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WHERE'S THE BRANCH?
BANKING ACCESS IN AN ERA OF BRANCH CONSOLIDATION

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Abstract. This study examines changes in household and employment access to bank branches in the United States from 2014 to 2024, calculating distances with highly granular census block-level data. We develop a continuous measure of bank branch access that accounts for population and employment density, implicitly accounting for varying travel times within different urban and rural areas. Our findings indicate that despite a 19-percent decline in bank branches over the decade, average distances to the nearest branch increased only modestly—by 0.02 to 0.28 miles depending on area density. We find some disparities in branch access across racial and income groups, but these gaps did not widen substantially over the 2014-2024 period. Overall, our results suggest that while some localized reductions in branch access occurred, the significant reduction in the number of branches did not result in significant decreases in access to local bank branches for households or businesses.

JEL: G21, R32

Keywords: Banking, Branch Networks, Geospatial Analysis, Banking Deserts

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1. Introduction

Access to financial services, especially banking services, has been a topic of interest in research and a concern for policymakers. Historically, bank branches, specifically brick and mortar locations, have been the centerpiece to such analyses, as many banking services were locally provided at nearby branches. Fueled mainly by the decline in the number of bank branches and the continued national consolidation of banking assets, consumer advocates have raised concerns about access to bank branches. These structural changes further fueled concerns that banks are leaving poorer, perhaps more racially diverse neighborhoods. As the supply of banking services provided through branches declines, some groups or businesses, who are more reliant on branches and have to travel further to a branch, could be harmed. In this paper, we reconsider the question of whether household distances to their nearest branch has increased in a changing banking environment. We calculate more accurate measures of distance using more detailed geographic data and we also consider a more continuous measure of branch access.

Over the past decade, the banking industry has experienced significant structural changes, with the most notable being a dramatic decline in the number of branches. Figure 1 illustrates the number of commercial bank and savings institution branches since 1994, showing that after nearly three decades of consistent growth, branch numbers began to decrease following the global financial crisis (GFC). The total number of branches peaked at approximately 99,500 shortly after the GFC. By 2014, this number had decreased to 94,725, and by 2024, it had further declined to 76,742, representing a net loss of nearly 18,000 bank branches (19 percent). Commercial banks alone saw a reduction from 86,530 branches in 2014 to 71,994 in 2024, a decline of almost 17 percent.[1]

This trend is further evidenced by the increase in branch closings over this period. Figure 2 depicts the number of branch openings and closings since 2000. Prior to 2009, branch openings consistently outnumbered closings, resulting in a net increase. However, post-2009, this pattern reversed, with closings exceeding openings, leading to the observed net loss of branches over the past decade.[2]

The decline in bank branches has given rise to discussions about "banking deserts," defined as areas where residents have no access to traditional bank branches. Residents of banking deserts might not be able to obtain financial services and may have to rely on

[1] Credit union branch counts remained relatively stable over this period, at about 20,000 branches.

[2] The number of banks also collapsed over this period, from more than 11,000 institutions before 2000 to about 4,000 today (Adams and Gramlich (2016)).

alternative financial services, such as payday, auto title, or pawn lenders, which can be more expensive and less regulated than traditional banking services.[3] Limited access to credit and banking services can make it difficult for individuals to start businesses, purchase homes, or invest in their education, which can limit their economic mobility and hinder economic growth in their communities.

As a first step, we consider how distance to the nearest bank branch changed over the 2014-2024 period. We then measure access by calculating the number of people per branch, using kernel-density weights based on distance to a branch. Utilizing comprehensive data on household, employment, bank branch, and other public and commercial service locations, we present two key findings: (1) Despite the decline in the number of bank branches, the distance from households and businesses to their nearest branch has not changed substantially over the past decade. (2) Access to branches has also not changed substantially over the past decade.

Our analysis distinguishes itself from previous research in several important ways. First, we use more granular household data, focusing on census blocks rather than census tracts or ZIP codes. Most studies calculate distances from census-tract centroids or simply focus on the existence of branches within (or near) a census tract. Tracts can be large with few or no inhabitants. Furthermore, tract boundaries are somewhat arbitrary, sometimes with little relevance to economic activity.

