Location Choices of Community Banks and Redlining: The case of Minority Depository Institutions

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Abstract

I study the present-day proximity of urban community banks, Minority Depository Institutions (MDIs) to historically segregated urban neighborhoods. Using a Poisson Generalized Estimating Equation (GEE) framework, I investigate whether MDIs are more likely to locate in "redlined" census tracts based on the Home Owners' Loan Corporation's (HOLC) "residential security maps" in 1930s. I find the expected number of Black MDIs increase 10 percent, whereas those of non-MDI banks decrease 1 percent for each ten point increase in the tract's redlined area. I also find Asian MDIs and Hispanic MDIs location choices are negatively correlated with the tract's redlined areas. Rather, their expected numbers increase 3 percent and 1.1 percent for each percent increase in Asian language and Spanish speakers at the tract level respectively. The results show how historical federal policies continue to influence the modern banking landscape and how Black-owned banks co-exist with larger banks in their local markets.

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1 Introduction

The per capita wealth ratio between Whites and Black currently stand at six to one. Derenoncourt et al. (2024) document the role income growth, savings behavior, and capital returns play in explaining the gap and show from a starting point of nearly 60:1 per capita wealth ratio following the Civil War, the white-to-Black per capita wealth ratio fell to 10:1 by 1920 and to 7:1 by the 1950s, only to fall to 6:1 in the present day. One of the persistent reasons behind the enduring wealth gap is the difference between ownership rates and home values among the Black and White population. The enduring wealth gap is partially due to New Deal era policies from agencies such as the Home Owner's Loan Corporation (HOLC) and the Federal Housing Administration (FHA), established in 1933 and 1934 respectively. These institutions were designed to facilitate the refinancing and insuring of nonfarm residential mortgages after the Great Depression. In the late 1930s, HOLC created color-coded "residential security maps" evaluating neighborhoods in more than 200 cities. The maps exacerbated restricted mortgage activity in already impoverished urban neighborhoods (Jackson, 1985). The effect of the maps were particularly severe for struggling urban neighborhoods because the maps were strongly reliant on private realtors and appraisers for neighborhood information (Winling and Michney, 2021) and further heightened the cost of obtaining private credit in these neighborhoods (Hiller and Knowles, 2002).

The effects of the HOLC "residential security maps" on the enduring wealth gap persists in the present. Aaronson et al. (2021) find the HOLC maps had consequential and lasting effects on the development of urban neighborhoods in the following decades through reduced credit access, lower home-ownership rates, reduced home values and rent in these neighborhoods while also eroding the wealth of their residents, due to falling property values. Woods (2012) show the maps systematically disadvantaged low-income and minority urban residents and lead to disproportionately substandard housing conditions for these communities. Hernandez (2009) studies Sacramento County in California and show a substantially large portion of mortgage application denials, along with subprime mortgage borrowers and

property foreclosures during the Great Recession were concentrated in urban regions that were previously designated as "declining" and "hazardous" and graded D by the HOLC maps. Park and Quercia (2020) find four out of five neighborhoods graded A, the highest possible grade, by the HOLC maps are high income at present and none are low income, whereas over half of neighborhoods graded C and D are low income. Hynsjö and Perdoni (2022) use census tract level data from 1960 until 2010 and find substantially lower property values, home values and home ownership rates in neighborhoods with the lowest grade with the negative effects on property values persisting until the early 1980s. Joshi et al. (2024) use data from 2000 until 2018 find similar results.

This paper studies the location choices of depository institutions, known as Minority Depository Institutions (MDIs) and whether these institutions have a higher likelihood of locating in neighborhoods with lower HOLC grades compared to non-MDIs. MDIs are US banks owned and operated primarily by minorities and established to serve minority borrowers that historically had restricted access to credit (Office, 2006). The Federal Deposit Insurance Corporation (FDIC) defines MDIs as banks serving primarily in minority-populated areas and with a majority of the board of directors of minority origin or banks with at least 51% minority ownership.[1] Since MDIs are mission-driven community banks primarily owned by minorities, I study whether they address this mission by establishing within or close to neighborhoods that historically had difficulty accessing credit and mortgage insurances.

To conduct the research, I construct panel datasets using National Bureau of Economics Research's (NBER) Tract Distance Database to locate neighboring tracts, FDIC's Summary of Deposits, HOLC redlining scores and percentages of different grades ("A, B, C, D") within the census tracts under study and their neighboring tracts and the 5 year American Community Surveys (ACS).I use data on historic HOLC redlining scores for the 2010 census tracts

[1]Minority-owned banks represent a very small percentage of depository institutions in the US. MDIs consist of 2.8 percent of all depository institutions in the US and the combined assets of $330 billion of the 147 MDIs (in 2024) represents just 1% of U.S. bank assets (Barth and Xu, 2020; Toussaint-Comeau and Newberger, 2023).

developed by Meier and Mitchell (2023) using percentages of HOLC areas in each tract.[2] Higher HOLC scores reflect lower graded neighborhoods, with a score of four indicating the entire census tract was redlined. The outcome variables are the number of Black-owned banks, Asian-owned banks, Hispanic-owned banks and non-MDIs in the studied tracts. I estimate the likelihood of bank branch presence using Poisson Generalized Estimating Equations (GEEs) following Wang et al. (2024).

I find the expected number of Black MDIs increases by 10 percent, whereas the expected number of non-MDI banks decreases by 1 percent for each 10 percent increase in the census tract's area with Grade D.[3] I also find Asian MDIs and Hispanic MDIs location choices are negatively correlated with the area of the census tracts Graded D. Instead, the expected number of Asian MDIs and Hispanic MDIs increases by 3 percent and 1.1 percent for each percent increase in the Asian language and Spanish speakers at the census tract level respectively. To understand whether both non-MDIs and Black-owned banks have propensities of locating within very similar tracts, I also check the Low-Moderate Income (LMI) status of these tracts.[4] I find the expected number of Black-owned banks increases by about 50% if the census tract is considered LMI vs. non-LMI. I also find non-MDIs are slightly (about 3-4 percent) more likely to also locate in LMI tracts. However, this result may arise from my sample as I consider primarily urban census tracts.

As robustness checks, I use the HOLC score as the explanatory variable in separate estimations. The results are largely similar. I find the expected number of Black MDIs (from here I refer to them as Black-owned banks) increases between 13-15 percent, whereas the expected number of non-MDI banks decreases by about 2-3 percent for each point increase (on a four point scale) in the census tract's HOLC scores. In other words, holding all other variables constant, including the number of non-MDIs branches and the status of the census

[2]The data is hosted on the Inter-university Consortium for Political and Social Research's (openICPSR) website.

[3]From here on I refer to Black MDIs as Black-owned banks

[4]The Department of Housing and Development (HUD) considers U.S. Census Tracts in which 51 % or more of the households earn less than 80 percent of the Area Median Income (AMI) as LMI tracts. AMI is the median household income for a specific geographic area (e.g., county, metropolitan area).

tracts as LMI, Black-owned banks are more likely to locate in tracts with more redlining. I also find Asian MDIs and Hispanic MDIs location choices are negatively correlated with the HOLC scores. Instead their expected number increases by 3 percent and 0.8 percent for each percent increase in the tract's Asian language or Spanish speakers respectively.

I also provide a reason why Black-owned banks tend to disproportionately locate within previously "redlined" neighborhoods. I compare Black-owned banks with non-MDIs in their immediate neighboring tracts and with non-MDIs in census tracts that have relatively high Black populations but are not served by Black-owned banks.[5] I show Black-owned banks tend to survive in urban neighborhoods with fewer community banks where the banking landscape is dominated by relatively larger non-community banks. Whereas, non-MDIs in neighborhoods with higher Black population but no Black-owned banks tend to be older and small community banks (75% have assets less than $10 billion) with very high deposit share at the census tract level, 50% branches holding more than 50% of deposits in their corresponding tracts. I argue Black-owned banks do not locate or survive in census tracts where the local Black communities are well integrated within the existing banking system. I hypothesize that the location choices of Black-owned banks are partially results of historical federal policies and these banks formed within neighborhoods that were not well-integrated to the broader banking landscape. Even after the HOLC maps fell out of use by the 1940s, Black-owned banks continue to locate in these neighborhoods. I also show that the Black-owned bank branches that currently survive in these redlined neighborhoods are older (more than 30 years old) small-sized community banks, with very high deposit share at the census tract level.

The findings enrich three areas of existing scholarship. First, the paper contributes to literature studying location choices of bank branches. Chang et al. (1997) find bank branches have a tendency to spatially cluster and attribute this behavior to rational herding by banks. Bank branches tend to open in locations with existing branches, even though it leads to less

[5]These are census tracts with an average of 60% Black population.

profitability among existing branches. Babajanova (2022) shows MDIs tend to locate in LMI tracts to avoid intense competition and earns less profit when they share a location with a rivalrous MDI or a non-MDI branch. Second, the paper extends prior literature on the historical segregation of urban areas, racial wealth gap and credit access among minority communities (Aaronson et al., 2021; Hernandez, 2009; Park and Quercia, 2020; Hynsjö and Perdoni, 2022). Finally, the paper contributes to research studying minority-owned banks and their impact within their immediate local communities. Breitenstein et al. (2014) and Eberley et al. (2019) show the markets served by MDI offices include a higher share LMI census tracts, as well as a higher share of minority populations. Similarly, Hurtado and Sakong (2023) show minority borrowers applying for mortgages in banks sharing minority identity are nine percentage points more likely to be approved than otherwise identical minority borrowers in non-minority banks. Similarly, Razzak (2025) studies closures of both MDI and non-MDI branches within census tracts and demonstrates closing MDI branches generally leads to credit contraction among communities sharing minority identity with the MDI owners whereas closing non-MDI branches more often than not leads to a credit expansion within the local communities.

Economic and social outcomes of local communities are strongly correlated with their ability to access credit. A reliable avenue towards credit accessibility may be as simple as how close a household or small business is to a bank branch (Nguyen, 2019; Herpfer et al., 2022). This is the first paper to study the location choices of Black-owned banks and their proximity to historically segregated urban neighborhoods. I also provide a mechanism for this phenomenon and highlight the unique role these banks play in their neighborhoods.

2 Context for Black-owned banks

2.1 Historical context

This section provides a historical grounding for my paper as I discuss the interplay between the HOLC maps, the residents within the redlined neighborhoods, their difficulty get-

ting credit and how the need for this access initially facilitated the formation of Black-owned banks within these neighborhoods. A brief historical framing is necessary to understand why we may observe Black-owned banks in previously redlined neighborhoods. In the 1930s, the HOLC maps graded urban neighborhoods using letters, A, B, C and D. Urban neighborhoods coded green (designated as A) were considered "new, homogeneous, and in demand as residential locations in good times and bad times.", while areas coded blue (designated as B) were termed "reached their peak", but were "still desirable". Finally, areas coded yellow (designated as C) were termed as "definitely declining" and those coded red (designated as D), the lowest rating, were considered as the most "hazardous" (Jackson, 1985) for investment. Because HOLC maps also served as a dominant source of information for private lenders, residents in areas shaded mostly yellow and red faced significantly higher private credit costs (Hiller and Knowles, 2002). Even prior to the HOLC color coded maps, the FHA evaluated neighborhoods using block level information provided by the New Deal relief programs and the US Census. The agency did not insure mortgages in low income neighborhoods in the cities, where the vast majority of urban Black Americans lived (Fishback et al., 2024).

Almost all Black neighborhoods in the HOLC security maps were rated "hazardous" for mortgage lending and received a corresponding grade "D" and designated as red. Interestingly enough, not all "D"-rated neighborhoods were Black; however, all Black neighborhoods were marked red with only six known exceptions. One such inconsistent designation was in Savannah, Georgia with an "A"-rated or green designated Black neighborhood (Winling and Michney, 2021). According to the authors, although the HOLC never shared the security maps outside of government circles, they did disseminate the theories and methodologies behind the security maps with other organizations such as the Federal Home Loan Bank Board (FHLBB), who further passed on these information to private mortgage lenders. It must be noted that even prior to the existence of these maps, population sorting based on race was a common phenomenon in major US urban areas. Shertzer and Walsh (2019) uses

district-level spatial dataset of major US cities, spanning the years 1900 through 1930, and show a quantitatively large flight of White residents from urban neighborhoods in response to Black arrivals from the South. This phenomenon accelerated between 1900 and 1930. Akbar et al. (2025) use city block-level data of matched addresses, and find that over a single decade, (between 1930 and 1940) rental prices soared by roughly 50% on city blocks that transitioned from all White neighborhoods to majority Black neighborhoods, while, home values fell by 10% relative to blocks that maintained all White neighborhoods.

Increasingly segregated, these predominantly Black neighborhoods also faced a compounding problem of reduced access to financial institutions, such as banks. This is because, the New Deal included provisions that encouraged the establishment of smaller community banks over larger banking conglomerates or national banks. The decision to advocate for small community banks over larger bank networks was not racially motivated but was implemented to protect small banks from both bank runs and competition of larger conglomerates. Nevertheless, these decisions negatively impacted the prospects for Black-owned banks. Before the implementation of the New Deal, it was generally acknowledged that for Black-owned banks to survive, they needed to be branches of larger national banks and cease to be standalone banks. This is because, the Black community in general had insufficient amounts of stored wealth and limited access to credit, and hence could not develop within a system that tied all its deposits and loans only to those within its community borders (Baradaran, 2017).

Post Great Depression, the problems faced by Black-owned banks compounded and providing credit access in these minority communities proved significantly difficult. Black-owned banks, in spite of increasing in numbers between 1918 and 1929, had their assets decreased sharply during the Great Depression; falling from $13,000,000 to $7,000,000 by the 1930s.[6] This is primarily because of less diversified loan portfolios. The loans made out by Black-owned banks consisted of mostly real estate loans, which frequently fluctuated in value. These banks generally gave out very little commercial loans. In many instances, loan officers

[6]This amounts to a fall from $248 million to $133 million in 2025.

in these banks made out loans not based on soundness of the loan applications but rather because of community affiliations (Harris, 1936; Mitchell, 1937). Once the banking legislations of the New Deal had passed, Black-owned banks could no longer be part of larger national conglomerates and were left on their own to serve within their immediate communities and therefore "mirrored the already narrowed Black participation" in American financial life (Mitchell, 1937).

2.2 Institutional context

There are very few Black-owned banks in the US. In 2011, total number of such institutions are 30 and by the end of the sample period in 2023, about 18 remain. At the beginning of the sample period, there are 154 branches spread over 149 census tracts, while at the end of the sample period there are 79 branches. Over 85% of Black-owned banks have at least one branch located in neighborhoods that were part of the HOLC "residential security maps". Figure 1 through Figure 3 show MDIs (primarily Black-owned banks) and non-MDIs in some of the largest counties: Baltimore county, Manhattan county and Bronx county. To understand why Black-owned banks are over-represented in these neighborhoods, I isolate the remaining banks in the year 2011 by age. If only relatively older Black-owned banks are in the redlined neighborhoods, these surviving branches are artifacts of past federal policies. However, if newer banks also establish close to these neighborhoods, it points to a more persistent phenomenon.

