy variables corresponding to four periods around the deregulation event: more than 3 years before deregulation, the 3 years preceding deregulation, the 3 years following deregulation, and more than 3 years after deregulation. The reference year is set as the actual deregulation year. The results presented in Column (2) of Table A5 demonstrate that, within the first 3 years after deregulation, there is a significant increase in bank branch density by 3.4%.

I investigate whether the impact of bank deregulation on bank branch density in minority communities leads to a reduction in the racial gap concerning access to bank accounts using the SIPP dataset. The following linear probability regression model presents my empirical

design:[20]

$$BankAccount_{i,s,t+1} = \beta Dereg_{s,t} \times Minority_i + \gamma Minority_i + FEs + \alpha_{s,t} + \varepsilon_{i,s,t} \quad (4)$$

where $BankAccount_{i,s,t+1}$ is a dummy variable set to 1 if a resident i in state s, opens a bank checking or saving account in the next year. $Dereg_{s,t}$ represents the banking deregulation index. The indicator variable $Minority_i$ equals one if households are minorities. Joint state-time fixed effects $\alpha_{s,t}$ are included to capture local economic and political conditions that may influence the implementation of bank deregulation (Kroszner and Strahan (1999)).[21] In my analysis, I include numerous fixed effects: income deciles, family structure (the number of family kids and the number of family adults), age, homeownership, education (elementary, high school, and college), marital status, and employment conditions. I also interact state-year joint fixed effects with income deciles fixed effects to absorb every unobserved heterogeneous time-varying local shock across different income groups. These fixed effects enhance the control over confounding factors that affect the demand for a bank account. Standard errors are clustered by state to control correlation within states. To identify my key coefficients β, I rely on comparing the racial gap in access to bank accounts between advantaged and disadvantaged households with similar sociodemographic features and income in a treated state before and after bank deregulation relative to a group of control states that do not experience regulatory changes. Positive coefficients on the interaction terms between demographics and the bank deregulation index imply that in states with greater openness to branching, disadvantaged groups are more likely to open bank accounts compared to their privileged counterparts. Panel B of Table 8 shows my regression results. The coefficient β of the interaction term $Deregulation\ Index \times Minority$ and the coefficient γ of the dummy variable *Minority* in Column (4) of Table 8 suggest that full deregulation can reduce the racial gap by 80% ($\beta \times 4 \div \gamma = 0.011 \times 4 \div 0.055 = 80\%$).

My finding that the racial gap in holding bank accounts decreases when deregulation exogenously increases the supply of the quantity of banking services indicates that unbanked

[20] A logit model is not my first choice for two reasons. First, a nonlinear model is not suitable for including plenty of fixed effects. Second, the efficiency gains obtained from a nonlinear model compared to a linear model are marginal when converting the raw coefficient estimations to interpretable marginal effects (Angrist and Pischke (2008)). However, my results remain robust if I use logit regression models.

[21] I am unable to include county-level fixed effects since the SIPP only provides the location of households at the state or MSA level.

minorities may face obstacles in accessing financial services. Bank deregulation can remove these barriers and promote financial inclusion.

5.2 Effect of Deregulation on the Quality of Banking Services

In the previous subsection, I focus on the effect of deregulation on the quantity of banking services provided to minorities and its effect on financial inclusion. However, limited information is available regarding the quality of banking products and services received by minorities. My research takes the first step in this dimension by studying the effect of deregulation on the quality of banking services within the consumer lending market, measured by the incidence of consumer complaints against banks regarding issues such as fraud, poor customer service, and misselling (Begley and Purnanandam (2021)). The consumer complaints data used in this study are collected from the CFPB. I find that deregulation has a positive impact on the quality of banking services, but only in the zip code with a high share of the minority population.

Panel B of Figure 3 reveals that areas with a high proportion of minority borrowers exhibit a notably higher incidence of mortgage-related complaints against banks. Begley and Purnanandam (2021) argue that these complaints are meaningful because complaints will lead to higher fines imposed on banks by the CFPB. I estimate the following model to study the relationship between bank deregulation and the quality of banking services provided to consumers in zip codes with a high share of minority population:

$$Log(complaints)_{z,t+1} = \beta Dereg_{s,t} \times Minority_z + \gamma_z + \alpha_{s,t} + \phi_{m,t} + \varepsilon_{z,t} \tag{5}$$

The dependent variable is the logarithm of the total number of complaints filed to the CFPB in a given five-digit zip code z in year t+1. $Dereg_{s,t}$ is the time-varying deregulation index at the state level. $Minority_z$ is the minority share of the population in a zip code z at the beginning of the sample period (2012-2021). Demographic data at the zip code level are collected from the 2010 Census files. Zip code fixed effects γ_z and state-year joint fixed effects $\alpha_{s,t}$ are included in my regressions to control for local economic conditions such as house prices, income conditions, and demographic characteristics such as educational attainment that may impact the incidence of complaints. MSA-year joint fixed effects $\phi_{m,t}$ are included to control finer local economic and political conditions. Therefore, my model captures variation

in the outcome variable within the same MSA area but straddling two states with different levels of bank deregulation, which enables me to study the relation between bank deregulation and the quality of banking services received by minority residents after ruling out the local economic conditions and demographic characteristics.

Panel A of Table 9 presents the results of the regression in the above equation (5). In Columns (1) to (3), the independent variable is the interaction term between the deregulation index and the minority ratio, while in Columns (4) to (6), I use the interaction term between the deregulation index and the minority dummy that indicates whether the minority population share is in the top quartile of the distribution. My results are robust when using different sets of fixed effects. Column (6) shows that a one-unit increase in the bank deregulation index is associated with a 5.4% reduction in complaints in areas with high proportions of minority borrowers, in comparison to less deregulated neighboring areas within the same MSA.

[Insert Table 9 about here]

I perform several robustness tests to demonstrate the validity of my results. Specifically, I focus on mortgage-related complaints due to the significance of home equity loans as sources of startup capital. My results are robust if I expand the analysis to include other products such as checking accounts and credit cards. This suggests that the impact of bank deregulation holds across various general banking services. As an alternative measure of the dependent variable, I re-estimate my results using the total number of complaints scaled by the total number of mortgages in a given zip code (which can be viewed as the complaint rate per mortgage in a given zip code) and find similar results (see Table A6). The data on the total number of mortgages are sourced from the IRS Statistics of Income database.

Finally, I adopt an approach informed by the works of Scharfstein and Sunderam (2016) and Buchak and Jørring (2021), crafting a quasi-random identification strategy based on incidental mergers and acquisitions (M&A) among local banks. I focus on mergers that unintentionally lead to increased market concentration in overlapping markets, which are not central to either party involved in the merger. Table A8 suggests that bank mergers, equating to dampened competition, are driving the increase in complaints, signaling deteriorated service quality in banking. The detailed research design is in the Appendix. In general, my results indicate that competition has the potential to enhance the quality of banking services received by residents in minority communities.

5.3 Effect of Deregulation on Discrimination against Minorities

According to theoretical predictions, bank deregulation can reduce discrimination due to the intensification of competition (Becker (1957)). If banks discriminate against borrowers in a competitive market, they experience a loss in market share since these borrowers have the option to switch to other banks that do not discriminate against them. However, it is difficult to detect discriminatory treatment using the unexplained racial gap in outcome variables like interest rate as an indirect measure of discrimination due to the presence of omitted variables. To address this issue, I develop a novel and direct measure of discriminatory treatment using the narrative information contained within the complaints available in the CFPB dataset based on the textual analysis method.[22] This measure allows me to directly test whether deregulation eliminates the complaints related to unfair treatment and discrimination against consumers. My results show that increased competition caused by the introduction of interstate banks leads to a reduction in the occurrence of complaints regarding discrimination, especially in areas with a high proportion of minority consumers.

Table 10 displays a consumer complaint example concerning "Applying for a mortgage or refinancing an existing mortgage," as publicly disseminated by the CFPB. This includes components such as "Date received", "Product", "Consumer complaint narrative", "Company", and "Company response to consumer", among others. Despite personal data being de-identified in complaint narratives, claims of discrimination are noticeable, especially with statements like "I believe that I am being discriminated against because I disclosed my race as XXXX".[23] The company's reply to this particular situation is denoted as "closed with monetary relief," coupled with the company not disputing the complaint. These cues hint at possible misconduct by the bank towards this consumer. Clearly, thanks to the existence of the CFPB's complaint system, the complainant received compensation after being treated unfairly. This narrative information allows me to identify occurrences of discrimination in my research.

[Insert Table 10 about here]

I measure borrowers' perceptions of experiencing discrimination using textual analysis

[22] The narrative information is disclosed by the CFPB since 2015.

[23] The race information is erased by the CFPB to protect consumer privacy.

of the complaint narrative.[24] The narrative including the words "discrimination", "unfair", "partial", "inequity", "prejudice", "injustice" or other related words is treated as complaints about discrimination.[25] Figure A1 shows the geographical distribution of discrimination complaints at the county level. After identifying complaints related to discrimination, I employ the same model as in equation (5), with one key modification. Instead of using the dependent variable Log(complaints), I replace it with either Log(discrimination complaints) or **1**(discrimination complaints). Log(discrimination complaints) is the logarithm of the total number of complaints about discriminatory treatment filed to the CFPB in a given zip code. **1**(discrimination complaints) is a binary indicator variable that denotes the presence or absence of discrimination complaints in a given zip code.

To assess the effectiveness of using complaints as proxies for discrimination in the financial market, I analyze the correlation between this measure and the rates of loan rejections for minorities, as detailed in Table A9 of the Appendix. The results suggest that banks with a higher number of complaints associated with discrimination tend to demonstrate higher rejection rates for minority borrowers. These outcomes lend credence to my approach of considering complaints as a reliable indicator of discrimination.

There are two potential explanations for this phenomenon: scenarios where banks exhibit racial biases and those where they engage in statistical discrimination. In the case of racial biases, I define them as the combined result of taste-based discrimination (Becker (1957)) and miscalibrated beliefs (Bordalo, Coffman, Gennaioli, and Shleifer (2016); Arnold, Dobbie, and Yang (2018)) as suggested by Ewens and Townsend (2020) and Egan, Matvos, and Seru (2022). Taste-based discrimination would entail banks deriving dissatisfaction from approving applications from minority borrowers (or, conversely, deriving satisfaction from White borrowers). Miscalibrated beliefs imply that banks maintain incorrect stereotypes about minority borrowers. Considering the implicit nature of these biases and their potential to interact with discrimination against minorities, I view their impacts as one channel. An alternative explanation refers to the concept of statistical discrimination (Phelps (1972); Arrow (1974); Ewens, Tomlin, and Wang (2014)). Within the framework of this

[24]This textual analysis method was first used by Haendler and Heimer (2021) to measure the readability of complaints.

[25]Related derivative words for "discrimination" are the following: "discriminated", "discriminates", "discriminate", "discriminating", and other related words starting with "discrimin". Similarly, related words for "partial", "inequity", "prejudice", "injustice" are also included to identify discriminatory treatment.

study, statistical discrimination manifests when banks differentiate their treatment towards minority and non-minority borrowers based on the perceived higher inherent risks associated with minority borrowers. Consequently, banks may rationally reject a greater number of minority borrowers to maximize their profits from a business perspective.

Upon analysis, I confirm the existence of racial biases in banks' performance. The detailed research design is in the Appendix. Simply put, if banks' higher rejection rates for minority borrowers result from statistical discrimination, I should observe that in banks with a greater degree of discrimination, minorities exhibit greater financial risks in comparison to non-minority borrowers. Yet, as shown in Panel A of Table A10, minority borrowers in banks with more discrimination complaints surprisingly display a lower loan amount-to-income ratio (even though the coefficients are not significant). Furthermore, in banks with more discrimination complaints, minority borrowers are not observed to have a lower income than White borrowers, as indicated in Panel B of Table A10. Conversely, when discussing racial bias, Table A11 provides support for the notion that my discrimination measurement captures racial bias in the loan markets. I find that minority borrowers on the margin are remarkably more creditworthy than non-minorities on the margin condition on approved loan applicants in discriminatory banks.[26] The complaint narratives disclosed by the CFPB serve as factual evidence, providing direct insight into the inappropriate attitudes and prejudiced behaviors exhibited by bank staff towards minority applicants. For instance, a complaint presented in Table 10 states, "The loan officer sounded very condescending when she told me that I was denied," which directly illustrates the racial bias endured by minority borrowers.

Additionally, I rule out the role of statistical discrimination in the business loan market by taking advantage of the unique Paycheck Protection Program (PPP) loan setting. The PPP loans, designed to assist small businesses during the COVID period, come with a full guarantee from the government, thereby eradicating the default risks that banks typically encounter. Consequently, if banks differentiate in their treatment of minority loan applications based on the idea of statistical discrimination, there should be no noticeable disparity between minority borrowers and non-minority borrowers in the context of risk-free

[26]When comparing differences between minority borrowers and White borrowers here, I account for a comprehensive assortment of covariates. Specifically, I concentrate on the subsample of borrowers who are closest to the extensive margin of credit allocation, namely those with a credit score equal to or less than 660. This enables me to scrutinize racial disparities in average default rates near the margin of credit provision (Butler, Mayer, and Weston (2023)).

PPP loans. However, the analysis in Table A12 documents the existence of racial gaps. It further reveals that an increase in competition positively affects the chances of minority borrowers obtaining PPP loans from banks and securing larger loan amounts, which suggests that market competition has the potential to mitigate racial bias.

Panel B of Table 9 presents the impact of bank competition on discrimination. The dependent variable in Columns (1) to (4) is Log(discrimination complaints). I find that a one-unit increase in the bank deregulation index leads to a 2.8% reduction in discriminatory treatment (Column (4)) in minority communities, compared to less deregulated minority communities in the same MSA. As for the extensive margin, the probability of discrimination complaints decreases by 4.0% in areas with high proportions of minority borrowers as a result of one-step deregulation (Column (8)). The coefficient estimate is huge in terms of the mean value (5.3%) of the dependent variable.

My results are robust if I use the total number of discrimination complaints scaled by the total number of mortgages as an alternative dependent variable (see Table A6). To check if my findings are driven by frivolous complaints made by minority borrowers, I exclude potentially frivolous complaints by examining the resolution of complaints.[27] After excluding complaints disputed by lenders and complaints closed without monetary relief, respectively, I find that the robustness of my results remains intact (see Table A7). My results align with Becker's argument that increased competition may contribute to reduced discrimination.

6 Bank Deregulation and Entrepreneurial Firm Performance Gaps

6.1 Startup Firms' Subsequent Performances

In section 4, I focus on the impact of bank deregulation on startup firms' creation. In this section, I consider the impact of bank deregulation on subsequent firm performance. It is well documented that Black-owned and women-owned businesses are less successful than Whites-owned and men-owned businesses (Fairlie and Robb (2007), Fairlie and Robb

[27] Although the CFPB does not verify the accuracy of complaints, it does two things: (1) verify that the complainant is indeed a customer of the bank and (2) allow the bank to dispute the content of the complaint.