Second, many studies make comparisons across areas with very heterogeneous populations and, more importantly, with heterogeneous household and employment densities. Simply using city or metro-area boundaries can result in a wide range of population or employment densities within the area, making it difficult to compute appropriate cross-sectional travel distances and times. We create urban comparison groups based on more rigorous population and employment density metrics. We believe such urban density groups better capture implicit travel distances and times.

In creating these comparison groups, we also allow for flexible radial distances for determining nearby branch proximity. In cases where census blocks of varying densities border each other, we adjust the radial distances around the blocks to be more similar based on other nearby blocks. This results in a more gradual change in radial distances, rather than large, discrete changes at city or county boundaries.

[3] See, for example, Smith et al. (2008), who show that alternative financial service providers operate in areas with low local bank branch presence in the Philadelphia region.

Finally, we generalize a standard measure of bank branch access, branches per person weighting branches by their proximity to census blocks using a kernel estimator. This measure provides a continuous calculation for branch access, rather than the all or nothing notion of a banking desert. To account for differences in access due to, for example, state laws or urban and rural differences, we also create a relative measure of access based on comparing access in a given census block to its area mean.

2. Background and Related Research

The role of branches, their dramatic decline and the role of technology in banking have been important research topics over the past two decades.

Several factors likely contribute to the decline in bank branches. First, technology may be playing a significant role as banks devise new methods of providing services. Mobile banking and online banking are just two examples, where customers can access services without entering a branch. While benefits from such technological changes are apparent for basic services for retail customers, such advantages are not so apparent for other types of bank customers, such as small businesses, where services might necessitate access or closeness to a physical branch location. Second, even when local proximity is still warranted, banks may be driven to close branches by lack of profitable opportunities in some regions, particularly in areas with declining economies or declining (or sparse) populations.

Despite the technology changes, some bank customers may still prefer local branches or banks with large branch networks. Indeed, past research has shown that consumers prefer banks with more branches. For example, Adams et al. (2007) and Dick (2008) estimate consumer demand and find that banks with more branches, either locally or in multiple markets, tend to have higher market shares. Benson et al. (2023) find significant competitive effects in retail markets for bank mergers with local branch overlaps, indicating that local branches matter. Local branch networks also help with the evaluation of risk and provision of services to households. For example, Ergungor (2010) show that greater mortgage originations and lower mortgage spreads are correlated with local branch presence in low-income areas.

Traditionally, small businesses also prefer local branches. Small businesses tend to be informationally opaque and evaluating their creditworthiness can be problematic (Berger and Udell (1995), Petersen and Rajan (1994)). Banks can overcome this problem through relationship lending and close proximity to borrowers (Boot and Thakor (2000), Amel and

Brevoort (2005), Kwast et al. (1997)). More recent research shows that local branches still matter for small businesses. Nguyen (2019) shows decreases in small business lending after branch closures that resulted from bank merger, implying that small businesses may lose services with branch closures. Moreover, Adams et al. (2023) show that distances for small business lending have not changed at the bank level, rather changes in industry average distances are the result of increases in shares of lending for certain types of loans (i.e. credit cards), giving rise to the notion the technology helped certain types of lending.

Survey evidence suggests that these structural changes have not lead to significant changes in household use of banking services. For example, the FDIC National Survey of Unbanked and Underbanked (2023) finds that the share of unbanked households has declined by nearly half over the 2011-2023 period. Overall, the unbanked share of households fell from 8.2 percent in 2011 to 4.2 percent in 2023. Among black households, the unbanked share fell from 21.4 percent to 10.6 percent. And for Hispanic households, the share fell from 20.1 percent to 9.5 percent. FDIC (2023) also notes possible reasons for not using a bank among unbanked households. While 16 percent of unbanked households mention inconvenient location of a branch as one reason for not banking, only 2.5 percent mention it as a main reason in 2023.