Figure 4, Panel A and B show banks that are in the scored neighborhoods are likely to have fewer branches and also have comparatively larger asset sizes.[7] These comparatively larger banks with very little branching footprint also tend to survive longer and many of them are still operating in the year 2023. Figure 4, Panel C and D show branch level characteristics of Black-owned banks. Interestingly enough, only half of Black-owned bank branches are located within census tracts that were part of the "residential security maps". In other words, Black-owned banks with assets less than 500$ million and with larger branching footprint

[7] About a third of the Black-owned banks in the sample have assets less than 100$ million.

are not represented in these neighborhoods. As expected, the branches that exists in these neighborhoods have higher deposit share, between 50-60 percent of these bank branches have deposit shares greater than 50% at the census tract level. In other words, these branches are well-integrated within their local communities.

To study whether older Black-owned bank branches are over-represented in these neighborhoods, I divide the ages of the branches into three groups: those aged below 30 years, those aged between 30 and 60 years and those over 60 years. I make these divisions based on the timing of important federal banking legislations that could have impacted branching decisions such as the Fair Housing Act of 1968 and the Riegle–Neal Interstate Banking and Branching Efficiency Act (IBBEA) of 1994. The Fair Housing Act, also known as Title VIII of the Civil Rights Act of 1968, prohibited discrimination in housing based on race, religion, national origin, and sex. While the IBBEA was the primary federal legislation that allowed banks to branch across state lines, establishing a national framework for interstate banking and branching. As expected, Figure 4, Panel D shows a majority of branches within census tracts that were part of the "residential security maps" are older, established prior to the passing of IBBEA.

In order to fully separate the role of Black-owned banks in the recent decade, I separately study two mutually exclusive samples: (a) census tracts with Black-owned banks along with their neighboring tracts (I call it Sample A) consisting of 1107 tracts and (b) all census tracts with at least 40% Black population but not served by Black-owned banks (I call it Sample B) consisting of 1023 tracts. In the year 2023, about 14.4% of U.S population identified as Black, so the latter sample would have more than double the average US Black population. Even though there are only 149 census tracts with Black-owned banks in my sample, there are 1023 census tracts with at least 40% Black population but no Black-owned banks.[8] Therefore, a majority of Black populated census tracts in my sample are not served by Black-owned banks.

[8]I delete census tracts that are neighboring tracts of Black-owned banks from Sample B to create spatial separation between the two samples.

I take a two pronged approach. First, I compare the institutional structure and branch composition of each set of banks (Black-owned banks, non-MDIs in Sample A and non-MDIs in Sample B). Second, I compare the loan and deposit activities of these banks. I calculate large-sized loans: residential, commercial real estate (CRE), commercial and industrial (C&I) and small business loans (SBLs); personal loans: credit cards, auto-loans and other personal loans including student loans; core deposits: individual deposits, public funds and wholesale funds. Loans and deposits are all normalized by asset sizes of the banks. I then compare Black-owned banks in the HOLC scored neighborhoods with all Black-owned banks, Black-owned banks with non-MDIs in Sample A, Black-owned banks with non-MDIs in Sample B. The idea is to tease out the role Black-owned banks play in the places they exist and why they do not show up in areas even when there are significantly large Black communities. I provide a detailed discussion of the findings in Section 5.

3 Data

I construct panel datasets by combining publicly available datasets. These are the National Bureau of Economics Research's (NBER) Tract Distance Database to locate neighboring tracts within 1 mile and 5 miles of the census tracts under study, FDIC's Summary of Deposits (SoD), Federal Financial Institutions Examination Council's (FFIEC) Call Reports, HOLC's redlining scores and percentages of different grades within the census tracts and the 5 year American Community Surveys (ACS) resulting in datasets of all census tracts with bank branches within counties where an MDI branch is present in the year 2011. The dataset consists of 12,953 tracts observed over 13 years, 2011 until 2023. Among them about 1090 census tracts contain MDIs. All dollars values are converted to the 2021 dollar value using the Consumer Price Index (CPI) from US Bureau of Labor Statistics (2021) website. I also construct two sets of data, one with features of all neighboring census tracts within a mile of the census tracts under study and one with features of all neighboring census tracts within 5 miles of the census tracts under study.

3.1 Redlining Percentages and Scores

I collect redlining proportions for census tracts from two sources. Meier and Mitchell (2023) and the University of Richmond's *Mapping Inequality* data containing the HOLC spatial data cross-walked into 2010 and 2020 census tracts. From the former data set, I can obtain HOLC scores and from the latter, I recover percentages of redlined or Graded D areas mapped into 2010 census tracts. Meier and Mitchell (2023) classifies 12,834 urban census tracts representing 142 core-based statistical areas (CBSAs) across US based on the HOLC graded maps. They drop census tracts in which less than 20% of the land area was graded by HOLC. They then multiply HOLC graded percentages in each census tracts by number values 1-4, representing each HOLC grade. For example, if 50% of the census tract's graded area was classified "A" and 50% was "B," the census tracts receives a score of $((1 * 0.50) + (0.50 * 2)) = 1.50$. Lower historical redlining scores indicate higher grades, while higher scores up to 4.0 means almost the entire census tract area was considered hazardous and hence redlined.

3.2 Summary of Deposits

I obtain information on bank branches from the SoDs published on the FDIC website. The SoDs contain information on every operating bank branch in the US, including street addresses, zip codes, geolocation data and individual branch deposits, published yearly at the end of June. Initially I collect a unique identification number for each institution assigned by the FDIC (CERT numbers) of MDIs from 2011 until 2021. Using the CERT numbers, I collect bank branch information in all counties where an MDI is present between the years 2011 and 2023. The SoD data does not contain the census tracts where the branches are located. I use the "pygris" package in Python to geolocate latitude and longitude information of each branch to their corresponding census tracts based on the 2010 Census.[9]

[9]Many branch locations have missing latitude and longitude data. In case of missing latitude and longitude information, I use the API from Google Maps to obtain latitude and longitude information from street addresses of each branch.

3.3 Call Reports

I obtain each bank's deposit, asset and loan information from the Call Reports on the FFIEC website. I collect loan data such as residential loans, CRE loans, C&I loans and total SBLs of every bank in my sample from 2011 until 2023. I also collect personal loan information: credit card, revolving credit, automobile loans and other personal loans such as student loans. Finally, I collect deposit information, both transactional and non-transactional. I collect information on individual deposits, public funds (deposits from federal or state institutions) and wholesale funds (deposits from other commercial banks).

3.4 American Community Survey

I collect census tract characteristics from the 5-year ACS website, such as population, percentage of different racial communities, median household income, median home values for all census tracts in counties with MDIs. Appendix A Table A1 has census tract characteristics. The four panels of Table A1 show MDIs tend to locate in census tracts with higher proportions of the communities sharing their minority identity. Moreover, median household income generally fall between census tracts primarily graded A and census tracts primarily graded D. Additionally, percent of renters and vacancies increase between census tracts primarily graded A and those graded D. Even though I consider non-MDI tracts separately for the Summary Statistics table, many non-MDIs do locate within census tracts with MDIs. Figure A1, Panel A through Panel D show median household income, percent of SNAP beneficiary households, percent of vacancies and percent of renters for different HOLC intervals and the four different sets of tracts. The figure shows census tracts with Black-owned banks have lower household income and consequently higher percent of SNAP beneficiary households, vacancies and renters. These census tracts also tend to be more likely graded. Figures A2 through A4 show MDI and non-MDI branches superimposed on poverty rates in Baltimore county, Manhattan county and Bronx county in 2011. The figures show MDI branches generally locate in neighborhoods with high poverty.

4 Empirical analysis

I consider all census tracts with bank branches in counties with MDIs, for my analysis. The outcome variables are the number of different MDIs (Black MDIs, Asian MDIs and Hispanic MDIs) and non-MDIs at the census tract. My primary explanatory variables are the percentage of graded D in each tract.[10] I estimate four sets of equations, where the outcome variables are the number of Black MDIs, Asian MDIs, Hispanic MDIs and non-MDIs respectively. In the model I control for population within the census tract, population in all census tracts within a mile (or 5 miles) radius, percent of the community sharing minority identity with MDI owners, LMI status of census tracts, languages spoken at the tract level and other bank branches. For robustness, I estimate another Poisson GEE using the HOLC scores for each tract.

I do not use income level variables such as median household income or per capita income as explanatory variables for three reasons. One, they vary widely and is dependent on the cost of living of different counties which is difficult to control for in the analysis. Two, as shown in Figure A1, panels A1a through A1d, lower median household income, higher percent of SNAP beneficiary households, higher rates of vacancies and higher rates of renters are strongly correlated with primary grade intervals of the census tracts. This means higher HOLC scores or more redlining in each tract are strongly correlated with relatively worse economic outcomes. Three, I consider tracts that already have branches present, therefore, bank branching choices based on income characteristics of nearby communities are endogenous and already baked in. To account for income and general economic conditions of the tracts, I consider whether each census tract is designated as LMI or non-LMI.

I estimate the likelihood of bank branch presence using Wang et al. (2024). They introduce the Poisson GEE for estimating longitudinal data. Standard log-linearized models estimated using Ordinary Least Squares (OLS) and Generalized Linear Models (GLMs) can

[10] In Appendix B, I use the average HOLC scores within a mile radius (or 5 mile radius) and average graded D tracts with a mile (or 5 mile radius) of MDI containing tracts as the primary explanatory variable.

be quite misleading in the presence of heteroscedasticity. Therefore, they are not suitable for data with repeated observations because the former methods assume independence of observations. This independence of observations are violated in longitudinal settings where one observes within-unit correlations. GEEs are generally used to model population-averaged effects considering within-unit correlation. They are typically adopted to estimate the parameters of a generalized linear model when the correlation between repeated outcome observations are unknown (Liang and Zeger, 1986). First I estimate the model with the percent of the census tract with Grade D.

$$\begin{aligned} f(y_{i,t}|x_{i,t},\beta_j) = exp(&\beta_1 Population \\ &+\beta_2 Population\ x\ mile + \beta_3 Percent\ sharing\ minority\ identity \\ &+\beta_4 Percent\ sharing\ minority\ identity\ x\ mile + \beta_5 Percent\ Graded\ D \\ &+\beta_6 LMI\ tract + \beta_7 Other\ bank\ branches) + \nu_{i,t}. \end{aligned} \tag{1}$$

In the above equation, $y_{i,t}$ are the outcome variables; the number of different MDIs (Black MDIs, Asian MDIs and Hispanic MDIs) and non-MDIs at the census tract. I then estimate the model with the HOLC scores in each census tract.

$$\begin{aligned} f(y_{i,t}|x_{i,t},\beta_j) = exp(&\beta_1 Population \\ &+\beta_2 Population\ x\ mile + \beta_3 Percent\ sharing\ minority\ identity \\ &+\beta_4 Percent\ sharing\ minority\ identity\ x\ mile + \beta_5 HOLC\ score \\ &++\beta_6 LMI\ tract + +\beta_7 Other\ bank\ branches) + \nu_{i,t}. \end{aligned} \tag{2}$$

In essence, GEEs extend GLMs by introducing a working correlation matrix (e.g., exchangeable, autoregressive, unstructured) to model dependencies between repeated measurements and provide robust "sandwich" standard errors.[11] This paper assumes an exchangeable correlation structure, i.e., the correlation between any two measurements within the same unit of observations (census tracts) is time invariant, a reasonable assumption since I consider

[11] "Sandwich" standard errors account for misspecification of the correlation structure.

only thirteen years of observations. An advantage of the GEE specification is as long as the mean function is correctly specified, parameter estimates from the GEE are consistent even if the working variance-covariance structure is misspecified (Wang et al., 2024), which is more generally difficult to pin down correctly.

5 Results

This section provides estimates from the Poisson GEE estimation models. As discussed in the previous section, I use the percent of the census tracts with Grade D and the HOLC scores as the primary explanatory variables. Table 1 through Table 4 show the results. In Table 1 and Table 3, neighboring tracts are those within 1 mile of the studied tracts whereas in Table 2 and Table 4, neighboring tracts are those within 5 miles of the studied tracts. The results are consistent across the different specifications.

5.1 Results using percentage of census tract area redlined or graded D:

Table 1 and Table 2 show estimates from the Poisson GEE model using percent of the census tracts with Grade D as the primary explanatory variable. I find the expected number of Black-owned banks to increase by about 10 percent and the expected number of non-MDI bank branches to decrease by 1 percent for each ten percent point increase in tract area with Grade D. I also find Asian-owned and Hispanic-owned banks are less likely to locate in census tracts with higher percentage of Grade D areas. The results hold when I consider neighboring tracts within both 1 mile and 5 miles of the studied tracts. Conversely, I find Asian-owned and Hispanic-owned banks' locations are strongly influenced by the languages spoken at the census tract level. Notably, the expected number of Asian MDIs and Hispanic MDIs increases by 3 percent and 1.1 percent for each percent increase in the number of Asian language or Spanish speakers within the census tracts respectively.

5.2 Results using the HOLC or redlining scores

Table 3 and Table 4 show estimates from the Poisson GEE model using the HOLC or redlining score variable. The results are largely similar to Table 1 and Table 2. The expected

number of Black-owned banks increases between 13-15 percent, whereas the expected number of non-MDI banks decreases 2-3 percent for each point increase in the census tracts' HOLC scores. In other words, holding all other control variable constant, including the number of non-MDIs branches, Black-owned banks are more likely to locate in census tracts with higher scores. I also find Asian-owned and Hispanic-owned banks are less likely to locate in tracts with higher HOLC scores. The results are consistent when I consider neighboring tracts within both 1 mile and 5 miles of the studied tracts. Again, I find the expected number of Asian MDIs and Hispanic MDIs increases by 3 percent and 1.2 percent for each percent increase in the number of Asian language or Spanish speakers within the census tracts respectively. The results are consistent across all specifications.

5.3 Results using neighboring tracts

In Appendix B, I use the average area of census tracts with Grade D in neighboring tracts (within a mile or 5 miles radius) as the primary explanatory variable. I find the expected number of Black-owned banks increase by 13-16 percent for each ten percentage point increase in graded D areas within their neighboring tracts. Meanwhile, the expected number of non-MDIs also increase by 3-7 percent for each ten percentage points increase in areas with Grade D within their neighboring tracts. As robustness checks, I also use the average HOLC scores of neighboring tracts (within a mile or 5 miles radius) as the primary explanatory variable. Again, I find the expected number of Black-owned banks increase 14-18 percent for each point increase in the average HOLC scores of their neighboring tracts and the expected number of non-MDIs increase 2-6 percent for each point increase in the average HOLC scores of their neighboring tracts. This result is not surprising as many non-MDIs in the sample are within census tracts that were part of the "residential security maps" but were graded A or B. The results also show a degree of spatial clustering among Black MDIs, Asian MDIs, Hispanic MDIs and non-MDI bank branches. Figure 1 through Figure 3 confirms this observation. The HOLC maps contained contiguous regions of the highest grade (Green for Grade A) and the lowest grade (Red for Grade D). Hence the results

that non-MDI bank branches tend to locate within a mile or 5 miles of the lowest graded neighborhoods are unsurprising.