(2009)). I examine whether removing barriers in the financial market can impact the gender and racial gap in firm performance after establishment. I re-estimate equation (1), replacing the outcome variable indicating whether individuals transition into entrepreneurs with the firm performance variables to test this hypothesis. Specifically, I focus on individuals who were already entrepreneurs when they entered the sample.

$$\begin{aligned} Firm\ Performance_{i,s,\ t+1} =& \beta_1 Dereg_{s,t} \times Minority_i + \beta_2 Dereg_{s,t} \times Gender_i + \\ & \gamma_1 Minority_i + \gamma_2 Gender_i + FEs + \alpha_{s,t} + \varepsilon_{i,s,t} \end{aligned} \tag{6}$$

I use four variables to measure firm performance: (1) *Profit Amount*, the amount of firm profit; (2) *Profit Dummy*, a dummy variable equal to one if the firm is profitable and zero otherwise; (3) *Size*, a dummy variable equal to one if the firm has 25 or more employees; and (4) *Survive*, a dummy variable equal to one if the firm is still operating.

Furthermore, I link bank deregulation with economic fluctuation to check the effect of bank deregulation across business cycles by interacting the bank deregulation index with a financial crisis dummy equaling one for the 2008 financial crisis and zero otherwise. Iyer et al. (2014) emphasize the importance of access to finance for small firms during the financial crisis. Duygan-Bump, Levkov, and Montoriol-Garriga (2015) show that small firms were more likely to cut employment when financially constrained in 2008. Chodorow-Reich (2014) find that losing access to finance leads to between one-third and one-half decrease in employment at small and medium firms due to financial frictions deriving from asymmetric information. Motivated by these empirical findings, my prediction is that bank deregulation can aid minorities and women, particularly during financial crises, by reducing financial frictions. For example, their small, financially constrained firms may face higher borrowing costs, and their financing requests are more likely to be denied during crises. Additionally, they may encounter challenges in switching lenders due to information asymmetry and a lack of stable relationships with banks during crises. Bank deregulation may alleviate this predicament by improving efficiency within the banking system and reducing borrowing costs (Rice and Strahan (2010)). Table 11 summarizes the results.

[Insert Table 11 about here]

In Table 11, I confirm the existence of gender and racial gaps in firm performance, which aligns with prior studies. This gap strengthens during the financial crisis as female

and minority firms are more vulnerable. Additionally, gender and racial gaps in firm size are narrowed by bank deregulation. However, I do not find that deregulation significantly affects the survival of firms during regular times when credit supplies are relatively abundant and financial frictions are seemingly low. Nevertheless, during the crisis period when credit tightens, and the interest rate rises sharply, I find that female and minority firms are more likely to survive since they can access finance in fully deregulated states. Overall, my results underscore the bank deregulation's importance in reducing performance gaps. This effect is intertwined with the business cycle. During periods of economic prosperity, bank deregulation can reduce the gender and racial gaps in firm performance, even though the effect is modest. In contrast, bank deregulation plays a significant role in preventing economic crises from exacerbating these gaps.

6.2 Inequality in Business Equity Accumulation

In the previous sections, I document that bank deregulation can reduce gaps in business formation without worsening the quality of entrepreneurship and subsequent firm performance. A natural question is, what are the consequences of the narrowed gender and racial gaps on well-being? Given that bank deregulation removes the barrier to entry for talented female and minority entrepreneurs who may face financial constraints, will the reduced gap in entrepreneurial career choices impact inequality in wealth or income between advantaged groups and disadvantaged groups? Economic theory shows that financial frictions contribute to persistent disparities between the rich and poor by depriving poor people of entrepreneurial opportunities (Banerjee and Newman (1993)). Similarly, poor minorities and women are more likely to be financially constrained, making them less likely to become entrepreneurs, further widening the wealth gaps. Therefore, in this section, I investigate the impact of reduced entrepreneurial gaps on wealth inequality between advantaged and disadvantaged groups.

I examine the balance sheets of different groups in detail. First, on average, I find that men's net worth (mean value = $183,115) is higher than women's net worth (mean value = $114,503). This gap is larger if I look at the racial disparity. On average, the net worth owned by minorities (mean value = $82,029) is less than one-half of Whites' net worth (mean

value = \$189,324).[28] Second, holding other factors constant, I find that the gender gap in business equity accounts for 49% of the gender gap in wealth accumulation, while the racial gap in business equity accounts for 26% of the racial gap in wealth accumulation, implying the economic significance of business equity gaps. [29] In other words, if the gender or racial gaps in business equity can be closed, approximately 49% of the gender gap or 26% of the racial gap in net wealth can be effectively mitigated.

[Insert Table 12 about here]

To investigate the consequence of entrepreneurship on inequality, I do not directly regress net worth on bank deregulation due to concerns of omitted variables. Apart from reducing entrepreneurial gaps, bank deregulation can affect net worth through different channels (see Célerier and Matray (2019)). This study specifically focuses on the business equity accumulation pathway to isolate other potential channels through which bank deregulation may impact wealth inequality. Table 12 explores the impact of bank deregulation on the business equity gaps between advantaged entrepreneurs and disadvantaged entrepreneurs. In Column (3), I find that entrepreneurs possess business equity that is seven times larger than non-entrepreneurs. Furthermore, advantaged entrepreneurs have business equity that is one time larger than that of disadvantaged entrepreneurs. The gender or racial gap can be reduced by around 6% or 11% if a state relaxes its bank regulation by one step.[30] A simple back-of-envelope calculation demonstrates that the effect of the one-step relaxation of bank deregulation on entrepreneurial gaps translates into a 3% decrease in wealth inequality.[31] It is important to note that these estimates should be viewed as a lower boundary, given that they are conditional upon being an entrepreneur, and they overlook the changes in wealth inequality due to a decreased propensity gap in entrepreneurship. Overall, my findings suggest that bank deregulation can mitigate wealth inequality by providing equal financial access and equal opportunities for entrepreneurship. While a multitude of research endeavors attempt to associate bank competition with inequality (Beck et al. (2010)), my paper is the

[28] Net worth is defined as total assets minus total debt.

[29] Business equity is equal to business assets minus business debt.

[30] The reduced gender gap in business equity = (the coefficient of *Deregulation index* × *Entrepreneur* × *Female*)(0.094) / (the coefficient of *Entrepreneur* × *Female*)(1.644) = 6%. The reduced racial gap in business equity = (the coefficient of *Deregulation index* × *Entrepreneur* × *Minority*)(0.112) / (the coefficient of *Entrepreneur* × *Minority*)(1.032) = 11%.

[31] The reduced net wealth gender gap = the fraction of business equity gap in the net worth gap (49%) × The reduced gender gap in business equity because of bank deregulation (6%) = 3%.

first to document the effect of entrepreneurship on reducing gender and racial inequalities in wealth accumulation.

7 Conclusion

In my paper, I investigate whether access to finance reduces gender and racial gaps in entrepreneurship.

To achieve this goal, I take advantage of two pivotal acts determining the progress of interstate bank deregulation in the United States as exogenous shocks on the supply of credit specifically targeted towards disadvantaged entrepreneurs. I document that following bank deregulation, women and minorities are more likely to be entrepreneurs, leading to a narrowing of the gender and racial gaps in entrepreneurship. Consistent with the hypothesis that bank deregulation can remove the barrier to entry for financially constrained individuals, I find that this effect is more pronounced in industries that heavily rely on external financing and in economies with a history of bias or discrimination against women or minorities. Turning to the mechanisms behind my main results, I argue that the direct channel is that bank deregulation reduces the gaps in accessing initial capital for supporting businesses. Furthermore, I evaluate the quality of these new ventures and find no evidence that bank deregulation worsens the quality of new businesses.

Additionally, I also develop a novel discrimination measure, finding that deregulation can reduce complaints about discrimination against banks. This measure could aid CFPB monitoring by quantifying the discriminatory treatment of banks. The method employed in my research can also be applied to other contexts since unstructured textual data are prevalent in various domains. Moreover, my research contributes to evaluating the effect of the antitrust intervention on financial market structure and promoting equitable growth by highlighting the need for policymakers to consider underserved borrowers when making decisions regarding antitrust interventions.

Overall, my results suggest that equal access to finance fosters equitable economic growth.

References

Adelino, Manuel, Antoinette Schoar, and Felipe Severino, 2015, House prices, collateral, and self-employment, *Journal of Financial Economics* 117, 288–306.

Alesina, Alberto F, Francesca Lotti, and Paolo Emilio Mistrulli, 2013, Do women pay more for credit? evidence from italy, *Journal of the European Economic Association* 11, 45–66.

Amore, Mario Daniele, Cedric Schneider, and Alminas Žaldokas, 2013, Credit supply and corporate innovation, *Journal of Financial Economics* 109, 835–855.

Angrist, Joshua D, and Jörn-Steffen Pischke, 2008, *Mostly harmless econometrics* (Princeton University Press).

Arnold, David, Will Dobbie, and Crystal S Yang, 2018, Racial Bias in Bail Decisions, *Quarterly Journal of Economics* 133, 1885–1932.

Arrow, Kenneth J., 1974, *The theory of discrimination* (Princeton University Press, Princeton).

Asiedu, Elizabeth, James A Freeman, and Akwasi Nti-Addae, 2012, Access to credit by small businesses: How relevant are race, ethnicity, and gender?, *American Economic Review* 102, 532–37.

Bai, John (Jianqiu), Daniel Carvalho, and Gordon M. Phillips, 2018, The impact of bank credit on labor reallocation and aggregate industry productivity, *Journal of Finance* 73, 2787–2836.

Banerjee, Abhijit V, and Andrew F Newman, 1993, Occupational choice and the process of development, *Journal of Political Economy* 101, 274–298.

Bartlett, Robert, Adair Morse, Richard Stanton, and Nancy Wallace, 2022, Consumer-lending discrimination in the fintech era, *Journal of Financial Economics* 143, 30–56.

Beck, Thorsten, Asli Demirgüç-Kunt, and Ross Levine, 2007, Finance, inequality and the poor, *Journal of Economic Growth* 12, 27–49.

Beck, Thorsten, Ross Levine, and Alexey Levkov, 2010, Big bad banks? the winners and losers from bank deregulation in the united states, *Journal of Finance* 65, 1637–1667.

Becker, Gary S, 1957, *The economics of discrimination* (University of Chicago Press).

Begley, Taylor A, and Amiyatosh Purnanandam, 2021, Color and credit: Race, regulation, and the quality of financial services, *Journal of Financial Economics* 141, 48–65.

Bertrand, Marianne, Antoinette Schoar, and David Thesmar, 2007, Banking deregulation and industry structure: Evidence from the french banking reforms of 1985, *Journal of Finance* 62, 597–628.

Bhutta, Neil, and Aurel Hizmo, 2021, Do minorities pay more for mortgages?, *Review of Financial Studies* 34, 763–789.

Black, Sandra E, and Philip E Strahan, 2001, The division of spoils: Rent-sharing and discrimination in a regulated industry, *American Economic Review* 91, 814–831.

Black, Sandra E, and Philip E Strahan, 2002, Entrepreneurship and bank credit availability, *Journal of Finance* 57, 2807–2833.

Blanchflower, David G, Phillip B Levine, and David J Zimmerman, 2003, Discrimination in the small-business credit market, *Review of Economics and Statistics* 85, 930–943.

Bordalo, Pedro, Katherine Coffman, Nicola Gennaioli, and Andrei Shleifer, 2016, Stereotypes, *Quarterly Journal of Economics* 131, 1753–1794.

Bordo, Michael D, and John V Duca, 2018, The impact of the dodd-frank act on small business, Working paper, National Bureau of Economic Research.

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess, 2023, Revisiting event study designs: Robust and efficient estimation, Working paper, University College London.

Buchak, Greg, and Adam Jørring, 2021, Do mortgage lenders compete locally? evidence beyond interest rates, Working paper, Stanford University.

Butler, Alexander W, Erik J Mayer, and James P Weston, 2023, Racial disparities in the auto loan market, *Review of Financial Studies* 36, 1–41.

Cetorelli, Nicola, and Phillip E. Strahan, 2006, Finance as a barrier to entry: Bank competition and industry structure in local u.s. markets, *Journal of Finance* 61, 437–461.

Charles, Kerwin Kofi, and Jonathan Guryan, 2008, Prejudice and wages: An empirical assessment of becker's the economics of discrimination, *Journal of Political Economy* 116, 773–809.

Chatterji, Aaron K., and Robert C. Seamans, 2012, Entrepreneurial finance, credit cards, and race, *Journal of Financial Economics* 106, 182–195.

Chemmanur, Thomas J, and Paolo Fulghieri, 2014, Entrepreneurial finance and innovation: An introduction and agenda for future research, *Review of Financial Studies* 27, 1–19.

Chen, Tao, Chen Lin, and Bo Sun, 2021, Racial disparities in small business lending, Working

paper, Nanyang Technological University.

Chodorow-Reich, Gabriel, 2014, The employment effects of credit market disruptions: Firm-level evidence from the 2008-9 financial crisis, *Quarterly Journal of Economics* 129, 1–59.

Cornaggia, Jess, Yifei Mao, Xuan Tian, and Brian Wolfe, 2015, Does banking competition affect innovation?, *Journal of Financial Economics* 115, 189–209.

Corradin, Stefano, and Alexander Popov, 2015, House prices, home equity borrowing, and entrepreneurship, *Review of Financial Studies* 28, 2399–2428.

Célerier, Claire, and Adrien Matray, 2019, Bank-branch supply, financial inclusion, and wealth accumulation, *Review of Financial Studies* 32, 4767–4809.

De Chaisemartin, Clément, and Xavier D'Haultfœuille, 2020, Two-way fixed effects estimators with heterogeneous treatment effects, *American Economic Review* 110, 2964–96.

Duchin, Ran, Mikhail Simutin, and Denis Sosyura, 2021, The origins and real effects of the gender gap: Evidence from ceos' formative years, *Review of Financial Studies* 34, 700–762.

Duygan-Bump, Burcu, Alexey Levkov, and Judit Montoriol-Garriga, 2015, Financing constraints and unemployment: Evidence from the great recession, *Journal of Monetary Economics* 75, 89–105.

Egan, Mark, Gregor Matvos, and Amit Seru, 2022, When harry fired sally: The double standard in punishing misconduct, *Journal of Political Economy* 130, 1184–1248.

Ewens, Michael, 2022, Race and gender in entrepreneurial finance, Working paper, National Bureau of Economic Research.

Ewens, Michael, Bryan Tomlin, and Liang Choon Wang, 2014, Statistical discrimination or prejudice? a large sample field experiment, *Review of Economics and Statistics* 96, 119–134.

Ewens, Michael, and Richard R Townsend, 2020, Are early stage investors biased against women?, *Journal of Financial Economics* 135, 653–677.

Fairlie, Robert, Alicia Robb, and David T Robinson, 2022, Black and white: Access to capital among minority-owned start-ups, *Management Science* 68, 2377–2400.

Fairlie, Robert W, and Alicia M Robb, 2007, Why are black-owned businesses less successful than white-owned businesses? the role of families, inheritances, and business human

capital, *Journal of Labor Economics* 25, 289–323.

Fairlie, Robert W., and Alicia M. Robb, 2009, Gender differences in business performance: Evidence from the characteristics of business owners survey, *Small Business Economics* 33, 375–395.