FDIC (2023) also finds that the share of households using mobile banking has increased from 23.2 percent in 2013 to 74.9 percent in 2023, with the share reporting using mobile banking as their primary means of banking increasing from 5.5 percent to 48.3 percent during the same period. So it would be no surprise to find that households have less need of bank branches. The share of households reporting using a bank teller has fallen from 78.8 percent in 2013 to 67.9 percent in 2023, with the share of households reporting using a bank teller as their primary means of banking falling from 33.3 percent to 15.1 percent during the same period. Moreover, the share of households reporting using a bank teller as their only means of banking has fallen from 17.5 percent in 2013 to 3.6 percent in 2023. 17 percent of households report not having visited a bank branch in 2019. Interestingly, households use of online banking and ATMs as the primary means of banking has also declined over this period (from 33.2 to 19.8 percent for online banking and from 24.4 to 13.8 percent for ATMs).

Several studies have focused on the notion of banking deserts.[4] Morgan et al. (2016) study the decline in bank branches after the financial crisis, branch closings, and bank

[4]An extensive literature exists on food deserts, which measures the proximity of households to grocery stores; see Allcott et al. (2020) and Dutko et al. (2012).

deserts. They use census tracts to measure the distance between population and the nearest bank branch, defining a branch desert as a census tract with no branch within 10 miles of the center of the tract. They find that about 1 percent of the population (and nearly 2 percent of the low-income population) live in a banking desert. Kashian et al. (2018) define bank deserts using the 5th percentile of distance as a cut-off for bank deserts and also consider two measures of distance: the simple distance of census tract to nearest branch and the population-controlled distance of the census tract distance to the nearest branch. They find bank desert distance cut-offs of 1.56 miles for inner cities, 4.28 miles for suburban areas, and 12.54 miles for rural areas. Leuven et al. (2024) also use regression analysis to measure banking deserts. Their main thrust is to allow for other census-tract variables that might indicate a desert and diversify the types of banking. Finally, Barca and Hou (2024) count banking deserts and the number of people residing within those deserts. They define branch deserts as census tracts with no branch within a certain radial distance of the tract. They use radial measures of 2, 5, and 10 miles to count people and deserts within principal cities, suburbs, and rural areas, respectively. Also they look at "potential" deserts, defined as census tracts with only one branch within that radial distance. In 2023, they find more than 12 million people living in banking deserts, or 3.8 percent of population, with an additional 11 million people in potential deserts.

Huysentruytet et al. (2013) analysis of branching in Antwerp, Belgium also considers the smallest geographic unit available, a neighborhood (a distance of approximately 600 meters). They apply a kernel methodology to weight branch proximity to each neighborhood. While their methodology resembles ours somewhat, their scope is limited because they only consider a single city. As a result, they do not handle issues surrounding rural and urban areas or, overall, areas of varying density.

On a related note, Dahl et al. (2021) observe that branch closures tend to happen in areas with other operational branches. From 2013 through 2018, median distance of a branch closure to a still operational branch was about 0.18 miles in urban areas and 0.64 miles in rural areas. They indicate trends to greater distance may be more muted, because of the nearby proximity.

Finally, a significant, related literature exists on the potential problems with analyzing spatial data. One example is the modifiable areal unit problem (MAUP), which focuses on the statistical bias that can result from using arbitrarily defined geographical units such as census tracts, cities, or counties. Fotheringham and Sachdeva (2022) discusses this issue and references the extensive literature. MAUP plays a crucial role, when thinking about household proximity to branches.

3. Measuring Distance to Bank Branches

3.1. **Data and Distance.** We assemble detailed geographic data on households, employment, bank branches, other public and commercial services[5], and mobile data coverage in the United States. The data appendix provides a more detailed description of our sources and how we put these data together. We focus on households and employment as of 2010 and 2020 and relate those to bank branches as of mid-2014 and mid-2024.

Many studies on banking deserts use census tracts as their geographic unit of observation in their analysis, using tract centroids for calculations. Census tracts can be problematic for several reasons. First, census tracts vary widely in size. According to the 2020 census tract definitions, the 90th-percentile census tract (populated) is over 70 square miles, while the 10th-percentile census tract is only 0.31 square miles. Similarly, the 90th percentile for number of households is 2,329, compared to 773 households at the 10th percentile. Second, as shown in Figure 3, household- and employment-weighted centroids for census tracts might not be very representative of how households and employment are actually distributed within individual tracts. Gaps often exist, when parks, lakes or other natural phenomena are contained within a tract. For example, many tracts have a centroids that are located somewhere in the middle of the tract (maybe even near empty space), while households and especially businesses (or employment) typically reside along the edges of the tract. Finally, tract boundaries can be arbitrarily drawn with little economic meeting, which creates issues when measuring distance. Often, tract boundaries follow roads or city/county boundaries. As a result, distance measures for many tracts likely result in inaccurate measures, especially because bank branches also tend to be located along the edges.[6]