6 Are Black-owned Banks Different

To understand why Black-owned banks are over-represented in these specific neighborhoods, I study bank and branch level characteristics of non-MDI banks present in majority Black communities, farther away from Black-owned banks. These banks are not officially designated as Black-owned banks or MDIs. At the start of the sample, 80% of these banks had asset sizes less than $10 billion, hence a majority of them were small-sized community banks. At the end of the sample in 2023, these small-sized community banks consist of 65% of the sample. Community banks in this time-frame went through several phases of consolidation (Minton et al., 2024) and it is possible that some existing banks merged and became larger. About two-thirds of bank branches are more than 30 years old and about a third are sixty or older. More than 70% of the banks operate a maximum of two branches in the studied tracts, and 86% of the banks operate a maximum of six branches. The percentage remain constant between 2011 and 2023, even though many banks close or consolidate.[12]. About 50% of branches holds a deposit share greater than 50% within the census tracts. In other words, the branches are well-integrated and specialized in serving their immediate communities.

Figure 5, Panels (a) through (d) compare non-MDI neighboring banks of Black-owned banks in previously redlined tracts (Sample A) with the non-neighboring non-MDI banks serving primarily Black communities in other areas (Sample B). What is immediately striking are the number of banks and branches that serve the latter population, even though the sample number of census tracts are similar, 1107 vs. 1023 census tracts. The number of banks and corresponding branches are much higher for Sample B at the start in 2011, although the two sample converge in numbers towards the end of the sample period in

[12]The caveat here is I only see what is happening at the local level, they may possibly have other branches in other counties or states

2023. At the beginning of the sample, these non-MDI banks tend to be small-sized and a majority of these banks can be considered as community banks based on FDIC's definition of community banks (FDIC, 2012). Towards the end of the sample period, older and relatively larger banks with greater deposit share at the census tract level survive. Notably, Figure 5 shows non-MDIs in Sample A are larger non-community banks with a majority of branches holding less than 20% of the deposits at the census tract level.

To further investigate the role of Black-owned banks in their immediate neighborhoods, I compare bank level loan activity and deposit data. In order to perform a uniform comparison, I normalize the loan activity and deposit data by the asset sizes of the respective banks. My first comparison is between Black-owned banks and other non-MDI banks in their immediate neighborhoods, Sample A.[13] My second comparison is between Black-owned banks and non-neighboring non-MDI banks in Sample B. The non-MDIs in Sample B serve census tracts with significant Black populations.

A visual comparison of the two sets, Sample A and Sample B is provided in Figure 6 and Figure 7 respectively. When compared to other banks operating within the same tracts or neighboring tracts, Black-owned banks tend to provide higher proportions of residential and CRE loans. However, they provide much lesser quantity of C&I loans and SBLs. In other words, Black-owned banks specialize in providing loans for residential purposes (both mortgages and to landlords) in their immediate communities. Black-owned banks also provide fewer credit cards and other revolving credit and automobile loans. In recent years, they have offered more personal loans, which also includes student loans. Interestingly enough Black-owned banks also hold more public funds as core deposits compared to other kinds of banks in their local markets.

When I compare Black-owned banks with non-MDI banks that serve communities with significant Black populations but are not designated as Black-owned banks or MDIs, the general overview remain the same. Here also, I observe Black-owned banks hold more public

[13]The comparison sample is all non-Black-owned banks in census tracts with Black MDIs and their immediate neighboring census tracts.

funds as core deposits compared to other kinds of banks serving Black communities. They also tend to give a higher proportion of personal loans and lesser amounts of credit card and automobile loans. I find the non-MDI banks serving in primarily Black populated census tracts integrate well within their communities as they are located within tracts that are on average 60% Black and provide a significant share of residential, CRE loans and larger quantities of C&I loans and SBLs.

7 Conclusion

In this paper, I demonstrate a positive relation between previously redlined urban neighborhoods and the prevalence of Black-owned banks within these neighborhoods. I use Poisson GEEs to estimate the numbers of Black-owned, Hispanic-owned, Asian-owned and other non-MDI banks in their respective census tracts. I find the expected number of Black MDIs increases 10 percent, whereas the expected number of non-MDI banks decreases 1 percent for each ten percent point increase in the census tracts' Graded D area. I also find Asian-owned and Hispanic-owned banks are less likely to locate in tracts with greater percentage of Grade D at the tract level or with higher HOLC scores. Notably, the expected number of Asian MDIs and Hispanic MDIs increases by 3 percent and 1.1 percent for each percent increase in the number of Asian or Spanish speakers within the census tracts respectively. For robustness, I use the HOLC or redlining scores as the primary explanatory variable. The results are consistent across different kinds of specifications.

To provide a reason for the observed phenomenon, I draw on historical literature focusing on the interaction between the HOLC maps, the residents of many of the redlined neighborhoods, their difficulty accessing credit and how the need for this access lead to the formation of Black-owned banks within these neighborhoods (Hiller and Knowles, 2002; Baradaran, 2017; Winling and Michney, 2021). To understand why Black-owned banks are still over-represented in these neighborhoods, I study individual characteristics of Black-owned banks, including their branch characteristics, and bank-level loan activities at present. I show Black-owned banks that exist in these neighborhoods tend to be older, with very high deposit share

and very little branching footprint. Many of them survive to the end of the sample in 2023, demonstrating some kind of resilience.

However, in my sample, I also find a large share of banks that are not Black-owned or designated MDIs but serve in primarily Black communities. These non-MDIs integrate well within their local communities and provide a significant share of residential, CRE and C&I loans and SBLs and larger proportions of credit card and automobile loans compared to Black-owned banks. Individually, these banks tend to be small-sized community banks with limited branching footprint. Moreover, more than 50% of these bank branches hold a deposit share greater than 50% at the census tract level, meaning they form an integral part of the banking services accessible to these primary Black minority communities.

I also compare Black-owned banks with non-MDI banks in neighboring tracts and the latter sample. I show Black-owned banks are primarily dependent on individual deposits and hold greater quantities of public funds as core deposits compared to non-MDIs. Holding greater quantities of public funds may protect surviving banks against financial shocks (Eberley et al., 2019). Although these banks provide a slightly greater share of residential, CRE and personal loans to their immediate local communities, in general, they do not play an out-sized role in providing other kinds of credit. In other words, surviving Black-owned banks in redlined neighborhoods specialize in mortgage originations and rental property loans. This is unsurprising, since many of them were historically formed to address higher costs of obtaining credit within the redlined neighborhoods. I conclude the over-representation of Black-owned banks within historically segregated urban neighborhoods is most likely due to a mix of past federal policies, White out-migration from core urban areas in early 20th century (Shertzer and Walsh, 2019; Akbar et al., 2025), leading to increased segregation and a lack of financial integration of the remaining communities within these neighborhoods to the broader banking landscape. Finally I show, surviving Black-owned bank branches specialize and continue to serve local communities in urban neighborhoods with relatively fewer well-integrated community banks.

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Table 1: Poisson GEE estimates on the count of MDI and non-MDI branches

Based on percent graded D within census tracts				
	Black MDIs	Asian MDIs	Hispanic MDIs	Other Bank Branches
(Intercept)	-6.459^{***}	-4.663^{***}	-5.409^{***}	-0.039
	(0.114)	(0.040)	(0.043)	(0.027)
Population (000s)	-0.056^{***}	0.019^{***}	0.005	0.031^{***}
	(0.015)	(0.005)	(0.005)	(0.001)
Population (000s) 1 mile	0.007^{***}	-0.001^{*}	0.006^{***}	0.001^{***}
	(0.001)	(0.001)	(0.000)	(0.000)
Percent Graded D	0.097^{***}	-0.005	-0.044^{***}	-0.009^{***}
	(0.008)	(0.009)	(0.009)	(0.002)
LMI tract	0.345^{***}	0.437^{***}	-0.783^{***}	0.028^{***}
	(0.075)	(0.045)	(0.038)	(0.009)
Other banks' branches	0.111^{***}	0.082^{***}	0.106^{***}	
	(0.004)	(0.003)	(0.003)	
Percent Black	0.374^{***}			0.006^{*}
	(0.019)			(0.003)
Percent Black 1 mile	0.008^{***}			
	(0.002)			
Non-English speakers	-0.015^{***}			0.009^{***}
	(0.002)			(0.000)
Percent Asian		0.327^{***}		0.036^{***}
		(0.021)		(0.004)
Percent Asian 1 mile		0.008^{***}		
		(0.002)		
Percent Asian speakers		0.030^{***}		
		(0.002)		
Percent Hispanic			0.456^{***}	-0.116^{***}
			(0.017)	(0.003)
Percent Hispanic 1 mile			0.009^{***}	
			(0.001)	
Percent Spanish speakers			0.011^{***}	
			(0.002)	
Percent White				0.069^{***}
				(0.003)
Scale	0.651	1.102	1.083	2.712
Observations	166174	166174	166174	166174

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$
Neighboring tracts are within one mile.

Table 2: Poisson GEE estimates on the count of MDI and non-MDI branches

Based on percent graded D within census tracts				
	Black MDIs	Asian MDIs	Hispanic MDIs	Other Bank Branches
(Intercept)	-6.929^{***}	-4.937^{***}	-5.833^{***}	-0.061^{*}
	(0.111)	(0.042)	(0.051)	(0.027)
Population (000s)	-0.075^{***}	0.021^{***}	0.015^{***}	0.031^{***}
	(0.015)	(0.005)	(0.004)	(0.001)
Population (000s) 5 miles	0.001^{***}	0.000^{***}	0.000^{***}	0.000^{***}
	(0.000)	(0.000)	(0.000)	(0.000)
Percent Graded D	0.102^{***}	-0.029^{**}	-0.017^{*}	-0.014^{***}
	(0.008)	(0.009)	(0.008)	(0.002)
LMI tract	0.429^{***}	0.395^{***}	-0.516^{***}	0.035^{***}
	(0.073)	(0.040)	(0.038)	(0.009)
Other banks' branches	0.109^{***}	0.081^{***}	0.103^{***}	
	(0.004)	(0.003)	(0.003)	
Percent Black	0.309^{***}			0.006
	(0.018)			(0.003)
Percent Black 5 miles	0.024^{***}			
	(0.002)			
Non-English speakers	-0.012^{***}			0.008^{***}
	(0.002)			(0.000)
Percent Asian		0.196^{***}		0.039^{***}
		(0.024)		(0.004)
Percent Asian 5 miles		0.024^{***}		
		(0.002)		
Percent Asian speakers		0.039^{***}		
		(0.003)		
Percent Hispanic			0.200^{***}	-0.112^{***}
			(0.023)	(0.003)
Percent Hispanics 5 miles			0.030^{***}	
			(0.002)	
Percent Spanish speakers			0.007^{***}	
			(0.002)	
Percent White				0.069^{***}
				(0.003)
Scale	0.573	1.161	1.155	2.713
Observations	166174	166174	166174	166174

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Neighboring tracts are within five miles.

Table 3: Poisson GEE estimates on the count of MDI and non-MDI branches

Based on HOLC Score using Meier and Mitchell (2023)				
	Black MDIs	Asian MDIs	Hispanic MDIs	Other Bank Branches
(Intercept)	-6.423^{***}	-4.659^{***}	-5.348^{***}	-0.033
	(0.114)	(0.042)	(0.044)	(0.027)
Population (000s)	-0.067^{***}	0.019^{***}	0.002	0.030^{***}
	(0.015)	(0.005)	(0.005)	(0.001)
Population (000s) 1 mile	0.007^{***}	-0.001	0.008^{***}	0.001^{***}
	(0.001)	(0.001)	(0.000)	(0.000)
HOLC score	0.127^{***}	-0.009	-0.200^{***}	-0.020^{***}
	(0.022)	(0.015)	(0.013)	(0.003)
LMI tract	0.384^{***}	0.439^{***}	-0.729^{***}	0.032^{***}
	(0.074)	(0.045)	(0.037)	(0.009)
Other banks' branches	0.112^{***}	0.081^{***}	0.103^{***}	
	(0.004)	(0.003)	(0.003)	
Percent Black	0.374^{***}			0.006^{*}
	(0.019)			(0.003)
Percent Black 1 mile	0.006^{***}			
	(0.002)			
Non-English speakers	-0.017^{***}			0.009^{***}
	(0.002)			(0.000)
Percent Asian		0.324^{***}		0.034^{***}
		(0.022)		(0.004)
Percent Asian 1 mile		0.008^{***}		
		(0.002)		
Percent Asian speakers		0.030^{***}		
		(0.002)		
Percent Hispanic			0.444^{***}	-0.118^{***}
			(0.017)	(0.003)
Percent Hispanic 1 mile			0.008^{***}	
			(0.001)	
Percent Spanish speakers			0.012^{***}	
			(0.002)	
Percent White				0.069^{***}
				(0.003)
Scale	0.621	1.199	1.067	2.706
Observations	166174	166174	166174	166174

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Neighboring tracts are within one mile.

Table 4: Poisson GEE estimates on the count of MDI and non-MDI branches

Based on HOLC Score using Meier and Mitchell (2023)				
	Black MDIs	Asian MDIs	Hispanic MDIs	Other Bank Branches
(Intercept)	-6.946^{***}	-4.913^{***}	-5.801^{***}	-0.054^{*}
	(0.114)	(0.043)	(0.051)	(0.027)
Population (000s)	-0.078^{***}	0.020^{***}	0.013^{**}	0.031^{***}
	(0.015)	(0.005)	(0.005)	(0.001)
Population (000s) 5 miles	0.001^{***}	0.000^{***}	0.000^{***}	0.000^{***}
	(0.000)	(0.000)	(0.000)	(0.000)
HOLC Score	0.147^{***}	-0.070^{***}	-0.158^{***}	-0.030^{***}
	(0.021)	(0.018)	(0.013)	(0.003)
LMI tract	0.454^{***}	0.411^{***}	-0.462^{***}	0.043^{***}
	(0.073)	(0.042)	(0.038)	(0.009)
Other banks' branches	0.111^{***}	0.079^{***}	0.101^{***}	
	(0.004)	(0.003)	(0.003)	
Percent Black	0.303^{***}			0.006^{*}
	(0.018)			(0.003)
Percent Black 5 miles	0.023^{***}			
	(0.002)			
Non-English speakers	-0.013^{***}			0.008^{***}
	(0.002)			(0.000)
Percent Asian		0.185^{***}		0.036^{***}
		(0.024)		(0.004)
Percent Asian 5 miles		0.024^{***}		
		(0.002)		
Percent Asian speakers		0.041^{***}		
		(0.003)		
Percent Hispanic			0.206^{***}	-0.116^{***}
			(0.023)	(0.003)
Percent Hispanics 5 miles			0.029^{***}	
			(0.002)	
Percent Spanish speakers			0.007^{***}	
			(0.002)	
Percent White				0.069^{***}
				(0.003)
Scale	0.552	1.136	1.125	2.704
Observations	166174	166174	166174	166174

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$
Neighboring tracts are within five miles.