Fairlie, Robert W, and Alicia M Robb, 2010, *Race and entrepreneurial success: Black-, Asian-, and White-owned businesses in the United States* (MIT Press).

Favara, Giovanni, and Jean Imbs, 2015, Credit supply and the price of housing, *American Economic Review* 105, 958–992.

Fonseca, Julia, and Adrien Matray, 2022, The real effects of banking the poor: Evidence from brazil, Working paper, National Bureau of Economic Research.

Gompers, Paul A, and Sophie Q Wang, 2017, Diversity in innovation, Working paper, National Bureau of Economic Research.

Goodman-Bacon, Andrew, 2021, Difference-in-differences with variation in treatment timing, *Journal of Econometrics* 225, 254–277.

Gottlieb, Joshua D, Richard R Townsend, and Ting Xu, 2022, Does career risk deter potential entrepreneurs?, *Review of Financial Studies* 35, 3973–4015.

Haendler, Charlotte, and Rawley Heimer, 2021, The financial restitution gap in consumer finance: insights from complaints filed with the cfpb, Working paper, Arizona State University.

Haltiwanger, John, Ron S. Jarmin, and Javier Miranda, 2013, Who creates jobs? small versus large versus young, *Review of Economics and Statistics* 95, 347–361.

Hebert, Camille, 2020, Gender stereotypes and entrepreneur financing, Working paper, University of Toronto.

Herkenhoff, Kyle, Gordon M. Phillips, and Ethan Cohen-Cole, 2021, The impact of consumer credit access on self-employment and entrepreneurship, *Journal of Financial Economics* 141, 345–371.

Hombert, Johan, and Adrien Matray, 2017, The real effects of lending relationships on innovative firms and inventor mobility, *Review of Financial Studies* 30, 2413–2445.

Hombert, Johan, Antoinette Schoar, David Sraer, and David Thesmar, 2020, Can unemployment insurance spur entrepreneurial activity? evidence from france, *Journal of Finance* 75, 1247–1285.

Howell, Sabrina T, and Ramana Nanda, 2022, Networking frictions in venture capital, and

the gender gap in entrepreneurship, *Journal of Financial and Quantitative Analysis* forthcoming.

Hsieh, Chang-Tai, Erik Hurst, Charles I. Jones, and Peter J. Klenow, 2019, The allocation of talent and u.s. economic growth, *Econometrica* 87, 1439–1474.

Iyer, Rajkamal, José-Luis Peydró, Samuel da Rocha-Lopes, and Antoinette Schoar, 2014, Interbank liquidity crunch and the firm credit crunch: Evidence from the 2007–2009 crisis, *Review of Financial Studies* 27, 347–372.

Jayaratne, Jith, and Philip E Strahan, 1996, The finance-growth nexus: Evidence from bank branch deregulation, *Quarterly Journal of Economics* 111, 639–670.

Johnson, Christian A, and Tara Rice, 2008, Assessing a decade of interstate bank branching, *Washington and Lee Law Review* 65, 73–127.

Kerr, William R., and Ramana Nanda, 2009, Democratizing entry: Banking deregulations, financing constraints, and entrepreneurship, *Journal of Financial Economics* 94, 124–149.

Krishnan, Karthik, Debarshi K. Nandy, and Manju Puri, 2015, Does financing spur small business productivity? evidence from a natural experiment, *Review of Financial Studies* 28, 1768–1809.

Kroszner, Randall S, and Philip E Strahan, 1999, What drives deregulation? economics and politics of the relaxation of bank branching restrictions, *Quarterly Journal of Economics* 114, 1437–1467.

Levine, Ross, Yona Rubinstein, and Alexey Levkov, 2014, Bank deregulation and racial inequality in america, *Critical Finance Review* 3, 1–48.

Naaraayanan, S Lakshmi, 2019, Women's inheritance rights and entrepreneurship gender gap, Working paper, Hong Kong University of Science and Technology.

Parker, Simon C, 2018, *The economics of entrepreneurship* (Cambridge University Press).

Phelps, Edmund S, 1972, The statistical theory of racism and sexism, *American Economic Review* 62, 659–661.

Piketty, Thomas, 2000, Theories of persistent inequality and intergenerational mobility, *Handbook of Income Distribution* 1, 429–476.

Rice, Tara, and Philip E. Strahan, 2010, Does credit competition affect small-firm finance?, *Journal of Finance* 65, 861–889.

Robb, Alicia M., and David T. Robinson, 2014, The capital structure decisions of new firms,

Review of Financial Studies 27, 153–179.

Scharfstein, David, and Adi Sunderam, 2016, Market power in mortgage lending and the transmission of monetary policy, Working paper, Harvard University.

Schmalz, Martin C., David A. Sraer, and David Thesmar, 2017, Housing collateral and entrepreneurship, *Journal of Finance* 72, 99–132.

Sun, Stephen Teng, and Constantine Yannelis, 2016, Credit constraints and demand for higher education: Evidence from financial deregulation, *Review of Economics and Statistics* 98, 12–24.

Tootell, Geoffrey MB, 1996, Redlining in boston: Do mortgage lenders discriminate against neighborhoods?, *Quarterly Journal of Economics* 111, 1049–1079.

Zandberg, Jonathan, 2021, Family comes first: Reproductive health and the gender gap in entrepreneurship, *Journal of Financial Economics* 140, 838–864.

Figures and Tables

Figure 1. Number of FDIC-insured commercial bank branches in the U.S. 1994-2021

This figure presents the total number of insured non-interstate and interstate branches in the U.S. from 1994 to 2021. The data used for this figure are sourced from the FDIC.

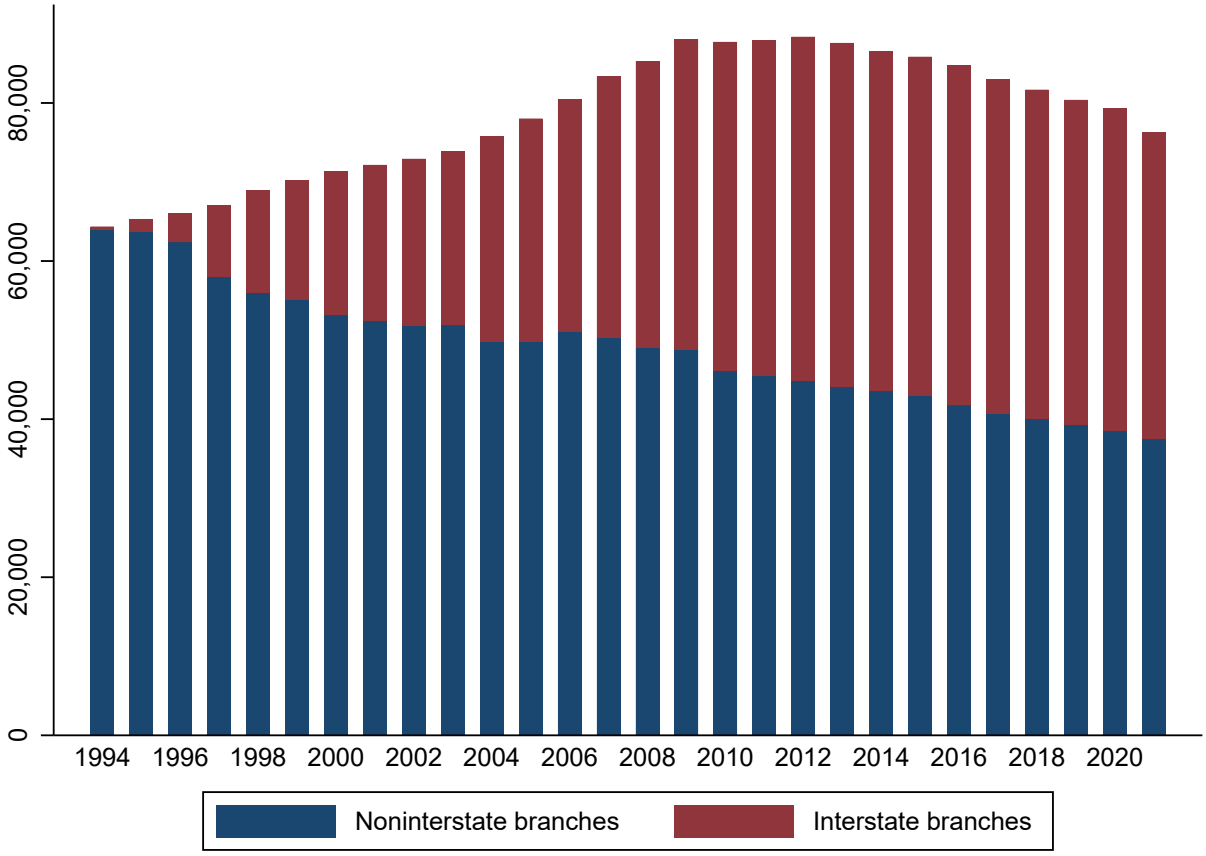
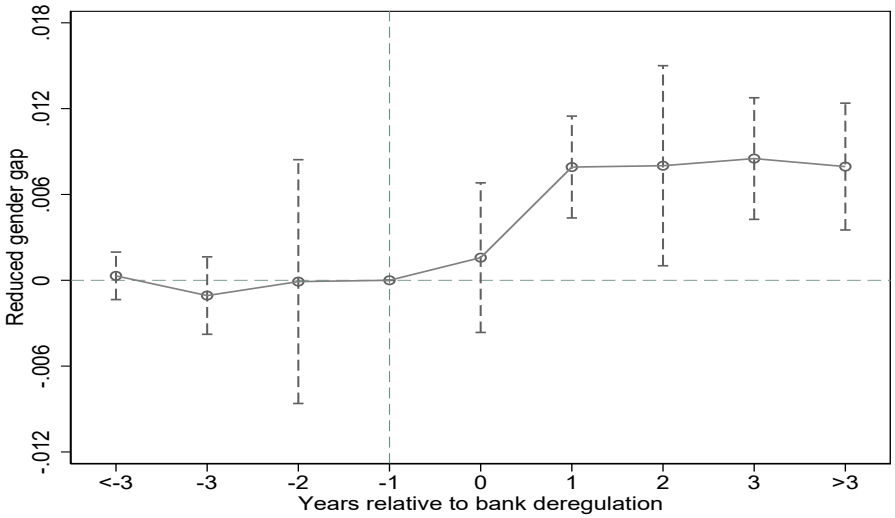
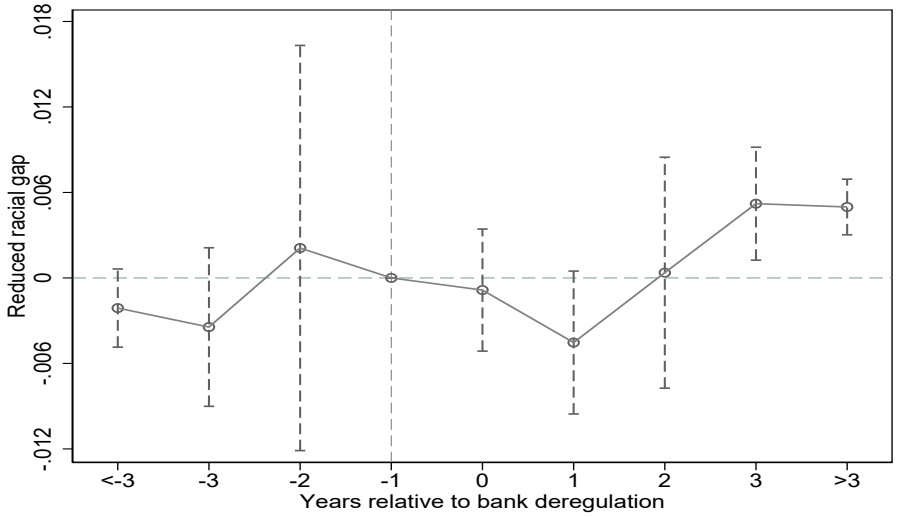


Figure 2. Impact of banking deregulation on entrepreneurial gaps

This figure illustrates a narrowing of both the gender and racial gaps in entrepreneurship surrounding the implementation of bank deregulation from 1990 to 2019. I use the same specification outlined in equation (1) in section 4.1.2, except that the bank deregulation index is substituted by a set of indicator *variables* $\sum_{t=-3}^{3} D(t)$, where $D(t)$ is equal to one exactly t years before or after the deregulation year. The plot presents the dynamics of the reduced gender and racial gaps and 95% confidence intervals for $t =< -3, -3, \ldots, 3, >3$. The reference year is $t = -1$ (one year prior to the deregulation year).



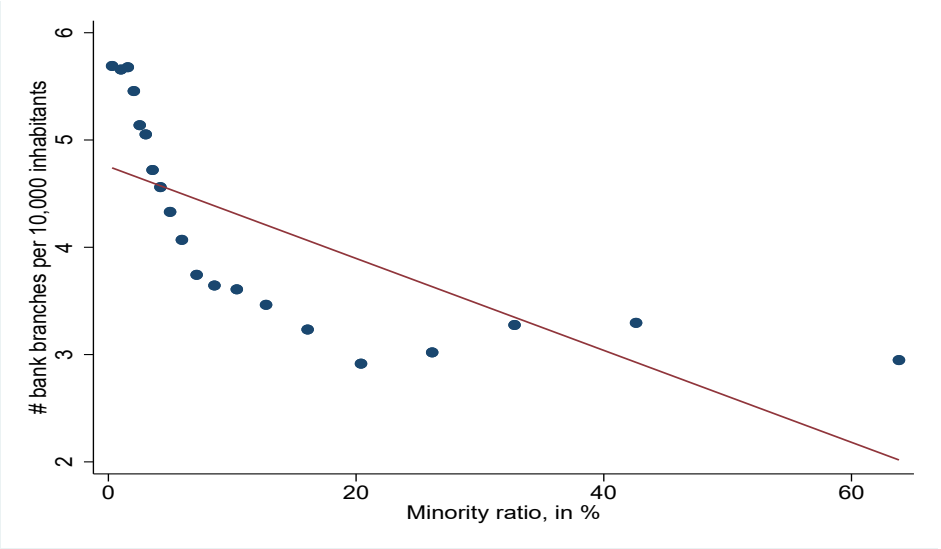
(a) Gender gap



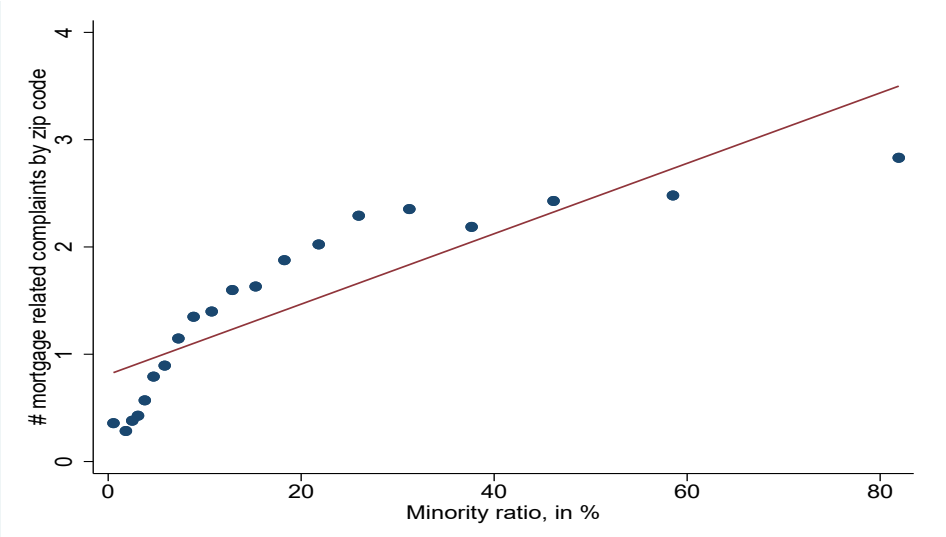
(b) Racial gap

Figure 3. The quantity and quality of banking service in minority communities

This figure shows the relationship between the minority ratio and two pivotal banking service measurements: service quantity (Figure 3(a)) and service quality (Figure 3(b)). The quantity of banking services is measured by the number of bank branches per 10,000 inhabitants at the county level, while the quality of banking services is measured by the number of mortgage-related complaints filed to the CFPB at the zip code level. The fitted linear regression is presented by the red line. The data are from the Census, CFPB, and FDIC.