In the case of branch distance and bank deserts, measures of distance benefit from more granular geographic data, because the distances tend to be very short. We use census blocks, the most granular measure available, which, relative to census tracts, will result in more precise and meaningful distance measures and radial counts. Census blocks have

[5]Public and commercial services include SNAP retailers, public schools, fire and police stations, post offices, hospitals, doctor and dentist offices, restaurants, and gas stations.

[6]These issues with census tracts are all related to the modifiable areal unit problem. Ideally, we would want to use data on household locations, but no such data exist. Our solution is to use more granular data to mitigate the problem. See Fotheringham and Sachdeva (2022) for more details.

much more homogeneous size than census tracts. Among 2020 census blocks, the 90th-percentile census block is only 0.77 square miles, while the 10th-percentile census block is 0.003 square miles. Similarly, the 90th-percentile for number of households is 49, compared to 2 households at the 10th percentile. Because of their small size, census blocks also better reflect where people actually live.

For all of our distance measures, we calculate population-weighted geodetic distances, or the length of the shortest curve between two points along the surface of the earth. We calculate all distances and radial counts using Stata's `geonear` function. In particular, we calculate the distance from each census block containing households to the nearest bank branch.[7]

3.2. **Household and Employment Density.** As mentioned above, one significant contribution of this paper is to group geographies in a more intuitive, rigorous manner. Grouping census blocks is necessary because we want to ensure that blocks are comparable. For example, households in differing census blocks may experience very different travel times (and different modes of transportation) moving from place to place. Traveling one mile in high-density urban areas usually requires more time than traveling one mile in less-populated rural areas. Zoning tends to also be very different across blocks as well. These differences are important, because measurement of access to nearby branches relies upon the implicit travel time from home or work to those nearby branches. We want to make sure that the radial distances provide a good proxy for travel time. Otherwise, we would draw on faulty comparisons, like using very small urban radial distances in rural areas that might be contained within urban areas.

Previous research grouped census tracts or counties into city, suburb, and rural categories, typically using city or county boundaries to delineate urban and rural areas. Barca and Hou (2024) categorize metro-area principal cities as cities, the remainder of metro areas as suburbs, and everything outside metro areas as rural (including micro areas and their principal cities). National Center for Education Statistics (NCES) employs a somewhat more appealing approach. Principal cities within Census-defined urban areas with population exceeding 50,000 are categorized as cities, while the remainder of those urban areas are defined as suburbs. Urban areas with populations below 50,000 are categorized as small towns, and Census-defined rural areas retain their rural categorization. However, these

[7]We also calculate the distance from each census block containing households to the third-nearest unique bank, to take into account the fact that not all households choose their nearest branch.

groupings have the downside that travel times within municipal city boundaries can vary substantially, as many city boundaries contain very dense areas as well as less-dense areas and even open space. Essentially, these studies imply that the same comparison applies to all areas within a city be it dense downtown, less-dense suburbs, or open space.

A separate line of research focuses on more rigorous groupings, using survey data and local housing characteristics to categorize small geographic areas as city, suburb, or rural. Kolko (2015) collected responses from about 2,000 participants of an online survey asking people to classify their neighborhood as city, suburb, or rural. He then correlated those responses with ZCTA-level characteristics to predict ZCTA-level city-suburb-rural for all ZCTAs. Similarly, Bucholtz et al. (2020) used over 60,000 responses to a 2017 American Housing Survey question on neighborhood city-suburb-rural designation to create census-tract-level predictions. Unfortunately, both studies used pre-2020 geographic definitions, so their mapping to 2020 census blocks is imprecise at best. Moreover, as we will show, the term "city" seems to be a relative concept, with many relatively high-density areas tending to call themselves suburbs in the presence of even higher-density areas, and many relatively low-density areas tending to call themselves cities when surrounded by rural areas.