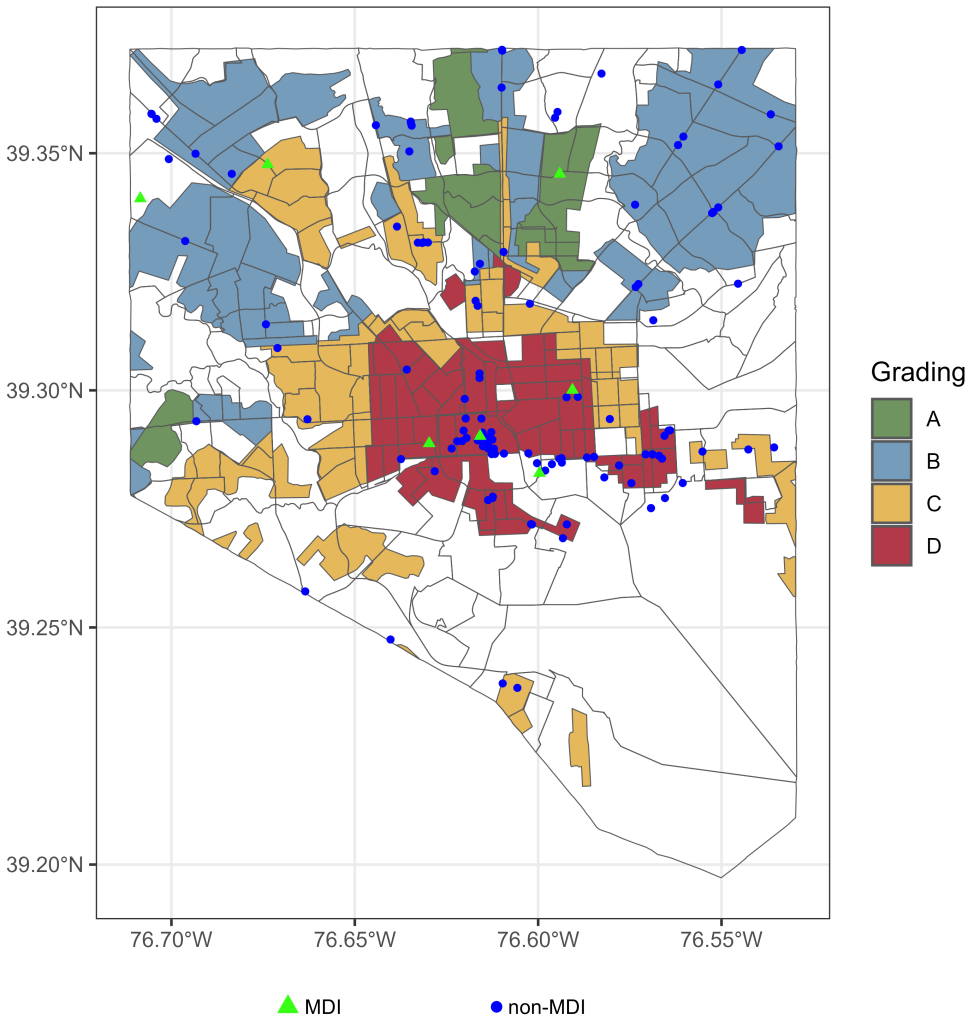


Figure 1: The figure shows MDI and non-MDI branches superimposed on the HOLC maps in Baltimore county in 2011.

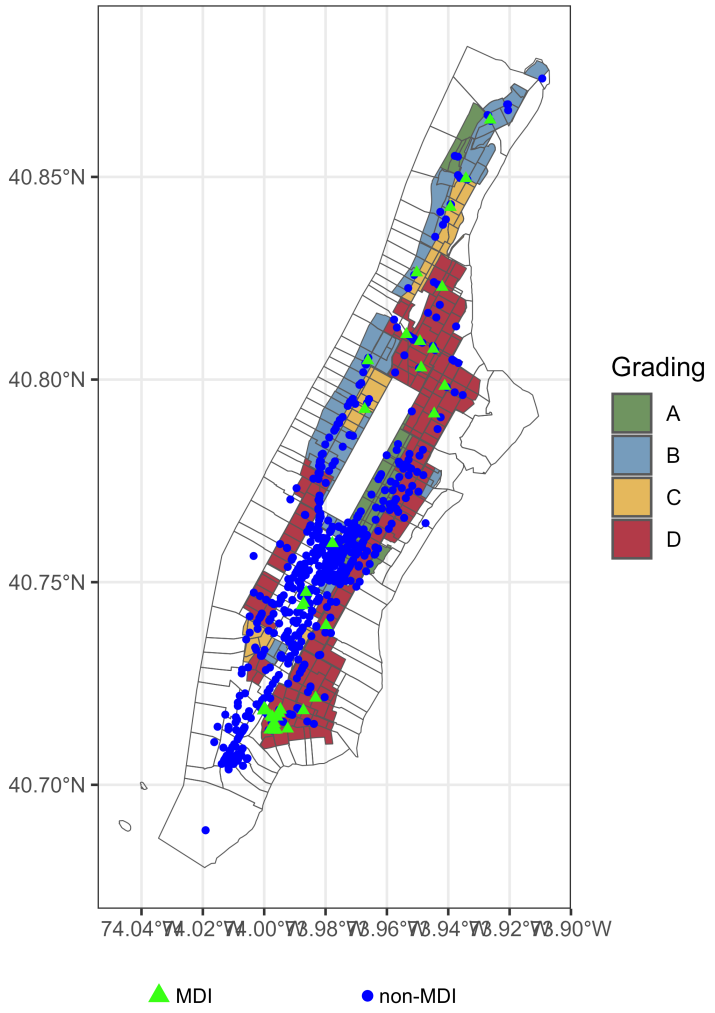


Figure 2: The figure shows MDI and non-MDI branches superimposed on the HOLC maps in Manhattan county in 2011.

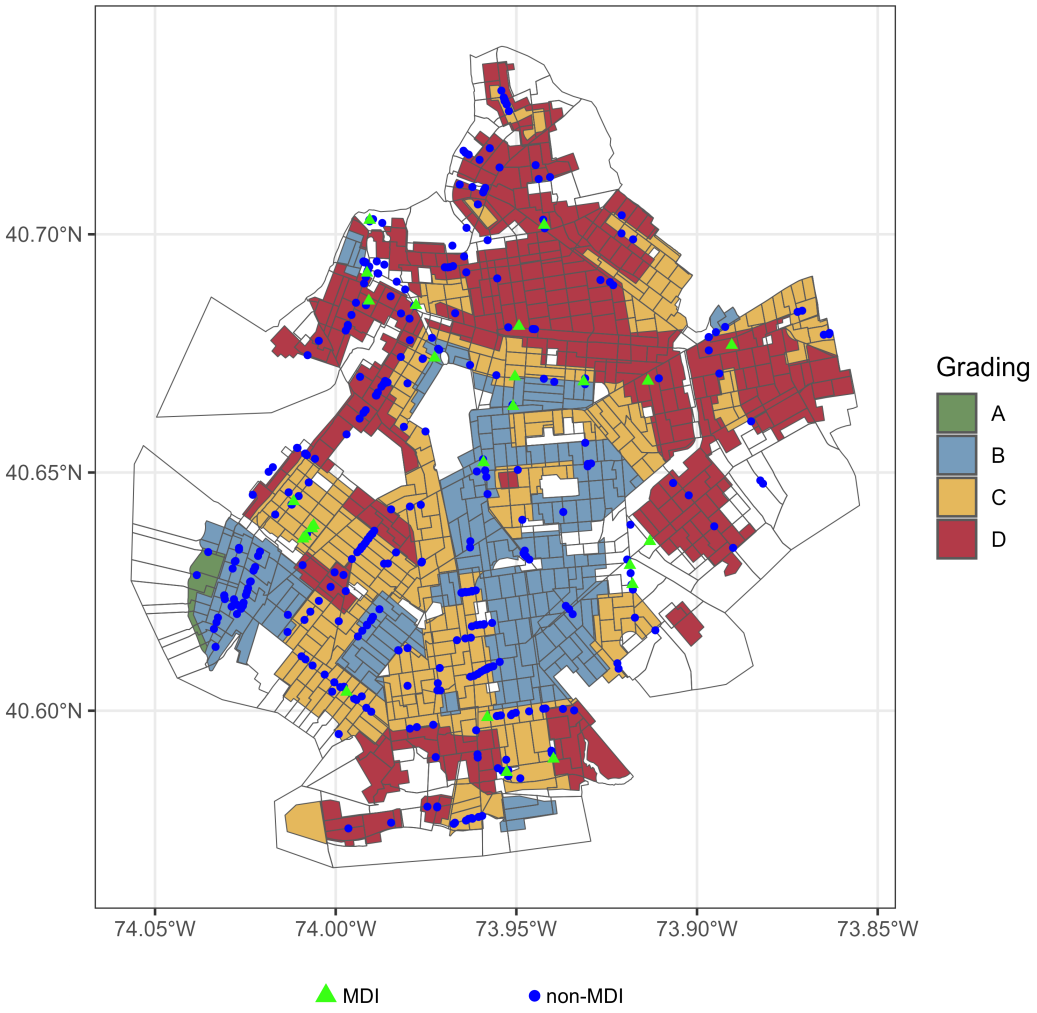
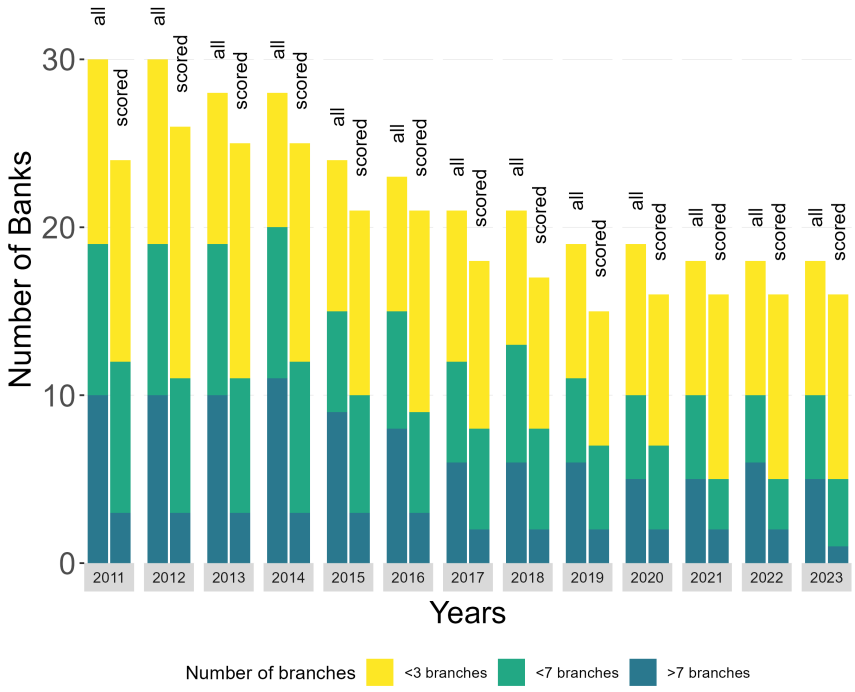
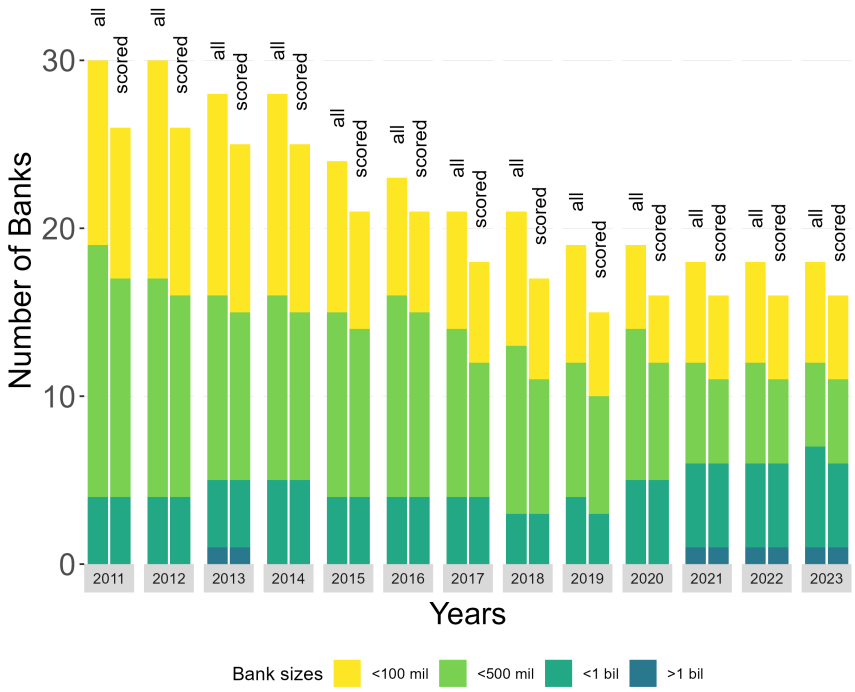


Figure 3: The figure shows MDI and non-MDI branches superimposed on the HOLC maps in Bronx county in 2011.

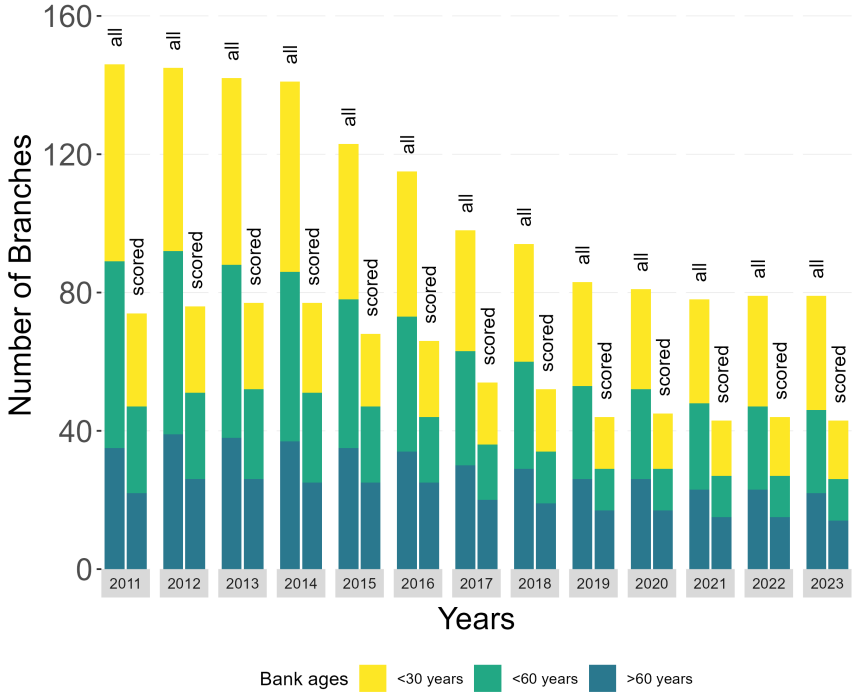


(a) Branch composition among banks in all census tracts vs. those in scored census tracts.