(a) Minority ratio and bank branch density



(b) Minority ratio and banking service quality

Table 1. State interstate branching laws: 2005-2021

This table lists the bank deregulation index, the effective date of the underlying regulatory changes, and the status of the following four provisions: minimum age requirement of target bank or branch in the interstate acquisition, permission of de novo interstate banking, allowance of interstate banking by acquiring a single branch or part of a bank, statewide deposit share cap on the interstate acquisition and the underlying bank regulation laws. The bank deregulation index is set to zero for states with the most lenient requirement for the entry of out-of-state banks. An increment of one is applied to the index when states adopt any of the four requirements based on the four provisions previously discussed. Specifically, one is added to the index under the following four conditions: (1) if a minimum age requirement of three or more years on the target institution for acquisitions is imposed by a state; (2) if de novo interstate branching is not allowed in a state; (3) if interstate branching through acquiring a single branch or part of a bank is not permitted in a state; (4) if the deposit market share cap is less than 30%. The index ranges from zero to four. The last column shows the determinant acts that influence regulatory changes and the corresponding fluctuations in the index. Data on state interstate branching laws from 1994 to 2005 is derived from Johnson and Rice (2008). The index from 2005 to 2021 is constructed based on the regulatory changes collected from the Westlaw platform.

State	Bank Deregulation Index	Effective Date	Minimum Age Requirement of Institution for Acquisitions	Allowance of de novo Interstate Branching	Allow Interstate Branching by Acquiring a Single Branch or Part of an Institution	Statewide Deposit Share Cap on Acquisitions	Acts
Alabama	1	5/31/2007	5 years	Yes	Yes	30%	Riegle-Neal
Alaska	1	7/21/2010	3 years	Yes	Yes	50%	Dodd-Frank
Arizona	1	7/21/2010	5 years	Yes	Yes	30%	Dodd-Frank
Arkansas	2	3/30/2011	5 years	Yes	Yes	25%	Riegle-Neal
Arkansas	3	7/21/2010	5 years	Yes	No	25%	Dodd-Frank
California	2	1/1/2012	5 years	Yes	No	30%	Riegle-Neal
California	2	7/21/2010	5 years	Yes	No	30%	Dodd-Frank
Colorado	1	7/1/2013	No	Yes	Yes	25%	Riegle-Neal
Colorado	3	7/21/2010	5 years	Yes	No	25%	Dodd-Frank
Delaware	2	7/21/2010	5 years	Yes	No	30%	Dodd-Frank
Florida	0	7/1/2011	No	Yes	Yes	30%	Riegle-Neal
Florida	2	7/21/2010	3 years	Yes	No	30%	Dodd-Frank
Georgia	1	7/1/2016	3 years	Yes	Yes	30%	Riegle-Neal
Georgia	2	7/21/2010	3 years	Yes	No	30%	Dodd-Frank
Idaho	0	7/1/2015	No	Yes	Yes	None	Riegle-Neal
Idaho	2	7/21/2010	5 years	Yes	No	None	Dodd-Frank
Indiana	0	7/1/2011	No	Yes	Yes	30%	Riegle-Neal
Iowa	3	7/21/2010	5 years	Yes	No	15%	Dodd-Frank
Kansas	3	7/21/2010	5 years	Yes	No	15%	Dodd-Frank
Kentucky	2	7/21/2010	No	Yes	No	15%	Dodd-Frank
Louisiana	1	8/1/2021	5 years	Yes	Yes	30%	Riegle-Neal
Louisiana	2	7/21/2010	5 years	Yes	No	30%	Dodd-Frank
Minnesota	2	7/21/2010	5 years	Yes	No	30%	Dodd-Frank
Mississippi	3	7/21/2010	5 years	Yes	No	25%	Dodd-Frank
Missouri	3	7/21/2010	5 years	Yes	No	13%	Dodd-Frank
Montana	1	10/1/2019	5 years	Yes	Yes	30%	Riegle-Neal
Montana	2	10/1/2013	5 years	Yes	Yes	22%	Riegle-Neal
Montana	3	10/1/2011	5 years	Yes	No	22%	Riegle-Neal
Montana	3	7/21/2010	5 years	Yes	No	22%	Dodd-Frank
Nebraska	1	4/7/2012	No	Yes	Yes	22%	Riegle-Neal
Nebraska	3	7/21/2010	5 years	Yes	No	14%	Dodd-Frank
Nevada	2	7/21/2010	5 years	Yes	Limited	30%	Dodd-Frank
New Jersey	0	7/21/2010	No	Yes	Yes	30%	Dodd-Frank
New Mexico	2	7/21/2010	5 years	Yes	No	40%	Dodd-Frank
New York	0	7/18/2012	No	Yes	Yes	30%	Riegle-Neal
New York	1	7/21/2008	5 years	Yes	Yes	30%	Riegle-Neal
Oregon	0	6/7/2011	No	Yes	Yes	30%	Riegle-Neal
Oregon	2	7/21/2010	3 years	Yes	No	30%	Dodd-Frank
South Carolina	2	7/21/2010	5 years	Yes	No	30%	Dodd-Frank
South Dakota	0	3/10/2008	No	Yes	Yes	30%	Riegle-Neal
Texas	1	6/14/2013	No	Yes	Yes	20%	Riegle-Neal
Washington	1	5/9/2005	5 years	Yes	Yes	30%	Riegle-Neal
Wisconsin	2	4/11/2006	5 years	Yes	No	30%	Riegle-Neal
Wyoming	1	7/1/2013	No	Yes	No	30%	Riegle-Neal
Wyoming	2	7/21/2010	3 years	Yes	No	30%	Dodd-Frank

Table 2. Summary statistics

This table presents the mean values for all variables utilized in the regression analysis spanning the period from 1990 to 2019. The first four columns display the mean values for four distinct subsamples: men versus women and White versus minority. The last column presents the mean values for the entire sample. To adjust for inflation, I deflate all nominal variables using the CPI from 2010. Panels A and B encompass all individuals in SIPP within their prime age range (between 22 and 60). "New entrepreneur" is a binary variable that takes a value of one if individuals transition to entrepreneurship within three years after their initial interview. "Net worth" is calculated as the difference between total assets and total debt. Panel C includes all prime-age individuals who operate businesses the first time they enter the sample and are interviewed.

Mean value	Men	Women	White	Minority	Total
Panel A: Sociodemographics					
Dummy: New entrepreneur	0.061	0.04	0.055	0.041	0.051
Number of children	0.791	0.865	0.737	1.045	0.828
Family size (number of adults)	2.146	2.088	2.057	2.261	2.117
Age (year)	37.457	38.054	38.15	36.789	37.749
Dummy: Homeowner	0.629	0.639	0.69	0.499	0.634
Dummy: Elementary education	0.125	0.09	0.07	0.2	0.108
Dummy: High school education	0.316	0.297	0.307	0.306	0.307
Dummy: Some college education	0.298	0.333	0.322	0.3	0.315
Dummy: College or more education	0.261	0.279	0.301	0.194	0.27
Dummy: Employed	0.951	0.956	0.964	0.927	0.953
Dummy: Married	0.575	0.531	0.58	0.488	0.553
Panel B: Economic conditions					
Monthly income	3,990.43	2,767.04	3,660.41	2,748.02	3,391.67
Total personal debt	58,715	48,280	63,461	37,345	53,328
Secured debt	50,942	39,559	54,179	30,690	45,066
Mortgage debt	44,537	33,242	47,251	25,227	38,706
Vehicle debt	6,732	6,515	7,112	5,544	6,619
Unsecured debt	7,773	8,721	9,282	6,655	8,263
Student debt	3,643	4,941	4,737	3,644	4,313
Credit card debt	2,017	2,110	2,249	1,665	2,066
Secured business debt	414,133	126,348	318,435	128,793	263,390
Business equity	49,150	15,510	42,536	14,826	31,785
Net worth	183,115	114,503	189,324	82,029	147,696
Number of unique individuals	166,859	159,950	230,548	96,261	326,809
Percentage	51%	49%	71%	29%	100%
Panel C: Firm characteristics					
Size dummy: Under 25 employees	0.95	0.966	0.952	0.968	0.955
Size dummy: 25-99 employees	0.037	0.024	0.035	0.023	0.033
Size dummy: No less than 100 employees	0.013	0.01	0.013	0.009	0.012
Monthly Profit amount	6,735.35	4,080.20	5,942.93	5,151.79	5,785.22
Number of unique entrepreneurs	26,385	14,703	32,898	8,190	41,088
Percentage	64%	36%	80%	20%	100%

Table 3. Entrepreneurship gaps and interstate bank deregulation

This table presents linear probability regressions of the interstate bank deregulation index on the gender and racial gaps in entrepreneurship. The dependent variable takes a value of 1 if the household makes a transition to entrepreneurship, as observed in the SIPP data from 1990 to 2019. The deregulation index ranges from 0 to 4, where 0 represents the least deregulated and 4 indicates full deregulation. Columns (1) to (2) include state-year joint fixed effects, while Columns (3) to (4) incorporate household sociodemographic fixed effects and state-year-income decile joint fixed effects. In addition, Column (5) includes MSA-year-income decile joint fixed effects. The household sociodemographic fixed effects encompass the number of raised children, family size, age, homeownership, educational attainment, employment status, and marital status of the surveyed household. For a detailed definition of these variables, refer to Section 4.1.1. Standard errors reported in parentheses are double clustered by state and year. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Female	-0.022***	-0.026***	-0.024***	-0.029***	-0.030***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
Minority	-0.014***	-0.020***	-0.013***	-0.019***	-0.022***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Dereg × Female		0.003***		0.003***	0.003***
		(0.001)		(0.001)	(0.001)
Dereg × Minority		0.004***		0.004***	0.003**
		(0.001)		(0.001)	(0.001)
State × Year FE	Yes	Yes	No	No	No
State × Year × Income decile FE	No	No	Yes	Yes	Yes
MSA × Year × Income decile FE	No	No	No	No	Yes
Sociodemographics	No	No	Yes	Yes	Yes
Observations	326,798	326,798	325,500	325,500	172,446
R^2	0.014	0.014	0.044	0.044	0.091
Sample mean	0.050	0.050	0.050	0.050	0.057

Table 4. Bank deregulation and entrepreneurial entry, by discriminatory social norms

This table examines heterogeneity in entrepreneurial entry based on state-level historical differences in discrimination or bias against minorities or women. Panel A presents the results for minority entrepreneurs, while Panel B presents the results for female entrepreneurs. The dependent variable is the transition into entrepreneurs within three years. In Panel A, I use four measures as a proxy for discrimination. The *High Discrimination* dummy is equal to one under the following four conditions: (1) if a state is a former slave state one year before the Civil War; (2) a state did not repeal anti-miscegenation law until after the US Supreme Court made the decision in *Loving v. Virginia* in 1967; (3) the racial bias index based on the interracial marriage rate, is above the median value; (4) a state does not have fair housing law until the Fair Housing Act of 1968 is passed by the federal government.

In Panel B, I follow Duchin et al. (2021) and build four gender imbalance dummy variables using the SIPP dataset. *Income imbalance* is the state-level average income difference between employed men and employed women in the year 1990 before the bank deregulation. In the same way, I build *Earning Imbalance*, *Education Imbalance*, and *Employment Imbalance* using the gender gap in earnings, the number of years of received education, and the labor participation ratio. The variable *High Bias* is equal to one if the corresponding imbalance measure is above the median value. The model specifications are fully saturated in all columns, but I only report the coefficients of variables of my main interest to keep it concise. Household sociodemographic fixed effects include the number of raised children, family size, age, homeownership, education attainment, employment, and marital status of the surveyed household. Section 4.1.1 defines these variables in detail. Standard errors reported in parentheses are double clustered by state and year. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Entrepreneurial racial gap and bank competition: Evidence of racial discrimination

Dep. Var= Entrepreneur	(1)	(2)	(3)	(4)
High Discrimination=	Former Slave State	Anti-miscegenation Law	Interracial Marriage Bias	No Fair Housing Law
Dereg × Black ×	0.005***	0.005**	0.004**	0.004**
High Discrimination	(0.002)	(0.002)	(0.002)	(0.002)
Black × High Discrimination	-0.014***	-0.013***	-0.014***	-0.013***
	(0.004)	(0.004)	(0.003)	(0.004)
Dereg × Black	0.000	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes

Continued on next page

Table 4 – *Continued from previous page*

Dep. Var= Entrepreneur	(1)	(2)	(3)	(4)
High Discrimination=	Former Slave State	Anti-miscegenation Law	Interracial Marriage Bias	No Fair Housing Law
State × Year × Income decile FE	Yes	Yes	Yes	Yes
Sociodemographics	Yes	Yes	Yes	Yes
Observations	325,500	325,500	325,500	325,500
R^2	0.044	0.044	0.044	0.044
Sample Mean	0.050	0.050	0.050	0.050

Panel B: Entrepreneurship gender gap and bank competition: Evidence of gender imbalance

Dep. Var= Entrepreneur	(1)	(2)	(3)	(4)
High Bias=	Income Imbalance	Earning Imbalance	Education Imbalance	Employment Imbalance
Dereg × Gender × High Bias	0.003**	0.003***	0.008**	0.002
	(0.001)	(0.001)	(0.003)	(0.003)
Gender × High Bias	-0.008***	-0.008***	-0.012**	-0.006
	(0.001)	(0.001)	(0.005)	(0.005)
Dereg × Gender	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes
State × Year × Income decile FE	Yes	Yes	Yes	Yes
Sociodemographics	Yes	Yes	Yes	Yes
Observations	325,500	325,500	325,500	325,500
R^2	0.044	0.044	0.044	0.044
Sample Mean	0.050	0.050	0.050	0.050