We take a slightly different approach and focus on population and employment density, rather than using city-suburb-rural definitions that could introduce potentially systematic measurement error and faulty comparisons in our analysis. Throughout our analysis, we define six comparison groups: (1) hyper-dense urban areas, (2) high-density urban areas, (3) medium-density urban areas, (4) low-density urban areas, (5) small-town urban areas, and (6) rural areas.

We start with Census-defined urban areas, then calculate population and employment densities (p and j, respectively) within $\sqrt{1/\pi}$ miles of each census block (one square mile). This method is intended to capture the local population and employment density surrounding a given census block—the neighborhood. We then calculate the quartiles of $d = \sqrt{p^2 + j^2}$ among census blocks contained within urban areas and metro-area principal cities. Finally, we define hyper-dense census blocks as those in metro urban areas within the top quartile of d, high-density census blocks as those in metro urban areas within the third quartile of d, medium-density census blocks as those in metro urban areas within the second quartile of d, and low-density census blocks as those in metro urban areas within the bottom quartile of d.[8] Small-town urban areas are defined as urban areas with populations below 50,000, while rural census blocks are defined as those outside urban areas (as delineated by Census).[9] Table 1 shows descriptive statistics for d, population density (p), and employment density (j) for hyper-dense, high-density, medium-density, and low-density urban areas, as well as small-town urban areas and rural areas.

Grouping census blocks by population and employment density results in dramatically different comparison groups. Table 2 shows how our density groupings compare with the aforementioned city-suburb-rural measures. Hyper-dense urban census blocks tend to fall within cities, while high-, medium-, and low-density urban census blocks become progressively more suburban. Small towns tend to have city, suburb, and rural characteristics, while rural census blocks lean heavily rural. Table 3 shows the distribution of our data across our density groupings.

Essentially, comparison groups that used city-suburb-rural definitions in previous studies may not be appropriate, putting blocks (or tracts) with very different characteristics (foremost with different travel times) in same groups. For example, the distribution of households located in cities is uniform across urban densities (by definition), while the household survey definitions tend to lean more toward higher-density blocks. While the majority of households located in the suburbs live in low-density areas, many are located in medium- and high-density areas, and some are even located in hyper-dense blocks. Clearly, these differences in density indicate that city-suburb-rural classifications are much more noisy in capturing differences in travel times across census blocks.

The differences become even more apparent when looking at a map. Figure 4 shows our density groupings for the state of Georgia, while Figure 5 shows the same groupings for the Atlanta Metropolitan Statistical Area. As shown, the previous approaches overlook the wide range of household and employment densities of principal cities and counties. Often times, areas outside principal cities have household and employment densities as high as principal cities, and areas inside principal cities can include rural areas. We believe that our use of urban density groupings make comparisons across states and metro areas more comparable (i.e., more apples to apples) and avoid indicating areas as low (or high) access because the radial distance measure is not appropriately set.

[8] In 2020, quartile thresholds were 12.48, 6.48, and 4.07 thousand people/jobs per square mile; in 2010, the thresholds were 11.70, 6.22, and 3.92.

[9] To align with 2020 Census definitions, 2010 blocks are reclassified as rural if located in an urban area with fewer than 5,000 residents and fewer than 2,000 housing units.

4. Household Distance and Access to Bank Branches

4.1. **Distance to Bank Branches.** We begin by considering the average distance that households must travel to their nearest bank branch. The significant decline in the number of bank branches (Figure 1) suggests that, on average, distances to branches have likely increased. Table 4 shows household-weighted summary statistics for the distance to the nearest bank branch. Overall, the average distance did not change much despite the roughly 19-percent decline in the number of bank branches. In hyper-dense urban areas, the average distance to the nearest branch was .33 miles in 2014. The average distance rose to .35 miles in 2024, an increase of about .02 miles. In high-density urban areas, the average distance rose from .56 miles in 2014 to .63 miles in 2024, an increase of .07 miles. In medium-density urban areas, the average distance rose from .68 miles in 2014 to .79 miles in 2024, an increase of .11 miles; in low-density urban areas, the average distance rose from 1.11 miles in 2014 to 1.24 miles in 2024, an increase of .13 miles. For small-town urban areas, the average distance rose from .98 miles in 2014 to 1.04 miles in 2024, an increase of .06 miles. For rural areas, the average distance to the nearest branch changed the most, from 3.96 miles in 2014 to 4.24 miles in 2024, an increase of .28 miles. Similar patterns apply across different percentiles.