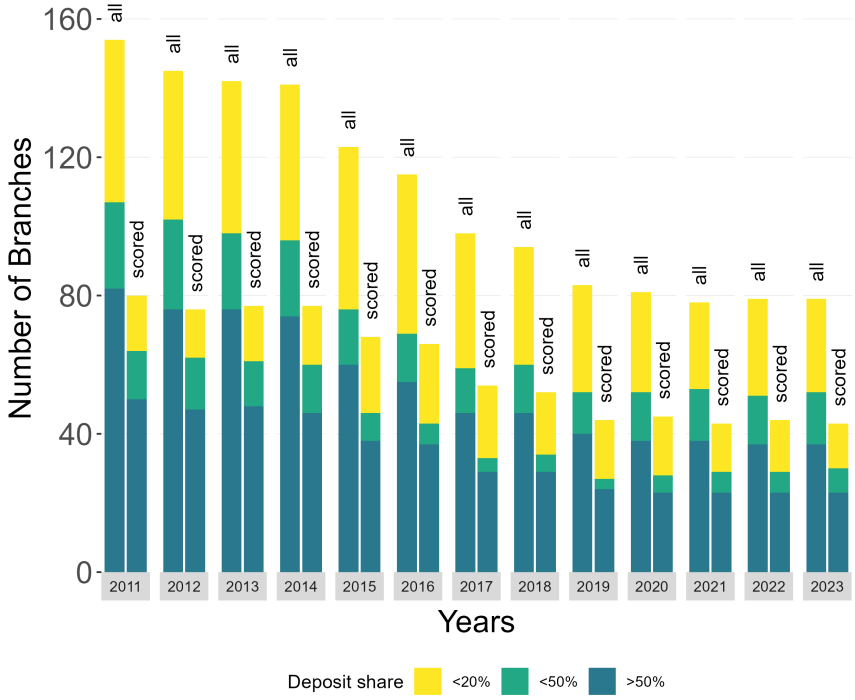


(b) Asset sizes of banks in all census tracts vs. those in scored census tracts.

Figure 4: The figure compares Black-owned banks in all census tracts with Black-owned banks in census tracts with an HOLC score greater than 0.

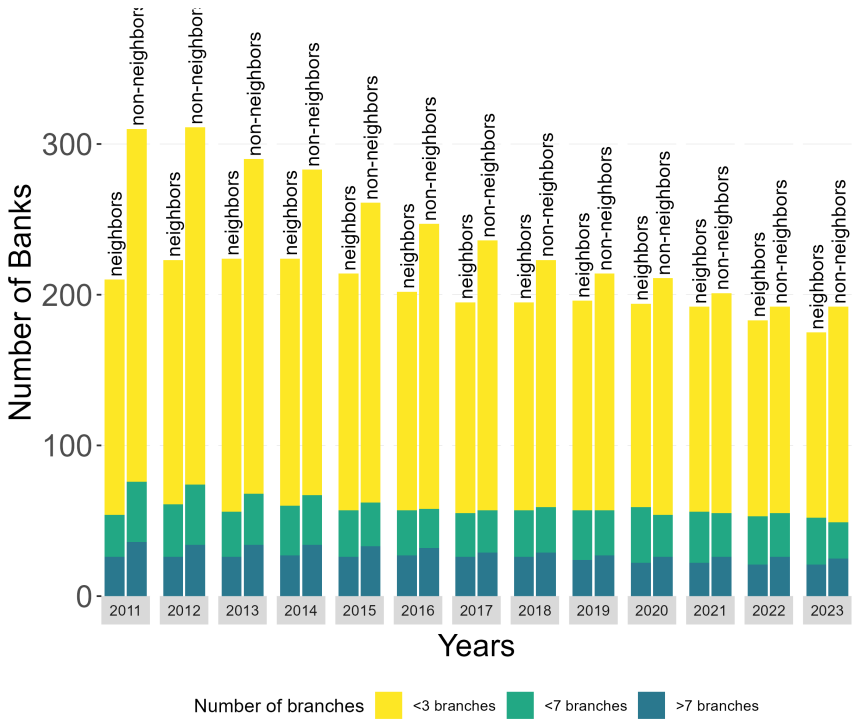


(c) Age of individual branches in all census tracts vs. those in scored census tracts.

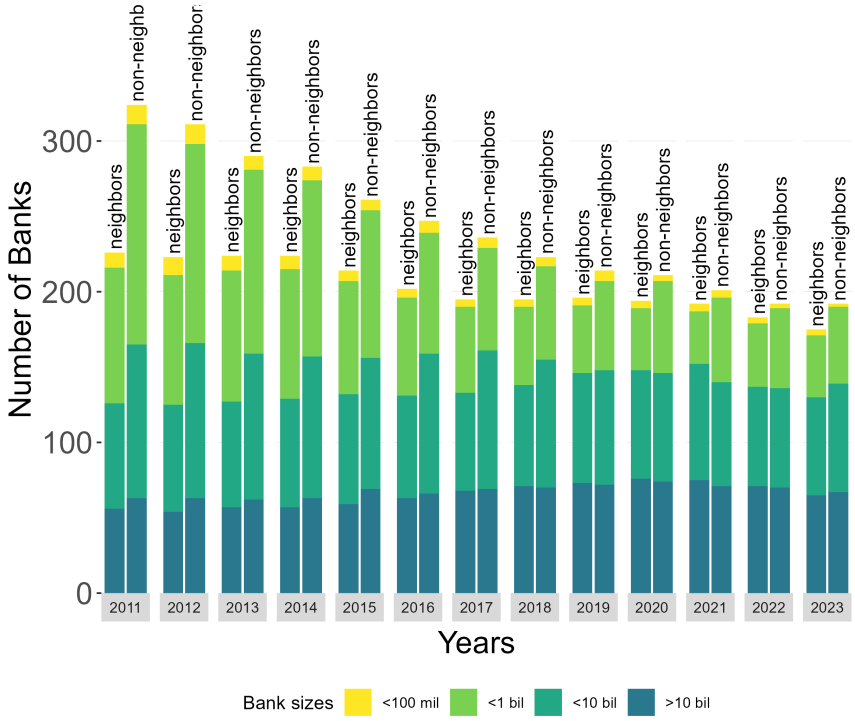


(d) Deposit share of individual branches in all census tracts vs. those in scored census tracts.

Figure 4: The figure compares Black-owned banks in all census tracts with Black-owned banks in census tracts with an HOLC score greater than 0.

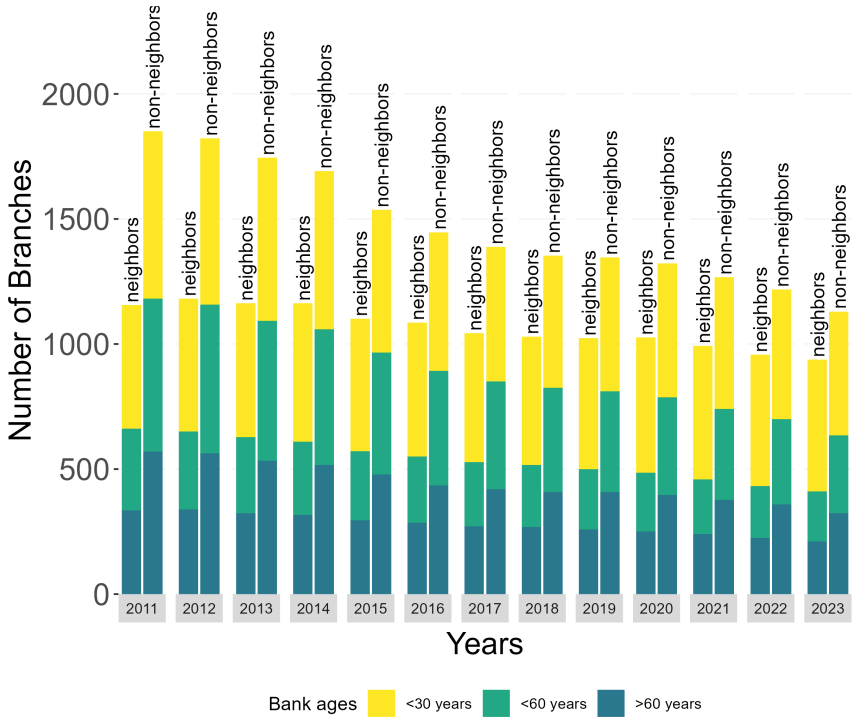


(a) Branch composition among non-MDI banks in neighboring tracts of Black banks vs. non-MDI banks serving in primarily Black neighborhoods.

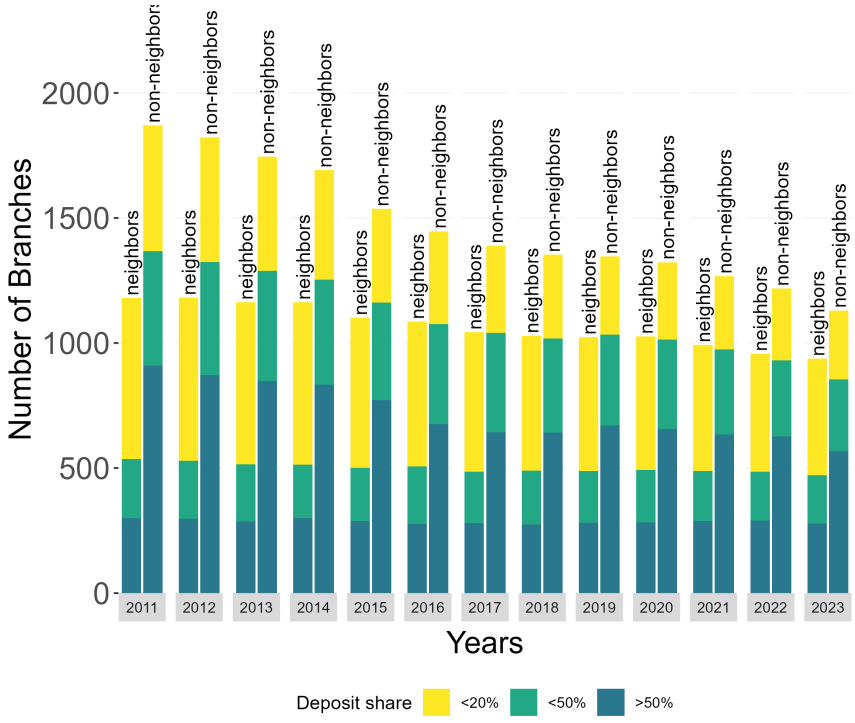


(b) Asset sizes of non-MDI banks in neighboring tracts of Black banks vs. non-MDI banks serving in primarily Black neighborhoods.

Figure 5: The figure compares non-MDI neighboring banks of Black-owned banks with non-MDI banks that serve primarily Black communities.

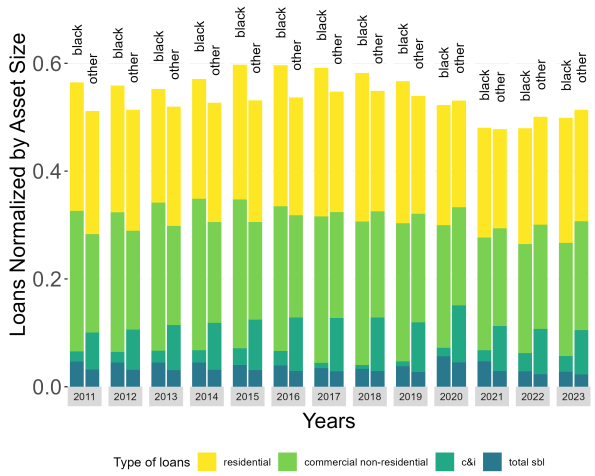


(c) Age of non-MDI branches in neighboring tracts of Black banks vs. non-MDI branches serving in primarily Black neighborhoods.

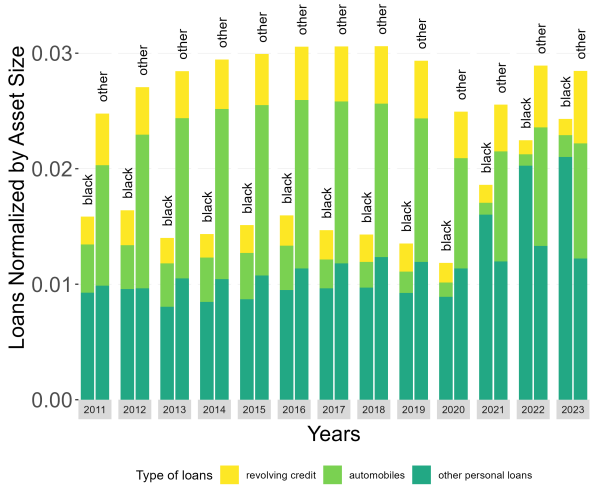


(d) Deposit share of non-MDI branches in neighboring tracts of Black banks vs. non-MDI branches serving in primarily Black neighborhoods.

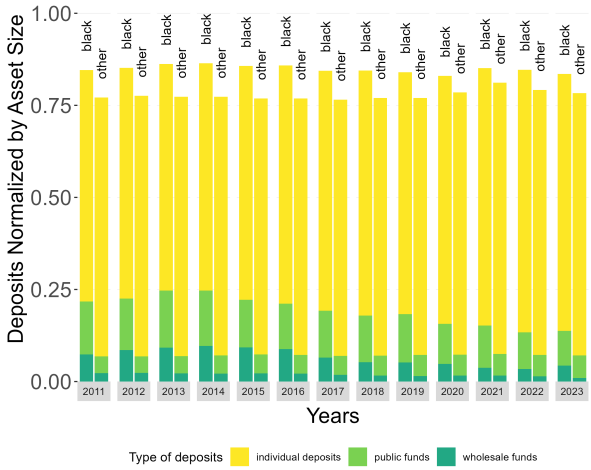
Figure 5: The figure compares non-MDI neighboring banks of Black-owned banks with non-MDI banks that serve primarily Black communities.



(a) Residential, CRE, C&I and total SBL.