Table 5. Heterogeneous effects by external financing dependence

This table presents results examining heterogeneity in entrepreneurial entry based on external financing dependence around the bank deregulation reform. The dependent variable is the transition into entrepreneurs within three years. Industries are categorized as *High Dependence* based on the fraction of capital expenditure funded by external financing. To measure external financing dependence, I adopt the procedures used in Cetorelli and Strahan (2006). Specifically, it is calculated as the fraction of capital expenditure funded by external financing. Negative values indicate that firms do not rely on external financing and have sufficient cash flow, while positive values indicate that firms depend on issuing equity or debt to support their investment activities. This measure is constructed using data from the Compustat database. The two-digit SIC codes in Compustat are matched to the industry classification used in the SIPP. *High Dependence* is equal to one if industries have positive external financing dependence and zero otherwise. Household sociodemographic fixed effects include the number of raised children, family size, age, homeownership, education attainment, employment, and marital status of the surveyed household. For a comprehensive definition of these variables, please refer to Section 4.1.1. Standard errors reported in parentheses are double clustered by state and year. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dereg × Female × High Dependence	0.003***		0.002***
	(0.001)		(0.000)
Dereg × Minority × High Dependence		0.003***	0.002**
		(0.001)	(0.001)
Dereg × Female	0.001**	0.001**	0.001**
	(0.000)	(0.000)	(0.000)
Dereg × Minority	0.002**	0.002**	0.002**
	(0.001)	(0.001)	(0.001)
Female	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)
Minority	-0.007***	-0.007***	-0.007***
	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes
State × Year × Income decile FE	Yes	Yes	Yes
Sociodemographics	Yes	Yes	Yes
Observations	269,749	269,749	269,749
R^2	0.644	0.644	0.644
Sample Mean	0.050	0.050	0.050

Table 6. Bank competition and debt gap among entrepreneurs

This table illustrates the effect of bank competition on entrepreneurial financing gaps conditional on entrepreneurs. The sample is restricted to entrepreneurs, and the dependent variables are the debt amount (Columns (1) and (3)) or a binary variable indicating whether an entrepreneur gains access to debt (Columns (2) and (4)) in the next year. The model specifications in all columns are fully saturated. *Minority* (*Female*) is a dummy variable equal to one if the minority (female) individual is an entrepreneur in the current period, and to zero otherwise. Household sociodemographic fixed effects include the number of raised children, family size, age, homeownership, education attainment, employment, and marital status of the surveyed household. For a detailed definition of these variables, refer to Section 4.1.1. Standard errors reported in parentheses are double clustered by state and year. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Dep. Var=	(1) Log(Secured Business Debt)	(2) **1**(Secured Business Debt)	(3) Log(Mortgage Debt)	(4) **1**(Mortgage Debt)
Minority	-0.391*	-0.028**	-0.760**	-0.065**
	(0.172)	(0.010)	(0.340)	(0.028)
Deregulation Index × Minority	0.097**	0.008***	0.245*	0.021*
	(0.034)	(0.001)	(0.132)	(0.011)
Female	-1.781***	-0.112***	-0.574	-0.053
	(0.343)	(0.021)	(0.440)	(0.036)
Deregulation Index × Female	0.201*	0.017**	0.120	0.011
	(0.090)	(0.006)	(0.138)	(0.011)
State x Year x Income Decile FE	Yes	Yes	Yes	Yes
Sociodemographics	Yes	Yes	Yes	Yes
Observations	24,139	24,139	24,139	24,139
R^2	0.180	0.352	0.220	0.219

Table 7. What types of firms do they found?

This table characterizes new businesses based on employment and profit. In Columns (1) and (2), the transition into entrepreneurship variable in equation (1) is decomposed into two mutually exclusive variables: a dummy variable equal to one if the new venture hires no less than 25 employees, and an indicator variable equal to one if the new business hires less than 25 employees. In Columns (3) and (4), the dependent variable is decomposed into two variables: the creation of a profitable firm and the formation of an unprofitable firm based on the profit amount. Household sociodemographic fixed effects include the number of raised children, family size, age, homeownership, education attainment, employment, and marital status of the surveyed household. For detailed definitions of these variables, refer to Section 4.1.1. Standard errors reported in parentheses are double clustered by state and year. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	(1) Big Firm (Employee>=25)	(2) Small Firm (Employee<25)	(3) Profitable Firm	(4) Unprofitable Firm
Dereg × Female	0.001***	0.001**	0.003***	0.000
	(0.000)	(0.001)	(0.001)	(0.000)
Dereg × Minority	0.001*	0.001	0.004***	0.000
	(0.001)	(0.001)	(0.001)	(0.000)
Female	-0.008***	-0.026***	-0.029***	-0.000
	(0.001)	(0.002)	(0.002)	(0.000)
Minority	-0.007***	-0.012***	-0.020***	-0.000
	(0.002)	(0.002)	(0.002)	(0.000)
State × Year × Income decile FE	Yes	Yes	Yes	Yes
Sociodemographics	Yes	Yes	Yes	Yes
Observations	182,959	182,959	328,654	328,654
R^2	0.037	0.041	0.044	0.031

Table 8. Bank deregulation and financial inclusion

Panel A presents the OLS results examining the impact of bank deregulation on branch coverage in minority communities. The dependent variable is the logarithm of the total number of bank branches per capita at the county level. The deregulation index ranges from zero to four, where zero indicates full regulation and four represents full deregulation. The minority ratio refers to the proportion of non-White residents in each county. The Minority Dummy variable equals one if counties are in the top quartile of the distribution in terms of the minority ratio. To maintain conciseness, only the coefficients of the interaction terms are reported, but the model specifications are fully saturated across all columns. Control variables, including income per capita, income growth, population, and unemployment rate, are included in columns (2) and (4). Branch density data are sourced from the FDIC, while county information is collected from the Census, Bureau of Labor and Statistics, and Bureau of Economic Analysis.

Panel B reports the results regarding the impact of bank deregulation on the racial gap in access to bank accounts at the individual level. The dependent variable is a binary indicator variable representing whether an individual holds a bank account. Columns (1) to (2) do not include any controls, while Columns (3) to (4) incorporate household sociodemographic fixed effects and state-year-income decile joint fixed effects. The household sociodemographic fixed effects encompass the number of raised children, family size, age, homeownership, educational attainment, employment status, and marital status of the surveyed household. The data are obtained from the SIPP. Standard errors reported in parentheses are clustered by state. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Panel A: The effect of bank deregulation on the racial gap in bank branch coverage

Dep. Var=Log(branch density per capita)	(1)	(2)	(3)	(4)
Deregulation Index × Minority Ratio	0.121**	0.115*		
	(0.056)	(0.058)		
Deregulation Index × Minority Dummy			0.030***	0.029***
			(0.011)	(0.011)
Controls	No	Yes	No	Yes
State × Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Observations	77,652	76,369	77,652	76,369
R^2	0.945	0.946	0.945	0.946

Panel B: The effect of bank deregulation on the racial gap in holding bank accounts

Dep. Var= Holds a bank account	(1)	(2)	(3)	(4)
Minority	-0.093***	-0.133***	-0.063***	-0.055***
	(0.008)	(0.014)	(0.011)	(0.011)
Deregulation Index × Minority		0.019***	0.012***	0.011**
		(0.005)	(0.004)	(0.004)
State × Year FE	Yes	Yes	Yes	No
State × Year × Income decile FE	No	No	No	Yes
Sociodemographics				
Family kids FE	No	No	Yes	Yes
Family adults FE	No	No	Yes	Yes
Age FE	No	No	Yes	Yes
Homeowner FE	No	No	Yes	Yes
Education FE	No	No	Yes	Yes
Employment FE	No	No	Yes	Yes
Marriage FE	No	No	Yes	Yes
Observations	356,517	356,517	289,578	289,454
R^2	0.025	0.026	0.084	0.107

Table 9. Bank deregulation and the quality of banking services

Panel A presents OLS results from the regression of log(complaints) on the interaction term Deregulation × Minority Ratio or Deregulation × Minority Dummy, and numerous sets of fixed effects at the five-digit zip code level. The dependent variable, log(complaints), represents the logarithm of the total number of mortgage-related complaints reported to the CFPB within a specific zip code from 2012 to 2021. The deregulation index ranges from zero to four, where zero denotes full regulation and four indicates full deregulation. The minority ratio refers to the proportion of non-White residents in each zip code for the year 2012. The Minority Dummy variable equals one if a particular zip code falls within the top quartile of the distribution in terms of the minority ratio. To maintain conciseness, only the coefficients of the interaction terms are reported (the individual components within the interaction term are included as the control variable), while the model specifications are fully saturated.

Panel B presents OLS results using the same regression as Panel A, with the exception that the dependent variable is either the logarithm of the total number of mortgage-related complaints or a binary variable indicating the incidence of mortgage-related complaints about discriminatory treatment filed to the CFPB within a given zip code. Discriminatory treatment is identified from the narrative using a textual analysis method. Standard errors reported in parentheses are clustered by state. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Panel A: The effect of bank deregulation on the racial gap in the quality of banking services

Dep. Var=Log(complaints)	(1)	(2)	(3)	(4)	(5)	(6)
Deregulation × Minority Ratio	-0.155**	-0.167***	-0.147***			
	(0.060)	(0.039)	(0.053)			
Deregulation × Minority Dummy				-0.055**	-0.058***	-0.054***
				(0.024)	(0.013)	(0.019)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Zip code FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	Yes	No	No
State × Year FE	No	Yes	Yes	No	Yes	Yes
MSA × Year FE	No	No	Yes	No	No	Yes
Observations	184,068	184,068	130,824	184,068	184,068	130,824
R^2	0.690	0.695	0.705	0.690	0.695	0.705

Panel B: The effect of bank deregulation on complaints about discriminatory treatment

Dep. Var=	Log(discrimination complaints)				**1**(discrimination complaints)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dereg×Minority Ratio	-0.044**	-0.057***	-0.083***		-0.060**	-0.073***	-0.105***	
	(0.021)	(0.018)	(0.019)		(0.024)	(0.022)	(0.022)	
Dereg×Minority Dummy				-0.028***				-0.040***
				(0.007)				(0.008)
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zip code FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	No	No	No
State × Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
MSA × Year FE	No	No	Yes	Yes	No	No	Yes	Yes
Observations	122,712	122,712	87,216	87,216	122,712	122,712	87,216	87,216
R^2	0.254	0.256	0.264	0.264	0.247	0.249	0.257	0.257

Table 10. Discrimination complaint example

Date received	2021/1/28
Product	Mortgage
Subproduct	Conventional home mortgage
Issue	Applying for a mortgage or refinancing an existing mortgage
Consumer complaint narrative	I was denied a mortgage loan from Bank of America for a property in XXXX XXXX, NJ on XX/XX/2021. I haven't received written confirmation yet, but the verbal reasoning is due to my employment history and employment gaps. The loan officer sounded very condescending when she told me that I was denied. It doesn't make sense to me to be denied for that reason alone as my employment history was stated on Day 1 and I was pre-qualified for the loan. To make matters worse, I was denied after having an appraisal done on the property so I was fairly far into the process with a refund unlikely for the $570.00 I was charged for the appraisal. I believe that I am being discriminated against because I disclosed my race as XXXX on Section X of the XXXX loan application. I would greatly appreciate it if this could be looked into to ensure that Bank of America didn't discriminate against me by showing that they also denied mortgage loans to people of other races, particularly XXXX people, with similar credit, income or debt-to-income ratio, savings, educational, and employment backgrounds as me. Quick summary of my background : I have excellent credit, my credit score is over XXXX. My 2 employment gaps greater than 30 days were related to school. I have a XXXX XXXX XXXX and currently in XXXX XXXX seeking a XXXX. I work full time as a mortgage loan advisor where I earn over $45000.00 annually. I have savings of $30000.00. The house I was looking to purchase cost $180000.00.
Company	BANK OF AMERICA, NATIONAL ASSOCIATION
State	PA
Submitted via	Web
Company response to consumer	Closed with monetary relief
Company disputed	No

Table 11. Bank deregulation and firm performance

This table presents the results of the effect of bank deregulation on firm subsequent performance. *Crisis* is a dummy variable equal to one for the crisis year 2008 and is zero otherwise. *Size* is a dummy variable equal to one if the number of employees in the following year is no less than 25. *Survive* is also a dummy equal to one if the firm remains operational in the subsequent year. Household sociodemographic fixed effects include the number of raised children, family size, age, homeownership, education attainment, employment, and marital status of the surveyed household. For detailed definitions of these variables, refer to Section 4.1.1. Standard errors reported in parentheses are double clustered by state and year. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	(1) Profit Amount	(2) Profit Amount	(3) Profit Dummy	(4) Profit Dummy	(5) Size	(6) Size	(7) Survive	(8) Survive
Dereg × Female	-297.047	-319.419	0.000	0.000	0.066***	0.065***	0.001	0.000
	(182.283)	(194.256)	(0.000)	(0.000)	(0.018)	(0.018)	(0.002)	(0.002)
Dereg × Minority	-265.652	-306.127	0.001***	0.001**	0.020**	0.020*	-0.001	-0.001
	(389.305)	(405.340)	(0.000)	(0.000)	(0.010)	(0.010)	(0.002)	(0.003)
Dereg × Minority × Crisis		617.562**		0.001***		0.000		0.006*
		(306.417)		(0.000)		(0.003)		(0.003)
Dereg × Female × Crisis		401.154*		0.006***		0.007*		0.013***
		(217.978)		(0.001)		(0.004)		(0.003)
Female	-108.773	-84.900	0.000	0.000	-0.240***	-0.240***	-0.033***	-0.033***
	(167.972)	(164.737)	(0.000)	(0.000)	(0.056)	(0.056)	(0.005)	(0.006)
Minority	-395.294	-358.726	-0.001***	-0.001***	-0.049*	-0.049*	-0.026***	-0.024***
	(298.879)	(306.921)	(0.000)	(0.000)	(0.028)	(0.028)	(0.007)	(0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × Year × Income decile	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sociodemographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,299	75,299	76,301	76,301	65,493	65,493	76,301	76,301
R^2	0.270	0.270	0.108	0.108	0.253	0.253	0.155	0.155

Table 12. Bank deregulation and business equity accumulation

The table shows the natural logarithm of business equity as the dependent variable regressed against gender, minority, bank deregulation index, a dummy variable indicating whether the individual is a business owner, and a set of fixed effects. Business equity is equal to business assets minus business debt. Household sociodemographic fixed effects include the number of raised children, family size, age, homeownership, education attainment, employment, and marital status of the surveyed household. For detailed definitions of these variables, refer to Section 4.1.1. Standard errors reported in parentheses are double clustered by state and year. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Dep. Var= Log (business equity+1)	(1)	(2)	(3)
Entrepreneur	5.104***	5.741***	7.303***
	(0.101)	(0.158)	(0.147)
Deregulation Index × Female × Entrepreneur	0.145*		0.094*
	(0.071)		(0.055)
Deregulation Index × Minority × Entrepreneur		0.108**	0.112**
		(0.047)	(0.049)
Female × Entrepreneur	-2.016***		-1.644***
	(0.079)		(0.147)
Minority × entrepreneur		-1.286***	-1.032***
		(0.121)	(0.134)
Controls	Yes	Yes	Yes
State × Year × Income decile FE	Yes	Yes	Yes
Sociodemographics	Yes	Yes	Yes
Observations	520,585	520,585	520,585
R^2	0.234	0.326	0.411

Internet Appendix to Li (2023)
Bank Competition and Entrepreneurial Gaps: Evidence from Bank Deregulation

This Internet Appendix contains supplementary analyses. These include the following:

Figures

1. Figure A1 shows the total number of complaints about discrimination at the county level.

Tables

1. Table A1 provides a variable list.

2. Table A2 provides state interstate branching laws in 2005-2021.

3. Table A3 tests whether state-level variables can predict the timing of the implementation of bank deregulation.

4. Table A4 demonstrates the effect of bank deregulation across interstate banks and local banks.

5. Table A5 checks the suitability of a linear representation of the deregulation index and also confirms that the observed effects are not driven by underlying trends.