But not all of these changes can only be attributed to branch closures and changes in branch locations. Households undoubtedly moved, many households were created (and others destroyed), and census block boundaries experienced significant changes (our data report over 6.19 million census blocks containing households in 2010, compared to 5.45 million census blocks containing households in 2020). The second row within each urban density grouping, labeled "Oaxaca" in the tables, shows the distance from each 2020 census block to the nearest bank branch in 2014. Taking the difference between this measure and that with branches in 2024 better isolates the pure branch effect. We therefore conclude that changes in bank branch locations account for increases of approximately .03, .06, .08, .09, .07, and .31 miles among hyper-dense, high-density, medium-density, low-density, small-town, and rural census blocks, respectively.[10]

[10]Households do not necessarily bank at their nearest bank branch, perhaps because of co-location with other services (such as grocery stores) or previous business with a particular brand. We therefore check to see if the overall decline in the number of bank branches has significantly reduced local banking options for households. Isolating the pure branch effect, the average distance to the third-nearest unique bank rose .06, .11, .13, .18, .52, and .52 miles among hyper-dense, high-density, medium-density, low-density, small-town, and rural census blocks, respectively. In other words, average distances to multiple bank choices has not dramatically changed either.

Banking services do not operate in a vacuum and the provision of other services certainly plays a role in the location of bank branches. Bank branches tend to co-locate with other commercial businesses, likely due to traffic patterns and zoning regulations. We therefore examine how distances to other services compare with those observed for branches. Table 5 shows the household-weighted average distance to the nearest SNAP retailer, SNAP grocery store, SNAP large grocery store, doctor office, dentist office, gas station/convenience store, full-service restaurant, fast-food restaurant, pizza restaurant, coffee/doughnut/bagel shop, elementary school, high school, fire station, police station, post office, and hospital. On average, the nearest bank branch tends to be similar in distance to (or closer than) the nearest large grocery store or coffee/doughnut/bagel shop, and closer than the nearest high school, fire station, post office, police station, or hospital.

4.2. **Access to Bank Branches.** We now discuss measuring access to bank branches. In this case, we consider what the spatial location and proximity of branches as an aggregate measure of supply.[11] A growing literature has focused on branch access or banking deserts. Most research focuses on census tracts or counties with no branches within a fixed radial distance. Studies such as Barca and Hou (2024), Dahl and Franke (2017), Edlebi et al. (2022), Ergungor (2010), and Morgan et al. (2016) all use radial distances to define bank deserts. Such radial distances have also been used in analogous studies of food deserts.[12]

Rather than constrain our analysis to binary branch desert classification, we introduce a new measure of access to bank branches to give a more complete picture. The main idea here is to compare the spacial distribution of households and jobs in the United States against the spacial distribution of bank branches. One naive estimate would be to count the number of people and the number of branches within a specific radial distance. Such a measure would provide a simple notion of the number of people per branch for each census block. We generalize this approach to account for varying population and employment densities, radial distances, and the characteristics of the nearby area.

The starting point for our measure is a kernel density function, which provides a measure of weighted proximity between two data points. We use a kernel density function because we want to weight a branch more if it is closer to a given census block. A generic

[11]We do not consider household or business demand, rather we infer supply based on proximity of branches. In other words, we are not concerned if households actually use the nearest branch, but only that there is a close branch for them to obtain financial services.