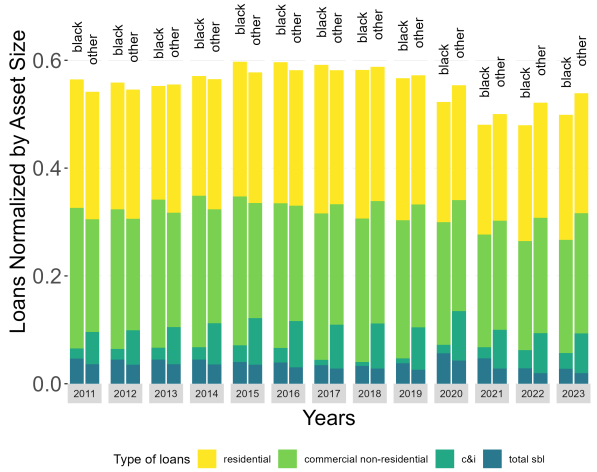


(b) Credit card and revolving credit, automobiles and other personal loans (student loans).

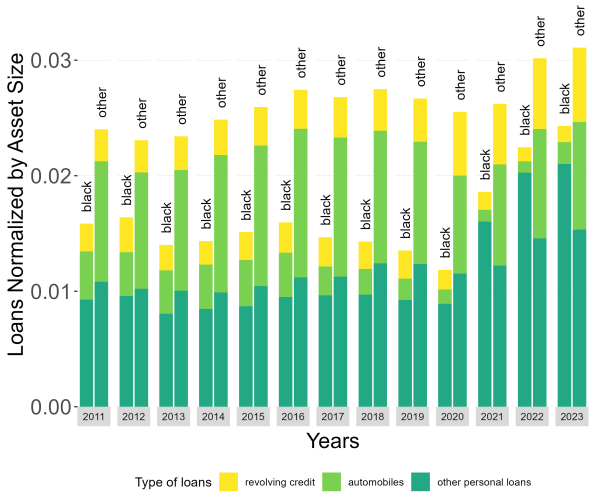


(c) Both transnational and non-transactional accounts, public funds consists of deposits from federal or state institutions.

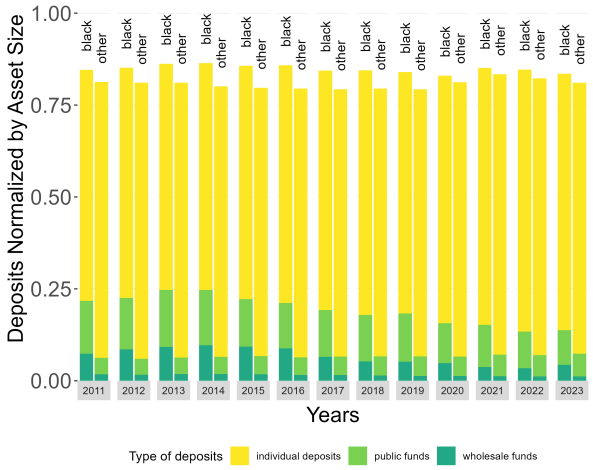
Figure 6: The figure compares Black-owned banks with other banks in the near vicinity



(a) Comparison of large loans- residential, CRE, C&I and total SBL.



(b) Comparison of personal loans - credit card and revolving credit, automobiles and other personal loans such as student loans.



(c) Comparison of deposit share - contains both transnational and non-transactional accounts. Public funds consists of deposits from federal or state institutions.

Figure 7: The figure compares Black-owned banks with other banks serving primarily Black communities.

A Appendix: Summary Statistics of the studied tracts, in counties with Black MDIs , counties with Asian MDIs, counties with Hispanic MDIs and all counties with MDIs

Summary statistics using 2011 as the base year for all kinds of MDIs and non-MDIs in my sample. Panel A show summary statistics for tracts in Black MDI counties, whereas Panel B through Panel D show statistics for tracts in Asian MDIs, Hispanic MDIs and non-MDIs counties respectively.

Panel A show Black MDI tracts had a higher proportion of Black population across all graded tracts and even across tracts not graded. Notably, these tracts have higher vacancies and greater proportion of renters across all grades when compared with tracts with other kinds of MDIs and non-MDIs. At the same time, median household income decreased considerably between tracts graded A and those graded D while percentage of Supplemental Nutrition Assistance Program (SNAP) beneficiary households increased.

Table A1: Summary statistics

	Panel A: Black MDI tracts				
	Not Graded	Grade A	Grade B	Grade C	Grade D
Count	70	4	11	24	40
Black MDIs	1.07	1.15	1.00	1.00	1.025
	(0.26)	(0.50)	(0.000)	(0.000)	(0.000)
Non MDIs	3.81	1.00	0.55	1.11	2.32
	(8.73)	(2.00)	(0.688)	(1.41)	(4.51)
LMI tract	0.54	0.75	0.72	0.75	0.85
	(0.50)	(0.50)	(0.46)	(0.44)	(0.36)
Population (000s)	3.99	3.98	3.79	3.51	2.28
	(1.89)	(1.33)	(1.75)	(2.54)	(0.79)
Population (000s)1 mile	11.770	23.540	49.120	29.720	46.523
	(17.72)	(2.18)	(59.51)	(26.96)	(58.49)
Population (000s) 5 miles	300.40	807.01	824.84	658.29	738.18
	(275.40)	(387.59)	(893.61)	(526.56)	(818.15)
Percent Black	63.41	63.25	75.91	71.45	69.73
	(29.17)	(41.32)	(31.57)	(30.44)	(23.75)
Percent Black 1 mile	41.17	56.25	77.36	64.50	67.50
	(36.91)	(32.54)	(23.16)	(31.54)	(18.97)
Percent Black 5 miles	51.67	28.75	58.91	49.83	48.78
	(23.80)	(17.88)	(16.17)	(23.24)	(16.04)
Percent Asian	3.54	8.25	3.81	3.63	3.60
	(5.26)	(11.41)	(2.36)	(3.81)	(4.77)
Percent Hispanic	10.14	5.00	4.64	16.70	7.90
	(13.90)	(1.41)	(7.07)	(23.20)	(11.01)
Percent White	26.18	37.00	18.27	16.29	21.15
	(24.47)	(26.15)	(30.47)	(19.30)	(19.75)
HOLC Score	0.00	1.33	2.08	3.01	3.88
	(0.00)	(0.36)	(0.15)	(0.14)	(0.23)
Average Neighbor Score 1 mile	0.44	1.82	2.35	2.79	3.48
	(0.92)	(0.34)	(0.48)	(0.80)	(0.47)
Average Neighbor Score 5 miles	0.85	2.25	2.37	2.45	2.53
	(1.04)	(0.71)	(0.67)	(0.64)	(0.63)
Percent Graded D	0.27	0.00	1.83	5.26	74.32
	(1.10)	(0.00)	(6.06)	(8.85)	(28.81)
Average Graded D 1 mile	4.76	5.34	7.74	20.39	60.99
	(13.12)	(10.65)	(8.56)	(17.55)	(22.93)
Average Grade D 5 miles	8.46	17.23	19.95	21.83	28.48
	(12.85)	(7.13)	(12.55)	(12.11)	(11.43)
Median Household Income (000s)	53.56	79.98	50.50	43.02	37.44
	(27.30)	(47.11)	(9.92)	(18.07)	(20.35)
Percent Households on SNAP	18.24	8.85	17.95	23.80	28.36
	(11.17)	(5.94)	(11.34)	(13.48)	(12.83)
Percent Vacancies	14.19	13.37	12.67	18.34	21.01
	(7.45)	(7.64)	(7.62)	(11.75)	(8.79)
Percent Renters	49.81	50.53	60.10	61.11	73.01
	(20.76)	(28.27)	(29.80)	(22.46)	(15.81)

Population variables and median household income are in thousands.

Table A1: Summary statistics

	Panel B: Asian MDI tracts				
	Not Graded	Grade A	Grade B	Grade C	Grade D
Count	280	8	26	60	36
Asian MDIs	1.53	1.50	1.13	1.67	2.05
	(1.16)	(0.76)	(0.51)	(1.16)	(1.80)
Non MDIs	3.24	3.00	2.38	2.33	3.28
	(5.46)	(0.92)	(4.00)	(3.60)	(4.47)
LMI tract	0.32	0.13	0.46	0.63	0.75
	(0.47)	(0.35)	(0.51)	(0.49)	(0.44)
Population (000s)	4.718	5.472	4.636	4.515	4.873
	(1.957)	(1.001)	(1.350)	(1.400)	(2.584)
Population (000s) 1 mile	16.550	11.881	47.693	57.340	73.837
	(29.259)	(8.314)	(26.088)	(47.973)	(54.931)
Population (000s) 5 miles	381.670	712.560	874.435	896.224	1297.213
	(345.338)	(216.809)	(441.573)	(502.675)	(682.557)
Percent Asian	28.0	35.25	36.08	43.68	42.72
	(22.70)	(21.49)	(221.18)	(22.49)	(26.10)
Percent Asian 1 mile	20.59	24.37	30.04	37.23	27.67
	(20.24)	(23.99)	(19.56)	(19.26)	(13.85)
Percent Asian 5 miles	18.90	21.88	18.50	22.47	14.75
	(13.16)	(13.09)	(9.67)	(11.50)	(7.07)
Percent Black	7.09	8.37	5.81	6.08	12.22
	(9.18)	(11.61)	(8.58)	(11.57)	(18.47)
Percent Hispanic	23.56	9.25	18.96	25.88	20.58
	(21.15)	(9.30)	(16.59)	(20.17)	(19.38)
Percent White	50.95	51.75	45.38	35.35	33.97
	(22.57)	(21.93)	(23.91)	(19.22)	(19.35)
HOLC Score	0.00	1.31	2.17	2.95	3.86
	(0.00)	(0.25)	(0.19)	(0.14)	(0.26)
Average Neighbor Score 1 mile	0.25	1.60	2.43	2.71	2.84
	(0.68)	(0.83)	(0.45)	(0.43)	(0.83)
Average Neighbor Score 5 miles	0.44	2.46	2.42	2.38	2.71
	(0.83)	(0.20)	(0.54)	(0.54)	(0.67)
Percent Graded D	0.18	0.80	0.50	1.72	60.59
	(1.19)	(2.25)	(1.66)	(6.08)	(28.52)
Average Graded D 1 mile	2.89	0.63	4.70	8.02	41.19
	(9.31)	(1.77)	(8.57)	(11.16)	(22.91)
Average Grade D 5 miles	4.03	10.38	16.00	15.20	31.50
	(9.72)	(8.92)	(7.41)	(9.90)	(14.02)
Median Household Income (000s)	84.18	135.51	80.56	62.66	53.71
	(39.56)	(41.52)	(28.06)	(21.58)	(34.05)
Percent Households on SNAP	7.25	4.21	5.26	7.04	13.86
	(6.93)	(2.09)	(4.09)	(7.05)	(14.41)
Percent Vacancies	8.73	4.76	7.35	7.44	10.31
	(6.82)	(1.38)	(3.70)	(4.94)	(9.81)
Percent Renters	44.22	22.56	60.12	65.37	74.60
	(24.76)	(15.57)	(18.84)	(21.66)	(21.79)

Population variables and median household income are in thousands.

Table A1: Summary statistics

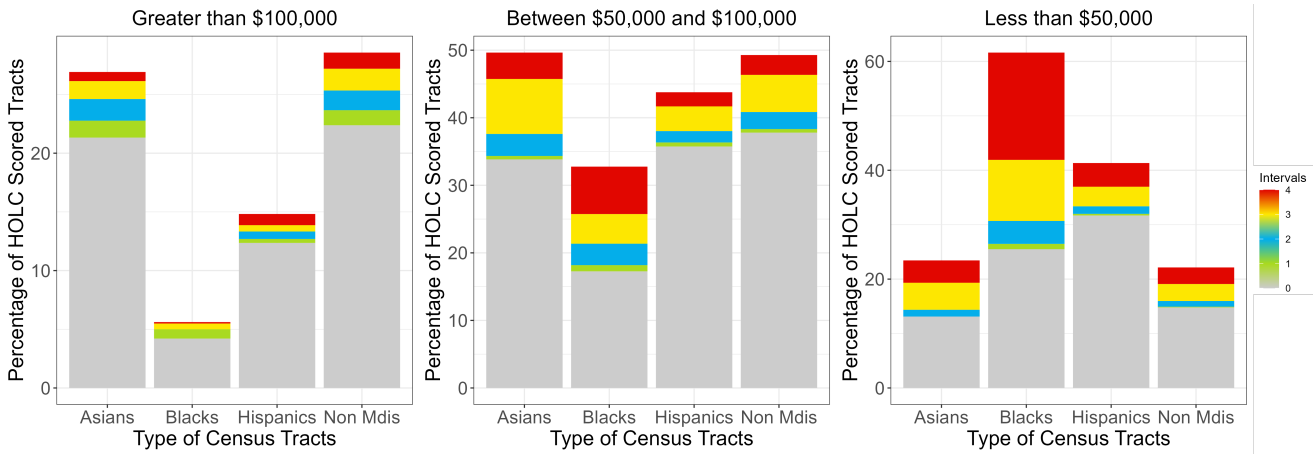
	Panel C: Hispanic MDI tracts				
	Not Graded	Grade A	Grade B	Grade C	Grade D
Count	389	6	18	38	36
Hispanic MDIs	1.11	1.33	1.17	1.18	1.19
	(0.63)	(0.82)	(0.75)	(0.51)	(0.1.17)
Non MDIs	2.62	5.33	5.00	2.74	2.69
	(3.43)	(6.86)	(6.86)	(4.90)	(4.68)
LMI tract	0.36	0.33	0.56	0.79	0.72
	(0.48)	(0.52)	(0.51)	(0.41)	(0.45)
Population (000s)	5.299	4.705	5.346	4.457	4.681
	(2.925)	(1.629)	(2.334)	(2.235)	(2.164)
Population (000s) 1 mile	6.324	28.894	77.354	74.269	86.981
	(10.434)	(36.415)	(81.465)	(61.393)	(61.822)
Population (000s) 5 miles	197.214	642.007	1185.792	1212.228	1463.552
	(214.331)	(670.789)	(950.083)	(860.709)	(940.940)
Percent Hispanic	51.13	49.33	49.17	58.13	53.72
	(32.77)	(26.64)	(28.23)	(29.50)	(33.65)
Percent Hispanic 1 mile	27.04	53.00	45.22	51.00	49.61
	(35.47)	(23.38)	(29.56)	(25.13)	(30.53)
Percent Hispanic 5 miles	47.71	56.33	49.89	43.74	39.56
	(32.67)	(19.73)	(19.31)	(19.97)	(19.46)
Percent Asian	3.86	3.83	7.50	9.39	7.47
	(7.28)	(4.67)	(11.98)	(14.02)	(8.48)
Percent Black	6.61	6.50	10.61	9.82	16.69
	(11.33	(6.32)	(16.68)	(14.00)	(21.89)
Percent White	77.48	75.50	59.61	54.24	53.39
	(15.98)	(18.67)	(27.53)	(26.17)	(27.60)
HOLC Score	0.00	1.19	2.12	2.99	3.85
	(0.00)	(0.25)	(0.20)	(0.12)	(0.25)
Average Neighbor Score 1 mile	0.10	1.45	2.01	2.64	3.13
	(0.46)	(0.63)	(0.93)	(0.64)	(0.59)
Average Neighbor Score 5 miles	0.20	1.83	2.04	2.50	2.55
	(0.51)	(0.68)	(0.83)	(0.60)	(0.63)
Percent Graded D	0.10	0.00	0.02	2.98	65.36
	(1.07)	(0.00)	(0.09)	(5.85)	(32.90)
Average Graded D 1 mile	0.70	0.40	14.15	11.71	47.76
	(4.27)	(0.73)	(17.11)	(15.44)	(25.40)
Average Grade D 5 miles	1.43	12.99	19.27	21.38	27.56
	(4.44)	(7.57)	(11.87)	(12.26)	(11.63)
Median Household Income	64.05	67.20	64.45	52.74	54.69
	(33.19)	(27.59)	(29.16)	(21.36)	(28.29)
Percent Households on SNAP	15.35	13.60	15.64	17.28	20.22
	(12.41)	(12.75)	(14.15)	(11.10)	(13.95)
Percent Vacancies	12.93	19.45	12.82	13.89	10.10
	(9.64)	(10.81)	(9.13)	(13.18)	(5.48)
Percent Renters	40.06	59.75	63.60	68.28	74.18
	(21.74)	(28.50)	(21.85)	(20.88)	(15.57)

Population variables and median household income are in thousands.