6. Table A6 shows the results using alternative measures of the dependent variables, the total number of complaints and discrimination complaints scaled by the total number

of mortgages in a given zip code.

7. Table A7 displays the results after excluding complaints disputed by lenders and complaints closed without relief, respectively, eliminating the possibility that my findings are driven by frivolous complaints.

8. Table A8 displays the effect of incidental M&A on the quality of banking services and discriminatory treatments in minority communities.

9. Table A9 tests whether the racial gaps in rejection rates are larger in banks with a high number of discriminatory complaints.

10. Table A10 illustrates the comparative risk profile of minority borrowers versus White borrowers within banks with a substantial quantity of discriminatory complaints.

11. Table A11 provides a comparative analysis of the creditworthiness of marginal minority borrowers versus marginal White borrowers within banks that receive a high volume of discriminatory complaints.

12. Table A12 shows that bank competition can reduce the racial gap in access to PPP loans.

13. Table A13 further analyzes the heterogeneous impact of bank deregulation on different minority groups, specifically broken down into three categories: Black, Hispanic, and other.

14. Table A14 presents the effect of interstate bank deregulation on entrepreneurial gender and racial gaps using the method proposed by Borusyak, Jaravel, and Spiess (2023)

and conducts a one-time shock test based on the Dodd-Frank Act.

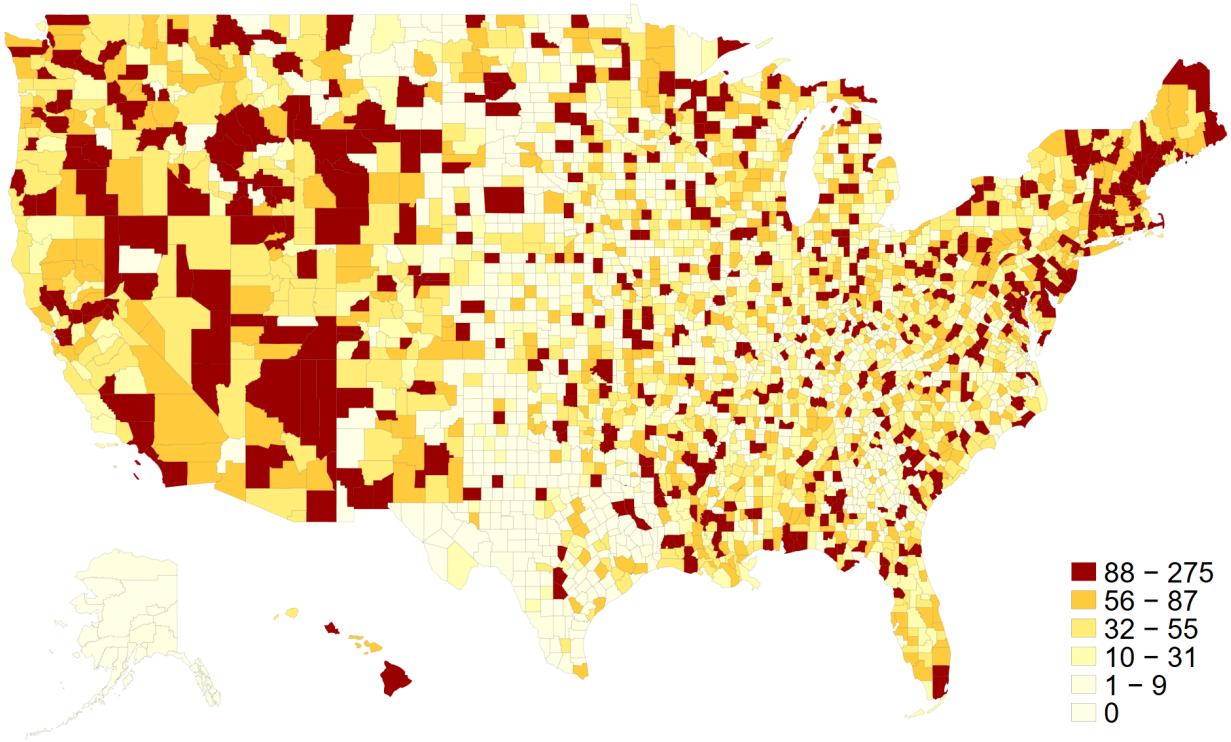


Figure A1. The total number of complaints about discrimination at the county level

Table A1. Variable list

Variable	Definition
Westlaw (1994-2021)	
Bank deregulation index	This index ranges from 0 to 4 based on four specific provisions. The index is set to zero in the absence of interstate branching restrictions, with each of the following conditions contributing to an increment of one: (1) if the minimum age requirement on target banks of interstate acquisition is three years or more; (2) if de novo interstate branching is not allowed in a state; (3) if an out-of-state bank cannot enter the local market via the acquisition of branches instead of buying the whole bank; (4) if the deposit cap imposed by the state is less than 30%. By definition, a smaller index value signifies heightened competition due to relaxed entry restrictions for out-of-state banks, thereby posing a challenge to local and community banks.
Federal Financial Institutions Examination Council (1990-2021)	
Merge and acquisition	A county-level dummy variable equal to one after the incidental merger. I focus on mergers that are exogenous to the local lending opportunities
Census (1990-2020)	
Minority ratio	The proportion of minority population within a county
Minority dummy	Equal to one if the proportion of the minority population within a county exceeds the median level.
Survey of Income and Program Participation (SIPP) (1990-2019)	
Minority/ Woman dummy	Equal to one if households are non-whites (women)

Continued on next page

Table A1 – *Continued from previous page*

Variable	Definition
Open a bank account	A dummy variable set to 1 if a resident opens a bank account
Entrepreneur	A dummy variable set to 1 if a resident opens a startup
Firm performance	Firm survival rate, employment, and revenue
Financing conditions	The total amount and dummy variables of the following loans: (1) business loans, (2) personal loans, including secured loans (home equity loans and vehicle loans), and unsecured loans (credit card debt and student debt).
Federal Deposit Insurance Corporation (FDIC) (1994-2021)	
Branch density	The number of branches per 10,000 inhabitants aggregated at the county level
Consumer Financial Protection Bureau (CFPB) (2012-2021)	
Quality of banking services	The total number of complaints against banks at the ZIP code level
Borrowers' perceptions of being discriminated against	The total number of complaints about discriminatory treatment. The narrative including the words "discrimination", "unfair","inequity", "prejudice", "injustice" or other related concepts or words is treated as complaints about discrimination.
Small Business Administration (SBA) Dataset (2020)	
Amount of PPP loans per supported job	Total loan amount divided by the total supported jobs in a given zip code
Take up rate	The total number of PPP loans divided by the total number of eligible firms in a given zip code

Table A2. State interstate branching laws: 2005-2021

State	Changes to State Interstate Branching Laws	Session Law	Effective Date	Minimum Age of Institution (Bank or Branch) for Acquisitions	Allows de novo Interstate Branching	Interstate Branching by Acquisition of Single Branch or Portions of an Institution	Statewide Deposit Cap on Branch Acquisitions
Alabama	Allowed de novo branching and branch acquisition	2007 Ala. Laws 224	5/31/2007	5 years; ALA. CODE § 5-13B-23(c)	Yes; ALA. CODE § 5-13B-23(e)	Yes; ALA. CODE § 5-13B-23(e)	30%; ALA. CODE § 5-13B-23(b)
Arkansas	Allowed de novo branching and branch acquisition. § 23-48-904 was repealed by Acts of 2011, Act 796	2011 Ark. Acts 796	3/30/2011	5 years; Ark. Code §23-48- 903 - §23-45-102(18)	Yes; Ark. Code §23-48-1001	Yes; Ark. Code §23-48-1001	25%; Ark. Code §23-48-406
California	Allowed de novo branching. Cal. Fin. Code §3824 was repealed by Cal. Fin. Code § 1684	2011 Cal. Stat. 243	1/1/2012	5 years; Cal. Fin. Code §1685	Yes; Cal. Fin. Code §1684(a)(3)	No; Cal. Fin. Code §1684(b)(2)	30% (per Federal Deposit Insurance Act)
Colorado	Allowed de novo branching and branch acquisition	2013 Colo. Sess.Laws 154	7/1/2013	No; Colo. Rev. Stat. §11-104-201- §11-104- 203	Yes; Colo. Rev. Stat. §11-104-202(6)	Yes; Colo. Rev. Stat. §11-104-202(6)	25%; Colo. Rev. Stat. §11-104-202(4)
Florida	Allowed de novo branching, branch acquisition and eliminated minimum age requirement.	2011 Fla. Laws 194	7/1/2011	No	Yes; Fla. Stat.§658.2953(11)-(c)	Yes; Fla. Stat.§658.2953(11)-(c)	30%; Fla. Stat.§658.2953(5)-(b)
Georgia	Allowed de novo branching and branch acquisition.	2016 Ga. Laws, Act 450, § 2-25	7/1/2016	3 years; Ga. Code §7-1- 628.3(b)	Yes; Ga. Code §7-1-628.8(b)	Yes; Ga. Code §7-1-628.9(a)	30%; Ga. Code §7-1-628.3(a)
Idaho	Allowed de novo branching and branch acquisition; eliminated the minimum age requirement.	2015 Idaho Sess.Laws 204	7/1/2015	No	Yes; Idaho Code §26- 1604(1)	Yes; Idaho Code §26- 1604(3)	Statute explicitly states no deposit cap; Idaho Code §26-1606

Continued on next page

Table A2 – *Continued from previous page*

State	Changes to State Interstate Branching Laws	Session Law	Effective Date	Minimum Age of Institution (Bank or Branch) for Acquisitions	Allows de novo Interstate Branching	Interstate Branching by Acquisition of Single Branch or Portions of an Institution	Statewide Deposit Cap on Branch Acquisitions
Indiana	Minimum age requirement was repealed	2011 Ind. Acts 89	7/1/2011	No	Yes; reciprocity required; Ind. Code §28-2- 18-20	Yes; reciprocity required; Ind. Code §28-2- 18-21	30% (per Federal Deposit Insurance Act)
Louisiana	De novo branching and branch acquisition are allowed	2021 La. Acts 17	8/1/2021	5 years; La. Rev. Stat. Ann.§6:532(11)	Yes	Yes	30% (per Federal Deposit Insurance Act)
Montana	22% Deposit cap on branch acquisitions is repealed	2019 Mont. Laws 58	10/1/2019	5 years; Mont. Code Ann. §32-1-370	Yes; Mont. Code Ann. §32-1-372	Yes; Mont. Code Ann. §32-1-376	30%; Mont. Code Ann. §32-1-370
Montana	Branch acquisition is allowed	2013 Mont. Laws 138	10/1/2013	5 years; Mont. Code Ann. §32-1-370	Yes; Mont. Code Ann. §32-1-372	Yes; Mont. Code Ann. §32-1-376	22%; Mont. Code Ann. §32-1-370
Montana	De novo branching is allowed	2011 Mont. Laws 64	10/1/2011	5 years; Mont. Code Ann. §32-1-370	Yes; Mont. Code Ann. §32-1-372	No	22%; Mont. Code Ann. §32-1-370
Nebraska	Eliminated minimum age requirement.De novo branching and branch acquisition are allowed. The state deposit cap is increased from 14% to 22%.	2012 Neb. Laws 963	4/7/2012	No	Yes; Neb. Rev. Stat. §8-2104	Yes; Neb. Rev. Stat. §8-2104	22%; ; Neb. Rev. Stat. §8-2106
New York	Eliminated minimum age requirement.	2012 N.Y. Laws 180	7/18/2012	No	Yes; N.Y. Banking Law §223-a	Yes; N.Y.Banking Law §223	30% (per Federal Deposit Insurance Act)
New York	Allowed de novo branching	2008 N.Y. Laws 316	7/21/2008	5 years; N.Y. Banking Law §223-a	Yes; N.Y. Banking Law §223-b	Yes; N.Y.Banking Law §223	30% (per Riegle Neal)

Continued on next page

Table A2 – *Continued from previous page*

State	Changes to State Interstate Branching Laws	Session Law	Effective Date	Minimum Age of Institution (Bank or Branch) for Acquisitions	Allows de novo Interstate Branching	Interstate Branching by Acquisition of Single Branch or Portions of an Institution	Statewide Deposit Cap on Branch Acquisitions
Oregon	Allowed de novo branching and branch acquisition; eliminated the minimum age requirement.	2011 Or. Laws 263 §19	6/7/2011	No	Yes; Or. Rev. Stat. §713.270(2)	Yes; Or. Rev. Stat. §713.270(1)	30% (per Federal Deposit Insurance Act)
South Dakota	Allowed de novo branching and branch acquisition; eliminated minimum age requirement.	2008 S.D. Laws 252	3/10/2008	No	Yes; S.D. Codified Laws §51A-7-16	Yes; S.D. Codified Laws §51A-7-16	30% (per Riegle Neal)
Texas	Eliminated minimum age requirement. Reciprocity requirements are removed	2013 Tex. Gen. Laws ch.940	6/14/2013	No	Yes; Tex. Fin. Code Ann. §203.002(a)	Yes; Tex. Fin. Code Ann.§203.002(c)	20%; Tex. Fin. Code Ann.§203.004
Washington	Allowed de novo branching and branch acquisition. Added reciprocity condition for de novo branching and branch acquisition.	2005 Wash. Laws348	5/9/2005	5 years; Wash. Rev. Code §30.04.232	Yes; reciprocity required; Wash. Rev.Code §30.38.015	Yes; reciprocity required; Wash. Rev.Code §30.38.015	30% (per Riegle Neal); Wash. Rev. Code §30.49.125
Wisconsin	Allowed de novo branching. Added reciprocity condition for de novo branching. No minimum age requirement for states with reciprocity, 5 year minimum age requirement for states with no reciprocity.	2005 Wis. Laws 217	4/11/2006	No, if reciprocity; 5 years if no reciprocity; §221.0901(8)	Yes; reciprocity required; Wis. Stat. §221.0904	No	30%; Wis. Stat.§221.0901(7)

Continued on next page

Table A2 – *Continued from previous page*

State	Changes to State Interstate Branching Laws	Session Law	Effective Date	Minimum Age of Institution (Bank or Branch) for Acquisitions	Allows de novo Interstate Branching	Interstate Branching by Acquisition of Single Branch or Portions of an Institution	Statewide Deposit Cap on Branch Acquisitions
Wyoming	No minimum age requirement. Wyo. Stat. Ann. §13-2-804(c) is repealed	2013 Wyo. Sess. Laws	7/1/2013	No	No	No	30%; Wyo. Stat. Ann. §13-2-804(b)

Table A3. Do entrepreneurial gaps drive deregulation?