[12]See Allcott et al. (2020) and Dutko et al. (2012).

kernel density estimate of f can be written as

$$\hat{f}(x) = \frac{1}{nh} \sum_{i=1}^{n} k\left(\frac{x_i - x}{h}\right), \tag{4.1}$$

where x is a continuous variable, $k(u)$ is a kernel function satisfying $\int_{-\infty}^{\infty} k(u) = 1$, and h is the bandwidth. The term $x_i - x$ is a measure of distance between x_i and x, scaled by the bandwidth h. In spatial analysis, we measure the geodetic distance to object i, d_i, using latitude-longitude pairs. Equation 4.1 can therefore be rewritten as

$$\hat{f}(x) = \frac{1}{nh} \sum_{i=1}^{n} k\left(\frac{d_i}{h}\right). \tag{4.2}$$

We next turn to our choice of kernel function $k(u)$, the weighting function, and bandwidth h, the distance measured around each data point (radial distance). Note that the existing research implicitly uses an arbitrary, fixed bandwidth and a uniform kernel function $k(u) = 1/h$.

4.2.1. *Kernel Selection.* We choose a semicircle kernel function because (1) it decays more slowly than other conventional kernel functions, such as the Epanechnikov and bi-weight kernels, as distance increases and thus more closely resembles consumer valuation of nearby objects, (2) it has bounded support defined by the choice of bandwidth which makes our computation times more tractable, and (3) is most closely linked to the radial measures of distance we use throughout. Moreover, the semicircle kernel function can be shown to be equivalent to a simple quadratic kernel function in two dimensional space (latitude and longitude). The semicircle kernel function takes the form

$$k(u) = \frac{2}{\pi h} \sqrt{1 - \left(\frac{d_i}{h}\right)^2} \tag{4.3}$$

for $d_i \leq h$ and $k(u) = 0$ for $d_i > h$. The kernel function gives higher weights to nearby objects and lower weights to objects further away. Any object outside the bandwidth receives a weight of zero.

4.2.2. *Bandwidth Selection.* We follow a two-step procedure for determining block-specific radial distances that uses our block-specific density measures as a starting point and adjusts based on what else is in the nearby area. We have two reasons for making this adjustment. First, we want nearby blocks with differing densities to have similar radial distances, because the characteristics of the surrounding areas are similar and warrant similar radial distances.

Such characteristics include travel times, zoning, land costs do not necessarily abruptly change with the change in density. We take into account nearby densities and how those might change the characteristics relative to that within a specific block. Second, we want to smooth the radial distance so as to avoid discrete jumps near block boundaries.

In the first step of the procedure, we compute the inverse of square root of the urban density, d, used to create urban density groupings. We then compute the household-weighted means of d for the densest half and for the least-dense half of each urban density grouping. As a starting point for our calculations, we set $r^0 = 0.75$ miles for highest-density half of our hyper-dense urban area grouping, which is about a 15-minute walk at 3 miles per hour. For these blocks, we calculate the factor by which we need to multiply the inverse square root density to get an initial radial distance of 0.75 miles. Then, using this same fixed factor throughout, we multiply the mean inverse square root density to calculate the radial distances for the other urban density groupings. As a result, we calculate radial distances of 0.75 and 1.125 miles for hyper-dense urban areas, 1.50 and 1.75 miles for high-density urban areas, 2.00 and 2.25 miles for medium-density urban areas, 2.50, 3.00, 3.50, and 5.00 miles for low-density urban areas[13], and 2.50 and 5.00 miles for small-town urban areas. For rural areas, we set $r^0 = 5.5 + \lfloor \text{distance to urban area} \rfloor$ for any urban area distance of 65 miles or less, and $r^0 = 75$ for any urban area distance of 65 miles or more.

In the second step, we then consider how densities might vary within the entire area contained in r^0 to consider how travel times might vary around each census block. We compute the weighted average of the initial radial distances (r^0) for all census blocks contained within the initial radial distance for each census block:

$$r_i^v = \frac{\sum_{j \in r_i^0} w_j r_j^0}{\sum_{j \in r_i^0} w_j}. \tag{4.4}$$

The weights w_j take into account the land area and the distance from block i. The weights therefore take the form

$$w_j = a_j \times \sqrt{1 - \left(\frac{d_{ij}}{h}\right)^2}, \tag{4.5}$$

where d_{ij} is the distance between block i and block j, and a_j is the land area of block j. This two-step process results in radial distances that adjust gradually and do not jump at census tract, city, or county boundaries.

[13]This group was the largest, so we split into four subgroups.