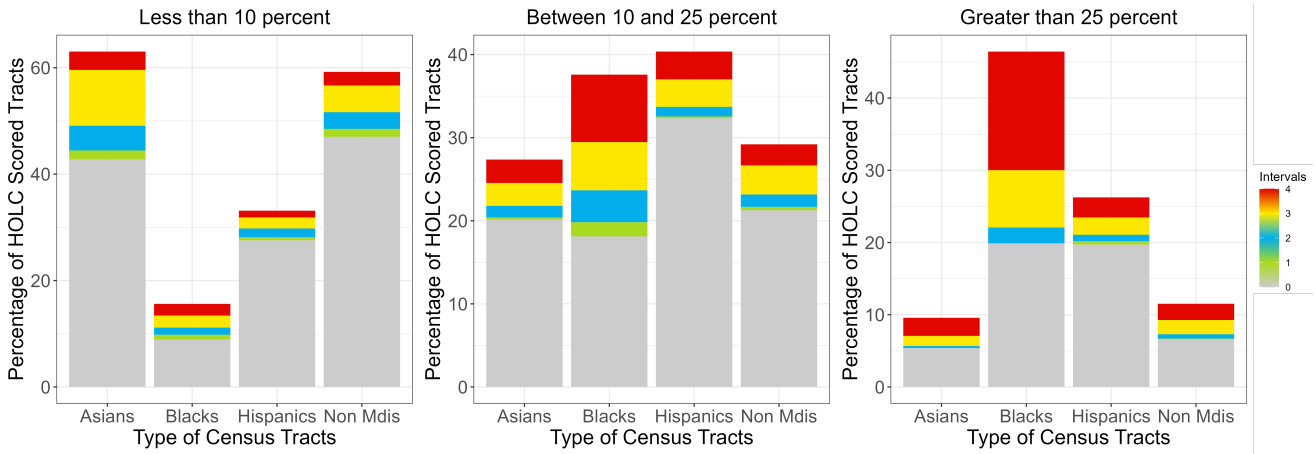
Table A1: Summary statistics

	Panel D: Non-MDI tracts				
	Not Graded	Grade A	Grade B	Grade C	Grade D
Count	8898	230	622	1244	872
MDIs	0.00	0.00	0.00	0.00	0.00
	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)
Non MDIs	2.40	2.80	2.34	2.09	20.04
	(2.07)	(2.82)	(2.04)	(1.78)	(2.04)
LMI tract	0.23	0.07	0.30	0.48	0.61
	(0.42)	(0.25)	(0.46)	(0.50)	(0.49)
Population (000s)	4.734	3.971	4.335	4.172	3.825
	(2.222)	(1.477)	(1.722)	(1.750)	(2.007)
Population (000s) 1 mile	7.643	26.271	36.609	40.905	48.888
	(13.994)	(48.438)	(44.427)	(41.647)	(50.899)
Population (000s) 5 miles	230.804	563.010	692.048	768.315	899.946
	(236.150)	(640.945)	(610.850)	(611.357)	(791.359)
Percent Asian	7.80	5.38	7.89	9.25	8.12
	(10.52)	(7.04)	(9.88)	(11.18)	(10.28)
Percent Black	12.08	11.57	17.68	17.61	23.04
	(18.01)	(18.61)	(26.16)	(25.30)	(28.23)
Percent Hispanic	19.16	9.17	15.43	24.49	26.40
	(20.94)	(13.50)	(20.22)	(25.78)	(26.51)
Percent White	68.74	79.80	66.41	60.42	55.09
	(22.92)	(20.20)	(26.71)	(26.53)	(26.82)
Percent White 1 mile	40.02	66.12	59.38	56.64	62.95
	(36.63)	(28.94)	(26.84)	(25.26)	(23.47)
Percent White 5 miles	64.43	58.24	55.28	54.10	51.14
	(21.01)	(15.17)	(16.13)	(15.31)	(14.58)
HOLC Score	0.00	1.31	2.12	2.94	3.82
	(0.00)	(0.25)	(0.18)	(0.15)	(0.24)
Average Neighbor Score 1 mile	0.12	1.66	2.05	2.58	3.00
	(0.52)	(0.85)	(0.78)	(0.79)	(0.92)
Average Neighbor Score 5 miles	0.30	1.87	2.12	2.30	2.50
	(0.62)	(0.66)	(0.63)	(0.66)	(0.66)
Percent Graded D	0.14	0.45	0.88	2.87	62.54
	(1.31)	(2.21)	(3.25)	(7.53)	(28.54)
Average Graded D 1 mile	0.95	5.89	6.29	11.40	42.76
	(6.22)	(13.13)	(11.34)	(15.58)	(25.17)
Average Grade D 5 miles	2.17	14.30	15.16	17.34	26.88
	(6.37)	(11.03)	(10.44)	(10.92)	(13.17)
Median Household Income (000s)	83.75	129.32	85.48	68.67	60.95
	(40.33)	(59.75)	(41.46)	(30.06)	(32.05)
Percent Households on SNAP	7.78	5.40	8.85	12.08	18.81
	(7.78)	(5.35)	(9.25)	(11.41)	(13.65)
Percent Vacancies	9.64	10.78	9.38	9.97	13.32
	(7.85)	(8.66)	(7.08)	(7.02)	(8.62)
Percent Renters	35.38	30.33	45.06	54.36	63.11
	(23.59)	(19.61)	(23.73)	(22.83)	(20.19)

Population variables and median household income are in thousands.

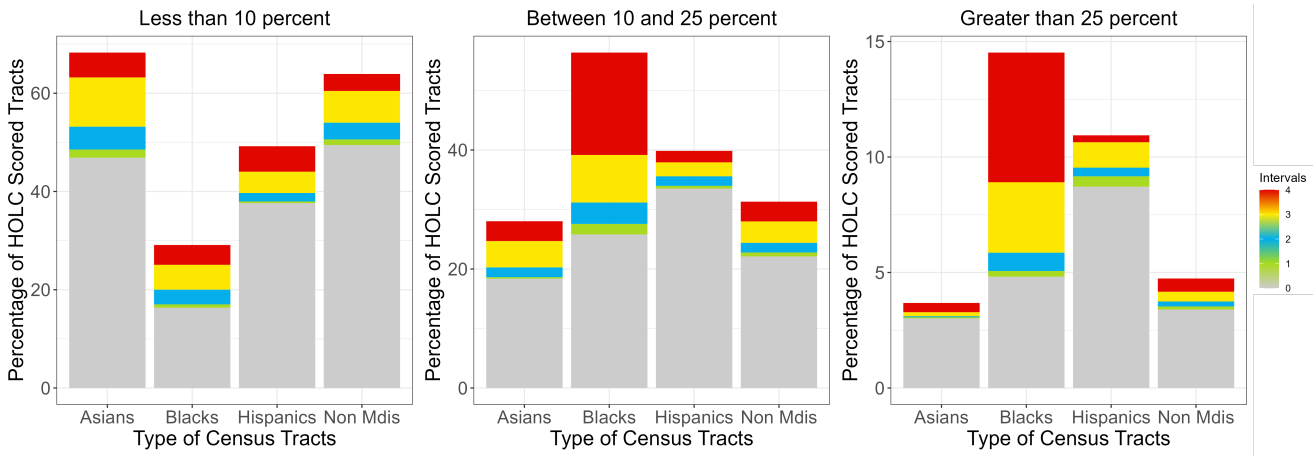


(a) Panel A - Median household income.

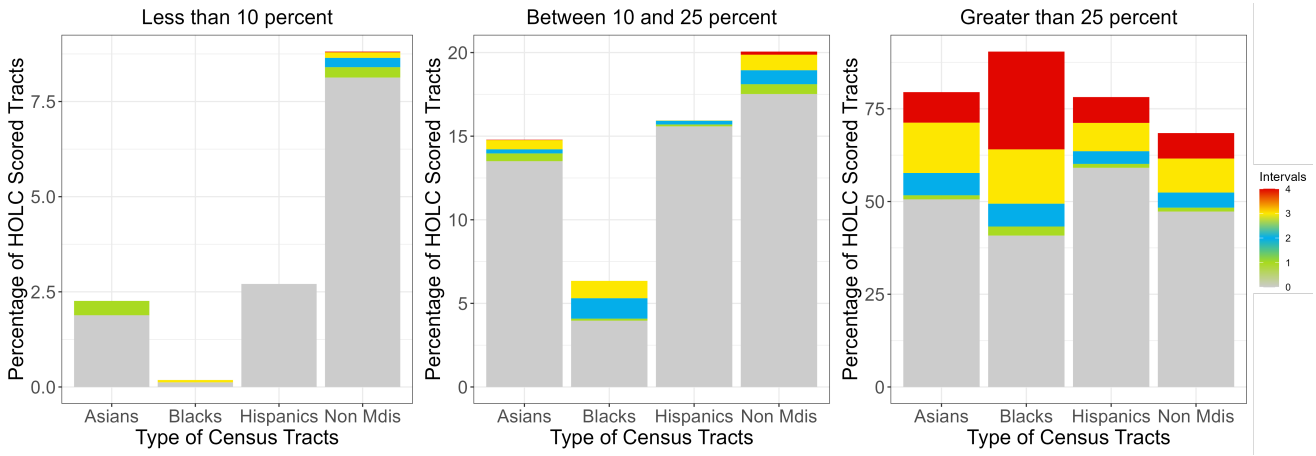


(b) Panel B - Percent of households with SNAP.

Figure A1: Distribution of census tracts by MDI types and percentage of HOLC scored tracts



(c) Panel C - Percent of vacancies.



(d) Panel D - Percent of renters.

Figure A1: Distribution of census tracts by MDI types and percentage of HOLC scored tracts

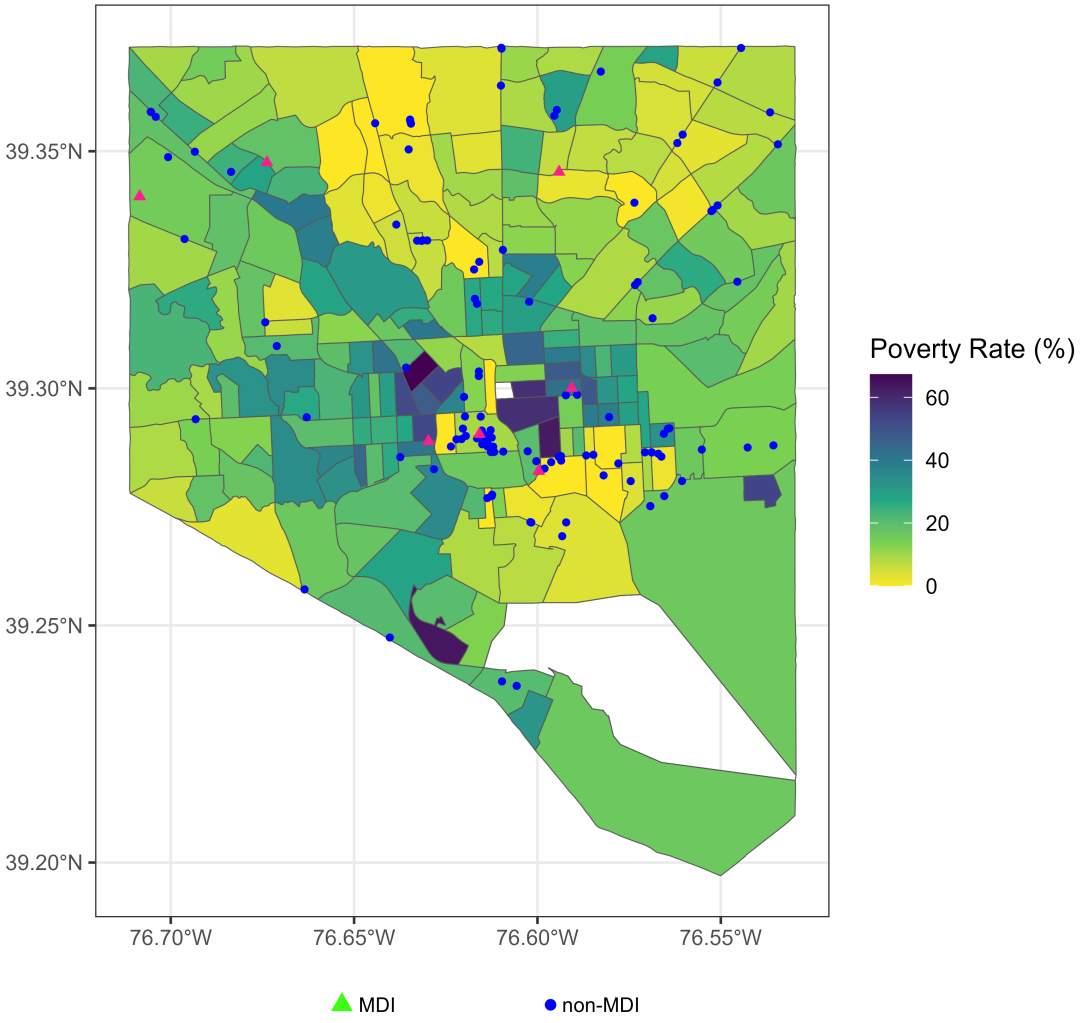


Figure A2: The figure shows MDI and non-MDI branches superimposed on poverty rates in Baltimore county in 2011.