This table tests whether state-level variables can predict the timing of the implementation of bank deregulation. Standard errors are double clustered by state and year.

	(1)	(2)
Dep. Var=	Time to deregulation	
Female Ratio	-0.015	0.009
	(0.039)	(0.041)
Minority Ratio	0.039	0.051
	(0.054)	(0.053)
Entrepreneur Ratio		0.113
		(0.090)
Female Entrepreneur Ratio		-0.285
		(0.233)
Minority Entrepreneur Ratio		-0.151
		(0.202)
State FE	Yes	Yes
Year FE	Yes	Yes
Observations	1,181	1,181
R^2	0.766	0.767

Table A4. The effect of bank deregulation across different types of banks

This table demonstrates the effect of bank deregulation by dividing banks into two categories: interstate banks and local banks. The regression results indicate that deregulation primarily affects interstate banks, while local banks remain unaffected, which means that deregulation caused a credit supply shock specifically for banks in the deregulated states, ruling out the demand-based explanations.

	Interstate banks		Local banks	
Dep. Var=Log(branch density per capita)	(1)	(2)	(3)	(4)
Deregulation Index × Minority Dummy	0.032***	0.033***	-0.013	-0.015
	(0.010)	(0.011)	(0.010)	(0.010)
State × Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Time-Varying County Controls	No	Yes	No	Yes
Observations	77,514	76,231	77,514	76,231
R^2	0.889	0.889	0.945	0.946

Table A5. The linearity and dynamic effects of bank deregulation

This table checks the suitability of a linear representation of the deregulation index (in Column (1) and Column (3)) by replacing the index with dummy variables for each level from one to four, with zero as the reference group, and also confirms that the observed effects are not driven by underlying trends (in Column (2) and Column (4)) by checking the dynamic effects of bank deregulation.

	All banks		Interstate banks	
Dep. Var=Log(branch density per capita)	(1)	(2)	(3)	(4)
(Deregulation Index = 1)× Minority Dummy	0.024*		0.055*	
	(0.014)		(0.027)	
(Deregulation Index = 2)× Minority Dummy	0.028***		0.064*	
	(0.010)		(0.035)	
(Deregulation Index = 3)× Minority Dummy	0.045***		0.118***	
	(0.014)		(0.026)	
(Deregulation Index = 4)× Minority Dummy	0.075***		0.133**	
	(0.022)		(0.050)	
Deregulation (<t-3)		0.008		-0.070
		(0.022)		(0.052)
Deregulation (t-3;t-1)		-0.000		0.004
		(0.017)		(0.037)
Deregulation (t+1;t+3)		0.034***		0.058**
		(0.011)		(0.023)
Deregulation (>t+3)		0.046***		0.086**
		(0.011)		(0.035)
State × Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Time-Varying County Controls	Yes	Yes	Yes	Yes
Observations	76,231	76,231	76,231	76,231
R^2	0.949	0.949	0.889	0.889

Table A6. Complaint ratio and bank deregulation

This table shows the results using alternative measures of the dependent variables, the total number of complaints and discrimination complaints scaled by the total number of mortgages in a given zip code.

	All complaints		Discrimination complaints	
Dep. Var=Complaint ratio	(1)	(2)	(3)	(4)
Deregulation × Minority Dummy	-0.036***	-0.027*	-0.020***	-0.015***
	(0.007)	(0.011)	(0.004)	(0.004)
Control	Yes	Yes	Yes	Yes
Zip code FE	Yes	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes	Yes
MSA × Year FE	No	Yes	No	Yes
Observations	124,245	90,305	69,176	51,024
R^2	0.296	0.378	0.295	0.316

Table A7. Robustness tests for the effect of bank deregulation on discrimination

Panel A and Panel B display the results after excluding complaints disputed by lenders and complaints closed without monetary relief, respectively, eliminating the possibility that my findings are driven by frivolous complaints. This table is an extension of Panel B of Table 9.

Panel A: Drop complaints disputed by lenders

Dep. Var=	Log(discrimination complaints)				**1**(discrimination complaints)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deregulation × Minority Ratio	-0.045**	-0.054***	-0.071***		-0.057**	-0.068***	-0.087***	
	(0.020)	(0.018)	(0.022)		(0.023)	(0.023)	(0.026)	
Deregulation × Minority Dummy				-0.021***				-0.031***
				(0.006)				(0.008)
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zip code FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	No	No	No
State × Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
MSA × Year FE	No	No	Yes	Yes	No	No	Yes	Yes
Observations	122,712	122,712	87,216	87,216	122,712	122,712	87,216	87,216
R^2	0.243	0.245	0.253	0.253	0.237	0.239	0.247	0.247

Panel B: Drop complaints closed without relief

Dep. Var=	Log(discrimination complaints)				**1**(discrimination complaints)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deregulation × Minority Ratio	-0.045**	-0.054***	-0.070***		-0.058**	-0.068***	-0.087***	
	(0.019)	(0.018)	(0.022)		(0.023)	(0.023)	(0.026)	
Deregulation × Minority Dummy				-0.021***				-0.031***
				(0.006)				(0.008)
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zip code FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No	Yes	No	No	No
State × Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
MSA × Year FE	No	No	Yes	Yes	No	No	Yes	Yes
Observations	122,712	122,712	87,216	87,216	122,712	122,712	87,216	87,216
R^2	0.244	0.245	0.253	0.253	0.238	0.240	0.248	0.248

Mergers & Acquisitions Identification Strategy

To provide additional evidence that heightened competition following deregulation positively impacts bank service quality, I adopt an approach informed by the works of Scharfstein and Sunderam (2016) and Buchak and Jørring (2021), crafting a quasi-random identification strategy based on incidental mergers and acquisitions (M&A) among local banks.

Local bank mergers are likely to reduce competition vitality among local banks. However, directly identifying mergers and acquisitions presents a challenge as merger activities are not sufficiently "random". To address this, I construct a sample of counties affected by bank mergers, while ensuring that these counties were unlikely to be the primary driving force behind the mergers (Scharfstein and Sunderam (2016)).

I implement a two-step strategy to identify bank mergers, utilizing data from the Federal Financial Institutions Examination Council. First, I examine bank mergers while excluding government-assisted failures and focusing only on mergers where all assets are transferred. Second, I pinpoint counties where both merging parties held market share in the previous year, specifically targeting cases where each bank accounted for more than 10% of county deposits, but the county was no more than 2% of either bank's total deposits. With this two-step strategy, my focus lies on mergers that unintentionally lead to increased market concentration in overlapping markets, which are not central to either party involved in the merger.

Building on this, I adapt equation (5), substituting the Deregulation Index with the newly formed mergers and acquisitions dummy variable, M&A. Table A8 displays the changes in the number of consumer complaints and discrimination complaints caused by incidental mergers and acquisitions. Column (1) shows an uptick in consumer complaints, and Column (2) reveals a similar surge in discrimination complaints. These patterns suggest that bank mergers, equating to dampened competition, are driving the increase in complaints, signaling deteriorated service quality in banking.

Table A8. M&A and the quality of banking services

This table displays the effects of incidental M&A on the quality of banking services and discriminatory treatments in minority communities. Log (total complaints) is the logarithm of total mortgage-related complaints to the CFPB in a county from 2012 to 2021. Log (discrimination complaints) is the logarithm of the total number of discriminatory mortgage-related complaints from 2015 to 2021 (given the CFPB started releasing complaint narratives in 2015), in which the discrimination complaint is determined using a textual analysis method from the narratives. The Minority Dummy equals one if a county ranks in the top quartile based on the minority ratio. Although only the coefficients of the interaction terms are presented for conciseness, the model specifications include comprehensive variables and controls. The standard errors, shown in parentheses, are clustered by county. *, **, and *** denote significance at 10%, 5%, and 1% levels respectively.

	(1)	(2)
Dep. Var=	Log (total complaints)	Log (discrimination complaints)
M&A × Minority Dummy	0.288**	0.144*
	(0.129)	(0.084)
County FE	Yes	Yes
Year FE	Yes	Yes
Control	Yes	Yes
Observations	23,472	13,040
R^2	0.9072	0.7408

Discrimination Measurement and Racial Bias

Verification of Discrimination Measurement

In this section, I assess whether minority borrowers are subjected to higher rejection rates in banks with a significant number of discriminatory complaints, which serve as measures of discrimination intensity. My analysis is based on loan application information made public in the Home Mortgage Disclosure Act (HMDA) dataset,[32] which comprises borrower characteristics like race and income, in addition to loan attributes such as rejection status, loan amount, and the time and geographical location of the loan application.

To authenticate the effectiveness of the discrimination measurement in this study, I use this specification to analyze HMDA datasets from 2015 to 2019:

$$\begin{aligned} Rejection_{i,l,t} =& \beta_1 Minority_{i,l,t} + \beta_2 DiscrimationRatio_{l,t} \times Minority_{i,l,t} + \\ & X_{i,l,t} + \mu_{l,t} + \pi_{z,t} + \varepsilon_{i,l,t} \end{aligned} \tag{7}$$

Where the $Rejection_{i,l,t}$ indicates whether the loan i is rejected by the bank l in year t. $Minority_{i,l,t}$ identifies the racial attributes of the loan applicant. The measurement of discriminatory behavior is noted as $DiscrimationRatio_{l,t}$, defined as the number of racial discrimination complaints per lender, annually, scaled by the total count of minority loan applicants to ensure comparability across banks. In my analysis, I also test results when the total number of complaints is converted into a dummy variable, that is, marking those with at least one complaint with racial discrimination as 1, and the rest as 0. To mitigate the potential effects of omitted variables, I control for the joint fixed effect of the lender and year, represented by $\mu_{l,t}$; joint fixed effect of the location of loan origination (I discuss both zip code and census tract) and year, indicated by $\pi_{z,t}$. Furthermore, I incorporate loan-level borrower characteristics, referred to as $X_{i,l,t}$. This set of controls includes the applicant's gender, income, and loan amount. For income and loan amount, I control for both their logarithmic values and fixed effects for their decile values.

The results are outlined in Table A9. Columns (1) and (2) depict the results of discrimination measurement in dummy variable form, whereas Columns (3) and (4) exhibit the results of discrimination measurement in continuous variable form. These four Columns collectively corroborate the validity of my discrimination identification method in terms of both the significance and direction of the estimated coefficients. More specifically, in banks

[32] The Home Mortgage Disclosure Act (HMDA) compliance surveys, covering 90% of mortgage originations in the U.S. as reported by Engel and McCoy (2011), serving as the only data source providing loan-level details on the race and ethnicity of the applicant.

where discriminatory practices are more widespread, rejection rates for minority borrowers are disproportionately higher when compared with White borrowers.

Table A9. Discrimination complaints and rejection rates

This table presents the racial gaps in rejection rates are larger in banks with a high number of discriminatory complaints. The data in the table are sourced from the HMDA dataset, spanning the years 2015 to 2019, with the dependent variable being the rejection status of each loan. Columns (1) and (2) utilize the dummy variable of discrimination measurement, whereas Columns (3) and (4) display the results of discrimination measurement as a continuous variable. Standard errors, which are reported in parentheses, are clustered by the bank (also referred to as the lender). The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dep. Var=	Rejection dummy			
Minority	0.034***	0.032***	0.034***	0.032***
	(0.004)	(0.003)	(0.004)	(0.003)
1 (Discrimination) × Minority	0.008***	0.008***		
	(0.003)	(0.003)		
Discrimination Ratio × Minority			0.667***	0.670**
			(0.249)	(0.271)
Zip code × Year FE	Yes	No	Yes	No
Lender × Year FE	Yes	Yes	Yes	Yes
Income decile FE	Yes	Yes	Yes	Yes
Loan amount decile FE	Yes	Yes	Yes	Yes
Census tract × Year	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes
Observations	3,681,921	3,658,115	3,681,921	3,658,115
R^2	0.075	0.148	0.075	0.148

Assessing the Presence of Racial Bias in the Financial Market

In order to determine whether the detected discrimination stems from racial bias within banks, statistical discrimination, or a mixture of both, I first examine the risk attributes of minority borrowers to distinguish the presence of these two channels. The findings suggest that it is primarily the racial bias prevalent in the loan market, not statistical discrimination, that fuels the inequality between minorities and non-minorities. I also corroborate these results using the risk-free Paycheck Protection Program (PPP) loans as a unique setting. The risk-free nature of PPP loans ensures that any racial disparity in this setting cannot be attributed to statistical discrimination by the banks.

Eliminating the Possibility of Statistical Discrimination

In this subsection, I investigate statistical discrimination by contrasting risk attributes of minority and non-minority borrowers within banks with higher degrees of discrimination. If banks' heightened rejection rates towards minority borrowers arise from the overall higher risk profile of this group compared to White borrowers, thereby inducing a profit-oriented market response of increased rejection likelihood, it would then be anticipated that minority borrowers portray higher financial risks within more discriminatory banks. I utilize the HMDA dataset to conduct my analysis in Table A10, exploring the relationship between the risk features of minority borrowers and the level of discrimination. The regression model applied here follows equation (7), with a minor modification where the dependent variable shifts to the loan amount-to-income ratio and the logarithm of income.[33]

Panel A and Panel B of Table A10 illustrate the results with the loan amount-to-income ratio and income as dependent variables, respectively. Columns (1) and (2) employ the dummy variable form of discrimination measurement, while Columns (3) and (4) depict the findings using a continuous discrimination measurement. All these outcomes exhibit a consistent pattern: minorities present a greater financial risk than non-minority borrowers, but there is no substantial evidence indicating that minority borrowers in more discriminatory banks possess a higher risk level. To expand the discussion, I later consider the case of PPP loans, which carry no default risk, as shown in Table A12. This analysis further affirms my rejection of the statistical discrimination hypothesis.

[33]This implies that for discussions centered on the loan amount-to-income ratio, I no longer control for the borrower's income and the loan amount.