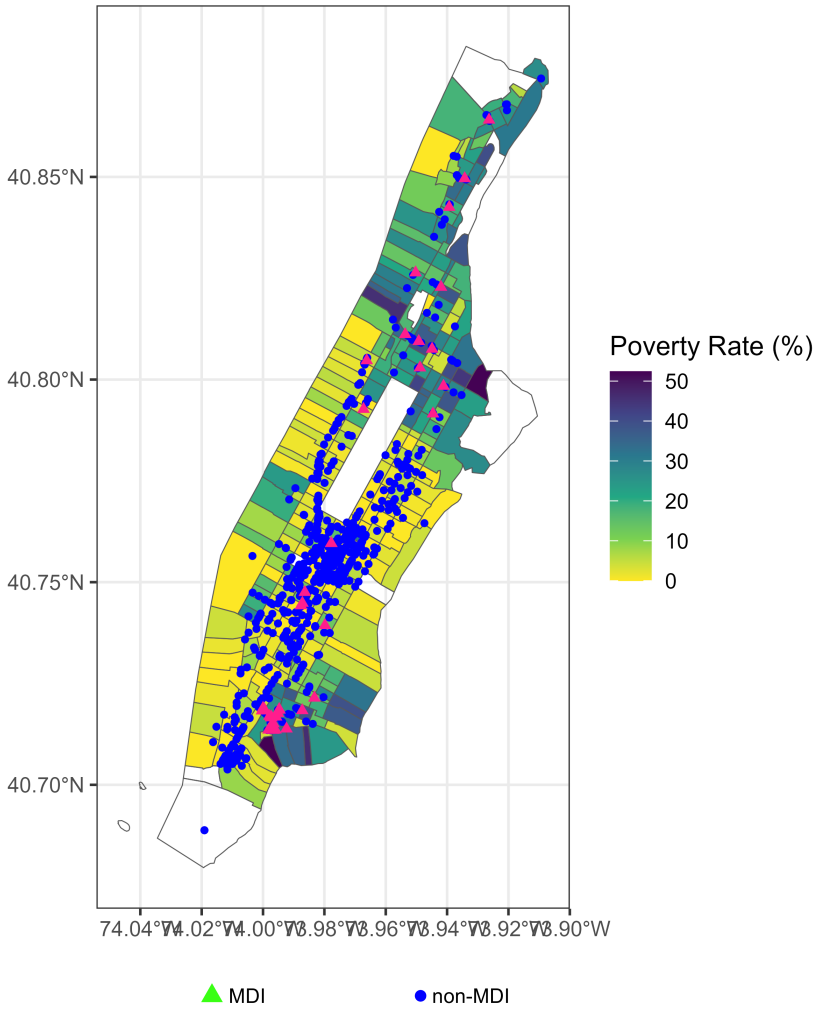


Figure A3: The figure shows poverty rates, MDI and non-MDI branches superimposed on poverty rates in Manhattan county in 2011.

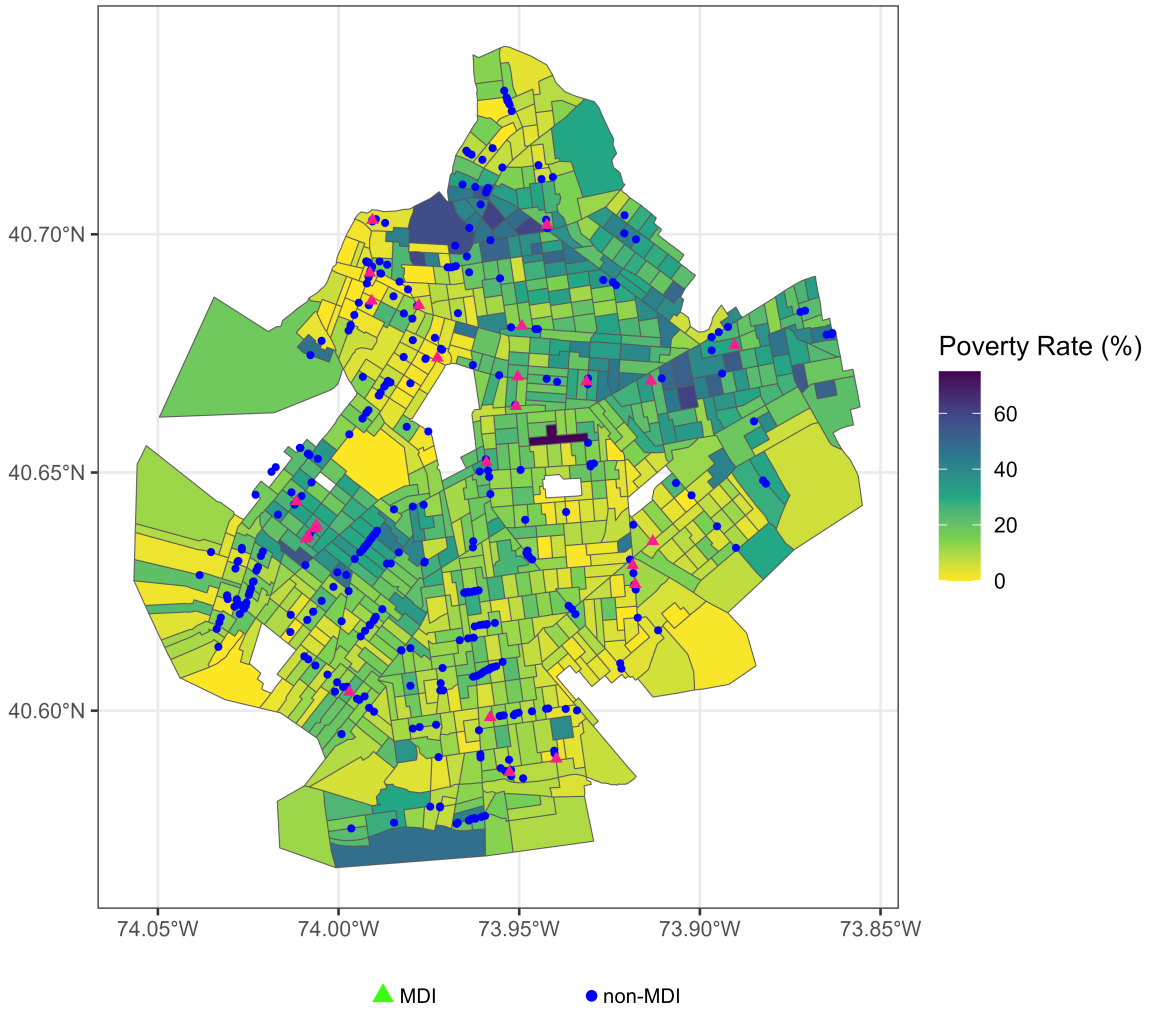


Figure A4: The figure shows poverty rates, MDI and non-MDI branches superimposed on poverty rates in Bronx county in 2011.

B Appendix: Estimation using average HOLC scores or average Graded D

I calculate the average HOLC scores and average percentage of tracts Graded D of neighboring tracts within a mile and 5 miles respectively and use them as the primary explanatory variable. Table B1 and Table B3 show results for tracts within a mile radius. Whereas Table B2 and Table B4 show results for tracts within 5 miles radius. The results are largely similar across all specifications.

Table B1: Poisson GEE estimates on the count of MDI and non-MDI branches

Based on percent graded D within census tracts				
	Black MDIs	Asian MDIs	Hispanic MDIs	Other Bank Branches
(Intercept)	-6.646^{***}	-4.660^{***}	-5.404^{***}	-0.061^{*}
	(0.113)	(0.040)	(0.043)	(0.030)
Population (000s)	-0.035^{*}	0.019^{***}	0.005	0.032^{***}
	(0.014)	(0.005)	(0.005)	(0.001)
Population (000s) 1 mile	0.006^{***}	-0.001^{*}	0.006^{***}	0.000^{**}
	(0.001)	(0.000)	(0.000)	(0.000)
Ave Percent Graded D	0.168^{***}	-0.012	-0.061^{***}	0.031^{***}
	(0.010)	(0.010)	(0.011)	(0.002)
LMI tract	0.301^{***}	0.440^{***}	-0.782^{***}	0.012
	(0.074)	(0.046)	(0.038)	(0.009)
Other banks' branches	0.107^{***}	0.082^{***}	0.107^{***}	
	(0.004)	(0.003)	(0.003)	
Percent Black	0.384^{***}			0.005
	(0.018)			(0.003)
Percent Black 1 mile	0.007^{***}			
	(0.002)			
Non-English speakers	-0.014^{***}			0.009^{***}
	(0.002)			(0.000)
Percent Asian		0.328^{***}		0.037^{***}
		(0.022)		(0.005)
Percent Asian 1 mile		0.008^{***}		
		(0.002)		
Percent Asian speakers		0.030^{***}		
		(0.002)		
Percent Hispanic			0.456^{***}	-0.117^{***}
			(0.017)	(0.003)
Percent Hispanic 1 mile			-0.009^{***}	
			(0.001)	
Percent Spanish speakers			0.011^{***}	
			(0.002)	
Percent White				0.070^{***}
				(0.003)
Scale	0.645	1.106	1.083	2.693
Observations	166174	166174	166174	166174

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Neighboring tracts are within one mile.

Table B2: Poisson GEE estimates on the count of MDI and non-MDI branches

Based on percent graded D within census tracts				
	Black MDIs	Asian MDIs	Hispanic MDIs	Other Bank Branches
(Intercept)	-6.833^{***}	-4.907^{***}	-5.833^{***}	-0.062^{*}
	(0.112)	(0.041)	(0.052)	(0.029)
Population (000s)	-0.089^{***}	0.018^{***}	0.010^{*}	0.033^{***}
	(0.016)	(0.005)	(0.005)	(0.001)
Population (000s) 5 miles	0.001^{***}	0.000^{***}	0.001^{***}	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Average Percent Graded D	0.128^{***}	-0.088^{***}	-0.269^{***}	0.075^{***}
	(0.025)	(0.023)	(0.021)	(0.005)
LMI tract	0.478^{***}	0.403^{***}	-0.460^{***}	0.002
	(0.075)	(0.041)	(0.038)	(0.009)
Other banks' branches	0.101^{***}	0.085^{***}	0.111^{***}	
	(0.005)	(0.003)	(0.003)	
Percent Black	0.308^{***}			0.001
	(0.018)			(0.003)
Percent Black 5 miles	0.022^{***}			
	(0.002)			
Non-English speakers	-0.012^{***}			0.009^{***}
	(0.002)			(0.000)
Percent Asian		0.202^{***}		0.035^{***}
		(0.024)		(0.005)
Percent Asian 5 miles		0.023^{***}		
		(0.002)		
Percent Asian speakers		0.039^{***}		
		(0.003)		
Percent Hispanic			0.218^{***}	-0.114^{***}
			(0.023)	(0.003)
Percent Hispanics 5 miles			0.028^{***}	
			(0.002)	
Percent Spanish speakers			0.006^{**}	
			(0.002)	
Percent White				0.068^{***}
				(0.003)
Scale	0.545	1.177	1.126	2.659
Observations	166174	166174	166174	166174

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Neighboring tracts are within five miles.

Table B3: Poisson GEE estimates on the count of MDI and non-MDI branches

Based on HOLC Score using Meier and Mitchell (2023)				
	Black MDIs	Asian MDIs	Hispanic MDIs	Other Bank Branches
(Intercept)	-6.476^{***}	-4.672^{***}	-5.337^{***}	-0.055^{*}
	(0.114)	(0.041)	(0.044)	(0.028)
Population (000s)	-0.061^{***}	0.019^{***}	0.001	0.032^{***}
	(0.015)	(0.005)	(0.005)	(0.001)
Population (000s) 1 mile	0.007^{***}	-0.001^{**}	0.009^{***}	0.001^{***}
	(0.001)	(0.001)	(0.000)	(0.000)
Ave Neighbor HOLC score	0.182^{***}	0.014	-0.247^{***}	0.022^{***}
	(0.024)	(0.015)	(0.016)	(0.004)
LMI tract	0.367^{***}	0.430^{***}	-0.727^{***}	0.017^{*}
	(0.074)	(0.046)	(0.038)	(0.009)
Other banks' branches	0.107^{***}	0.082^{***}	0.108^{***}	
	(0.004)	(0.003)	(0.003)	
Percent Black	0.380^{***}			0.005
	(0.019)			(0.003)
Percent Black 1 mile	0.005^{**}			
	(0.002)			
Non-English speakers	-0.016^{***}			0.009^{***}
	(0.002)			(0.000)
Percent Asian		0.329^{***}		0.038^{***}
		(0.021)		(0.004)
Percent Asian 1 mile		0.008^{***}		
		(0.002)		
Percent Asian speakers		0.030^{***}		
		(0.002)		
Percent Hispanic			0.445^{***}	-0.114^{***}
			(0.017)	(0.003)
Percent Hispanic 1 mile			-0.008^{***}	
			(0.001)	
Percent Spanish speakers			0.012^{***}	
			(0.002)	
Percent White				0.069^{***}
				(0.003)
Scale	0.622	1.106	1.065	2.707
Observations	166174	166174	166174	166174

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$
Neighboring tracts are within one mile.

Table B4: Poisson GEE estimates on the count of MDI and non-MDI branches

Based on HOLC Score using Meier and Mitchell (2023)				
	Black MDIs	Asian MDIs	Hispanic MDIs	Other Bank Branches
(Intercept)	-6.854^{***}	-4.886^{***}	-5.745^{***}	-0.081^{**}
	(0.113)	(0.043)	(0.052)	(0.028)
Population (000s)	-0.089^{***}	0.017^{***}	0.006	0.033^{***}
	(0.016)	(0.005)	(0.005)	(0.001)
Population (000s) 5 miles	0.001^{***}	0.000^{***}	0.001^{***}	0.000^{*}
	(0.000)	(0.000)	(0.000)	(0.000)
Ave Neighbor HOLC Score	0.137^{***}	-0.083^{***}	-0.377^{***}	0.061^{***}
	(0.032)	(0.023)	(0.023)	(0.005)
LMI tract	0.501^{***}	0.399^{***}	-0.420^{***}	0.011
	(0.074)	(0.042)	(0.038)	(0.009)
Other banks' branches	0.104^{***}	0.084^{***}	0.110^{***}	
	(0.004)	(0.003)	(0.003)	
Percent Black	0.302^{***}			0.002
	(0.018)			(0.003)
Percent Black 5 miles	0.023^{***}			
	(0.002)			
Non-English speakers	-0.013^{***}			0.008^{***}
	(0.002)			(0.000)
Percent Asian		0.187^{***}		0.042^{***}
		(0.024)		(0.005)
Percent Asian 5 miles		0.024^{***}		
		(0.002)		
Percent Asian speakers		0.041^{***}		
		(0.003)		
Percent Hispanic			0.214^{***}	-0.107^{***}
			(0.023)	(0.003)
Percent Hispanics 5 miles			0.028^{***}	
			(0.002)	
Percent Spanish speakers			0.006^{***}	
			(0.002)	
Percent White				0.069^{***}
				(0.003)
Scale	0.530	1.164	1.096	2.685
Observations	166174	166174	166174	166174

Notes: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$
Neighboring tracts are within five miles.