Table A10. Risk characteristics of minority borrowers in banks with high levels of discrimination

This table illustrates the comparative risk profile of minority borrowers versus White borrowers within banks subject to a substantial quantity of discriminatory complaints. Data for the table are drawn from the HMDA dataset covering the period from 2015 to 2019. The dependent variable is represented by the loan amount-to-income ratio in Panel A and the logarithm of income in Panel B. Both panels utilize the dummy variable form of discrimination measurement in Columns (1) and (2), while Columns (3) and (4) present results using a continuous discrimination measurement. Standard errors, which are reported in parentheses, are clustered by the bank (also referred to as the lender). The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Borrower risk proxy variable I: loan-amount to income ratio

	(1)	(2)	(3)	(4)
Dep. Var=	Loan amount-to-income ratio			
Minority	0.206***	0.197***	0.205***	0.197***
	(0.018)	(0.016)	(0.018)	(0.016)
1 (Discrimination) × Minority	-0.030	-0.035		
	(0.030)	(0.022)		
Discrimination Ratio × Minority			-0.528	-0.991
			(2.525)	(2.027)
Zipcode × Year FE	Yes	No	Yes	No
Lender × Year FE	Yes	Yes	Yes	Yes
Census tract × Year	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes
Observations	3,681,921	3,658,115	3,681,921	3,658,115
R^2	0.112	0.167	0.112	0.167

Panel B: Borrower risk proxy variable II: income

	(1)	(2)	(3)	(4)
Dep. Var=	Log (income)			
Minority	-0.092***	-0.075***	-0.091***	-0.075***
	(0.006)	(0.005)	(0.006)	(0.005)
1 (Discrimination) × Minority	0.009	0.008		
	(0.009)	(0.006)		
Discrimination Ratio × Minority			0.014	0.033
			(0.684)	(0.519)
Zipcode × Year FE	Yes	No	Yes	No
Lender × Year FE	Yes	Yes	Yes	Yes
Census tract × Year	No	Yes	No	Yes
Loan amount decile FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	3,681,921	3,658,115	3,681,921	3,658,115
R^2	0.658	0.687	0.658	0.687

Validating the Presence of Racial Bias

Existing analyses suggest that statistical discrimination does not substantively contribute to the scenarios under my study. Consequently, it is plausible to infer that racial bias is the principal force driving the observed discrimination. In this context, I investigate loan amount-to-value (LTV) ratios as a proxy for borrower quality, utilizing a dataset obtained by matching data from both the HMDA and Government-Sponsored Enterprises (GSEs).[34]

This approach effectively functions as an outcome test (Fisman, Paravisini, and Vig (2017); Butler, Mayer, and Weston (2023)), identifying the impact of racial bias by comparing the differences in applicant characteristics of approved loans between minority and White groups. To enhance the accuracy of this identification, I incorporate a wide array of control variables along with fixed effects. I also specifically concentrate on the subsample of borrowers adjacent to the extensive margin of credit allocation. This strategy allows me to scrutinize racial disparities in average default rates that are near the margin of credit provision (Butler et al. (2023)). In the mortgage market, this boundary is marked by subprime borrowers with credit scores below 660.

The model specification aligns closely with equation (7), with a sole modification of substituting the dependent variable with the loan amount-to-value (LTV) ratios. It is important to note that the loans used in this regression sample are those approved for application, with these loan applicants' credit scores falling below the threshold of 660 (which also explains the reduced sample size compared to before). Table A11 presents the results of this analysis. Columns (1)-(2) present the findings for the dummy form of discrimination measurement, while Columns (3)-(4) use the discrimination ratios in their continuous forms. The estimated results reveal that, in banks devoid of observed discrimination, marginal minority borrowers who successfully complete the application process exhibit higher LTV ratios, implying inferior qualifications compared to their White counterparts. Conversely, in banks marked by prevalent discrimination, these racial gaps diminish significantly, suggesting that such discrimination is objectively linked with less risky minority borrowers. This outcome test asserts that only the most qualified marginal minority borrowers can

[34] Although the HMDA dataset comprises pivotal variables such as applicant income, race, ethnicity, loan amount, and lender name, I incorporate GSE data for an enriched analysis of approved loans' characteristics. The GSE data augments the dataset by providing detailed loan information, including variables like interest rates, default, LTV, credit scores, etc. Given the absence of a direct crosswalk between these two datasets, I employ "fuzzy data matching" techniques following Law and Mislang (2022) to merge them. This consolidated dataset comprises all approved loans securitized by the GSEs from 2015 to 2019. Furthermore, given the management differences for loans of varied terms in the actual market, I filter this dataset in accordance with Barlett, Morse, Stanton, and Wallace (2022), utilizing variables such as credit scores, LTV, and loan amounts. Lastly, I incorporate complaint datasets sourced from the CFPB to obtain data for discrimination measurements.

successfully finish the loan application process in banks where discrimination is severe, thus underscoring the far-reaching impact of racial bias.

Table A11. LTV of minority borrowers in banks with high levels of discrimination

This table provides a comparative analysis of the quality of marginal minority borrowers versus marginal White borrowers within banks that receive a high volume of discriminatory complaints. The data used in this table are derived from the merged HMDA-GSE dataset spanning the years 2015 to 2019. To identify marginal borrowers, I restrict the sample to loans granted to borrowers with credit scores below 660. The loan amount-to-value ratio serves as the dependent variable. Columns (1) and (2) employ the dummy variable form of discrimination measurement, whereas Columns (3) and (4) display results utilizing a continuous discrimination measurement. Standard errors, documented in parentheses, are clustered by the bank, also known as the lender. The symbols *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dep. Var=	loan amount-to-value ratio			
Minority	2.018***	1.405***	1.695***	1.178***
	(0.255)	(0.342)	(0.219)	(0.275)
1 (Discrimination) × Minority	-1.156***	-1.191**		
	(0.415)	(0.461)		
Discrimination Ratio × Minority			-3.058	-9.094**
			(2.496)	(3.572)
Lender × Year FE	Yes	Yes	Yes	Yes
Zipcode × Year FE	Yes		Yes	
Census tract × Year FE		Yes		Yes
Income decile FE	Yes	Yes	Yes	Yes
Loan amount decile FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	63,240	30,694	63,240	30,694
R^2	0.537	0.651	0.537	0.651

Supplementary Evidence: Corroboration from Risk-Free PPP Loans

It is well documented that minority business owners are discriminated against by banks and less likely to get access to PPP loans even though PPP loans are fully guaranteed by the government, which eliminates the default risks faced by banks (Chernenko and Scharfstein (2022); Erel and Liebersohn(2022); Howell et al. (2023)). This disparity in access undermines the efficiency of the PPP program, as minority-owned businesses are the ones with the greatest need for these loans. Compared with their White counterparts, minority businesses are more likely to be financially fragile before the pandemic and concentrated in industries most hit by COVID-19. In this section, I test whether bank competition can mitigate this disparity in the distribution of PPP loans. Using the PPP loans dataset from the SBA, I find that the predetermined bank deregulation level before COVID-19 may impact the unequal lending pattern and, consequently, the effectiveness of the PPP program. My findings indicate that states with higher levels of competition in their financial markets exhibit smaller racial gaps in both the probability of accessing PPP loans and the loan amounts, compared to states with less competitive and more regulated financial markets.

I employ the following specification to test my hypothesis:

$$\begin{aligned} Y_{z,c,t} =& \beta Dereg_{s,t-1} \times MinorityRatio_{z,c,t-1} + \gamma MinorityRatio_{z,c,t-1} + \\ & \delta Control_{z,c,t-1} + \alpha_c + \varepsilon_{z,c,t} \end{aligned} \tag{8}$$

where $Y_{z,c,t}$ is the take-up rate of PPP loans in a specific zip code z and county c. The take-up rate is defined as the total number of PPP loans in a zip code z divided by the total number of small businesses with less than 500 employees. I also use the total loan amounts divided by the total number of jobs supported by these loans in a zip code as an alternative outcome variable. $MinorityRatio_{z,c,t-1}$ is the proportion of the minority population in zip code z one year before COVID-19. $Dereg_{s,t-1}$ is the predetermined bank deregulation index before COVID-19 at the state level s. I also control the population and its interaction term with the deregulation index as control variables. I include county fixed effects α_c to absorb local economic conditions that may impact small business employment and revenue. I combine the 2020 PPP loan data with the 2019 Zip code Business Patterns dataset (ZBP).[35]

Table A12 examines the relationship between bank competition and the racial gaps in access to PPP loans. In Columns (1) and (2), I find that business owners in minority

[35]I focus on loans made before 2021 because the PPP program explicitly prioritizes lending to minority-owned businesses from 2021 onwards.

communities are less likely to get PPP loans and the loan amounts per supported job they get are smaller. However, these racial gaps are mitigated by bank competition. In Column (3), using data at the PPP loan level, I find that in more competitive states, black owners are more likely to get PPP loans from banks instead of from Fintech companies after controlling for numerous fixed effects. The dependent variable in Column (3) is a dummy variable indicating whether a borrower gets loans from banks. It is equal to zero if a borrower gets loans from Fintech companies. Howell et al. (2023) find that black business owners are more inclined to apply for PPP loans from Fintech companies that do not discriminate against them. Overall, my findings suggest that bank competition mitigates racial gaps in accessing PPP loans. This unique setting rules out the alternative hypothesis that my results are driven by statistical discrimination.

Table A12. Bank deregulation and racial gap in access to PPP loans

The table shows that bank competition can reduce the racial gap in access to PPP loans. The dependent variable in Column (1) is the take-up rate, defined as the total number of loans divided by the total number of eligible firms in a specific zip code. In Column (2), the dependent variable is the loan amount per supported job in a given zip code. Column (3)'s dependent variable is a dummy variable indicating whether the loan originated from banks or Fintech companies using the loan-level data. Standard errors reported in parentheses are clustered by state. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dep. Var=	Take-up rate	Loan amount per job	Bank loan dummy
Minority Ratio	-0.225***	-0.115**	
	(0.058)	(0.051)	
Deregulation × Minority Ratio	0.036*	0.040**	
	(0.018)	(0.017)	
Black Dummy			-0.523***
			(0.121)
Deregulation × Black Dummy			0.164***
			(0.035)
County FE	Yes	Yes	No
Naics code FE	No	No	Yes
Loan amount FE	No	No	Yes
Loan term FE	No	No	Yes
Zip code FE	No	No	Yes
Year-month-day FE	No	No	Yes
Business type FE	No	No	Yes
Business age FE	No	No	Yes
Number of jobs FE	No	No	Yes
Control	Yes	Yes	Yes
Observations	33,504	36,061	1,818,445
R^2	0.331	0.199	0.347

Table A13. The heterogeneous impact of bank deregulation on different minority groups

This table further analyzes the heterogeneous impact of bank deregulation on different minority groups, specifically broken down into three categories: Black, Hispanic, and Other.

	(1)
Black	-0.027***
	(0.005)
Deregulation Index × Black	0.005**
	(0.002)
Hispanic	-0.020***
	(0.003)
Deregulation Index × Hispanic	0.005**
	(0.002)
Other	-0.011***
	(0.003)
Deregulation Index × Other	-0.005
	(0.004)
Female	-0.030***
	(0.001)
Deregulation Index × Female	0.003***
	(0.001)
State × Year × Income decile FE	Yes
MSA × Year × Income decile FE	Yes
Sociodemographics	Yes
Observations	172,446
R^2	0.091

Identification Strategy with Staggered Treatment Adoption

The Borusyak, Jaravel, and Spiess (2023) Method

Several recent studies have underscored potential complications when implementing a difference-in-differences approach with staggered treatment adoption. A prevalent issue is the potential heterogeneity of treatment effects across different periods or agents within a given period. This can result in certain units receiving non-convex or negative weights when aggregating results to estimate treatment effects, potentially introducing bias into the estimates. In this context, I apply the techniques proposed by Borusyak, Jaravel, and Spiess (2023) to verify the robustness of the primary conclusions drawn in Table 3. Borusyak, Jaravel, and Spiess (2023) tackle the issue of potential spurious identification in staggered designs using an "imputation" method. This strategy fundamentally begins with the estimation of a model for the potential outcomes of non-treated cases based on the non-treated observations. Subsequently, the model is extended to treated units, allowing for the imputation of potential outcomes $Y_{it}(0)$ in non-treated situations and deriving an estimate of the treatment effect $\tau_{it} = Y_{it}$ - $Y_{it}(0)$ for each treated case. The final step involves averaging estimated treatment effects that correspond to the estimand of interest.[36]

In estimating Table A14, I introduce a large set of household-level fixed effects and state-year-income decile joint fixed effects, which are consistent with Column (4) in Table 3. The findings in Columns (1) and (2) represent the identification results of the Borusyak, Jaravel, and Spiess (2023) method, persistently showcasing positive and significant coefficients.

One-time Shock Test (Dodd-Frank Act)

In addition, I utilize the enactment of the Dodd-Frank Act as an exogenous shock to verify my conclusions. This nationwide change in legislation was not within the control of any state government and thus plausibly exogenous to the local economic conditions and entrepreneurial financing needs. The triple-differences identification strategy in this scenario relies solely on a single shock point, thereby sidestepping potential complications from staggered treatment adoption. The results of this identification strategy are displayed in Column (3) of Table A14, where both the gender gap and the racial gap demonstrate a narrowing trend, consistent with my primary findings.

[36] This approach is refined by the authors and is currently implementable in Stata via the "did_imputation" package.

Table A14. Entrepreneurship gaps and interstate bank deregulation using the Borusyak et al. (2023) method and one-time shock test

This table presents the effect of interstate bank deregulation on entrepreneurial gender and racial gaps using the method proposed by Borusyak, Jaravel, and Spiess (2023) and conducts a one-time shock test based on the Dodd-Frank Act. The dependent variable is binary, taking a value of 1 when the household transitions into entrepreneurship. In Column (1) and Column (2), the deregulation index spans from 0 to 4, where 0 signifies the least deregulation and 4 indicates full deregulation. In Column (3), the deregulation index operates as a dummy variable, taking a value of 1 when a state is impacted by the Dodd-Frank Act, which allows interstate branching in 2010. Columns (1) to (3) include household sociodemographic fixed effects and state-year-income decile joint fixed effects. Household sociodemographic fixed effects include the number of raised children, family size, age, homeownership, education attainment, employment, and marital status of the surveyed household. Standard errors reported in parentheses are clustered by state. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
	Borusyak et al. (2023) method		One-time shock
Female			-0.026***
			(0.002)
Minority			-0.014***
			(0.002)
Dereg × Female	0.010***		0.018***
	(0.002)		(0.004)
Dereg × Minority		0.011***	0.014***
		(0.001)	(0.002)
State × Year × Income decile FE	Yes	Yes	Yes
Sociodemographics FE	Yes	Yes	Yes
Observations	324,111	325,487	325,500
R^2	-	-	0.0441

References

Bartlett, Robert, Adair Morse, Richard Stanton, and Nancy Wallace, 2022, Consumer-lending discrimination in the fintech era, *Journal of Financial Economics* 143, 30–56.

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess, 2023, Revisiting event study designs: Robust and efficient estimation, Working paper, University College London.

Buchak, Greg, and Adam Jørring, 2021, Do mortgage lenders compete locally? evidence beyond interest rates, Working paper, Stanford University.

Butler, Alexander W, Erik J Mayer, and James P Weston, 2023, Racial disparities in the auto loan market, *Review of Financial Studies* 36, 1–41.

Chernenko, Sergey, and David S. Scharfstein, 2022, Racial disparities in the paycheck protection program, Working paper, National Bureau of Economic Research.

Engel, Kathleen C., and Patricia A. McCoy, 2011, *The Subprime Virus: Reckless Credit, Regulatory Failure, and Next Steps* (Oxford University Press).

Erel, Isil, and Jack Liebersohn, 2022, Can fintech reduce disparities in access to finance? evidence from the paycheck protection program, *Journal of Financial Economics* 146, 90–118.

Fisman, Raymond, Daniel Paravisini, and Vikrant Vig, 2017, Cultural proximity and loan outcomes, *American Economic Review* 107, 457–492.

Howell, Sabrina T, Theresa Kuchler, David Snitkof, Johannes Stroebel, and Jun Wong, 2023, Lender automation and racial disparities in credit access, Journal of Finance forthcoming.

Law, Kody, and Nathan Mislang, 2022, The heterogeneity of bank responses to the fintech challenge, Working paper, Cornell University.

Scharfstein, David, and Adi Sunderam, 2016, Market power in mortgage lending and the transmission of monetary policy, Working paper, Harvard University.