Table 6 summarizes the initial radial distances and the resulting radial distances for each of our urban density groups. As shown, our generalized approach results in average radial distances of 1.12 miles for hyper-dense urban blocks, 2.12 miles for high-density urban blocks, 2.85 miles for medium-density urban blocks, 4.11 miles for low-density urban blocks, 5.50 miles for small-town blocks, and 7.52 to 62.71 miles for rural blocks. For comparison, Morgan et al. (2016) use a fixed 10-mile radial distance for all census tracts, while Barca and Hou (2024) use a fixed 2-mile radial distance for principal cities of metro areas, a fixed 5-mile distance for the remainder of metro areas, and a fixed 10-mile distance for non-metro areas (including small towns).

4.2.3. *Access Measure.* Having chosen a kernel function and bandwidths, we can now compute our measure of access to bank branches. We measure nearby bank branches as:

$$b_i^n = \sum_{j \in r_i^v} k_{ij}, \tag{4.6}$$

where

$$k_{ij} = \sqrt{1 - \left(\frac{d_{ij}}{r_i^v}\right)^2}, \tag{4.7}$$

and d_{ij} is the distance between block i and bank branch j. Similar measures are constructed for nearby households (h_i^n) and nearby employment (j_i^n). We then measure branch access for block i as nearby bank branches per nearby households and workers:

$$a_i = \frac{b_i^n}{h_i^n + j_i^n}. \tag{4.8}$$

We normalize this measure as branches per 10,000 households and workers. As shown in Table 7, the average and median of absolute access were 2.68 and 2.44 branches per 10,000 households and workers in 2024, respectively. Both are down from the 2014 mean and median, which were 3.69 and 3.51 branches per 10,000 households and workers. However, as shown in the Oaxaca calculation, about half of the decline can be attributed to factors other than changes in branch locations, such as changes in household locations or census block boundaries. Table 7 also shows the number of people who live in areas with lower absolute access to branches. For example, about 0.67 million households had no nearby branches, up from 0.44 million households in 2014. Almost all of this change was due to branch closings. We also calculate the number of people with low and moderate access to branching on 0.5 branch access intervals to 2 (just below the mean and median in 2024). In 2024, 20 million households lived in a census block with 1.5 to 2 branches per 10,000 households and workers. About 43 million households are located in census blocks with less than 2 branches per 10,000 households and workers, up from about 16 million in 2014. In both cases, most are households located in rural areas.

However, the absolute measure of branch access could be problematic because significant differences exist across states and areas of differing densities. For example, rural areas tend to have fewer branches and some states have more (or less) branches as a result of current and past branching laws. In fact, absolute access ranges from about 1.5 branches per 10,000 households and workers in the District of Columbia to about 5.3 branches per 10,000 households and workers in Arkansas in 2024.

To account for these differences across states, we introduce a relative measure of branch access. This measure is defined as the number of standard deviations from the mean absolute access within an area. The mean and standard deviation are calculated for blocks within a core-based statistical areas (CBSAs) or within a state if not in a CBSA. Low access is then defined as census blocks with absolute access of zero or two or more standard deviations below area means. Moderate access is defined as one or more standard deviations below, but less than two standard deviations below the area mean.

As an example, Figure 6 and Figure 7 show these access measures for Georgia and Atlanta in 2024. For the most part, much of the state and city of Atlanta have sufficient access to branches (i.e. within one standard deviation of area mean access). However, some regions show moderate or low access to branches. For example, rural areas northwest and northeast of Atlanta have low access, while some areas within the Atlanta metro area also have low access. Anecdotally, these areas are close to parkland. For example, the low access area in the southeast part of Atlanta is near a lake. Moderate access areas within Atlanta (and other cities as well) tend to be near airports or highway interchanges.

Table 8 shows the number of households with low and moderate bank branch access by density. In 2024, 1.68 million households had low access to bank branches, an increase of about 0.13 million households from 2014. Isolating the pure branch effect, branch closures/openings were responsible for only about 0.02 million of those additional households. Moreover, about half of households with low access live in rural blocks. A further 16.89 million households had moderate access to bank branches, an increase of nearly 1.8 million from 2014. Most of the overall change in households with moderate access is explained by other changes such as population growth or block boundaries and not changes due to changes in branch networks. Low-density, small-town, and rural census blocks experienced minor increases in number of households with moderate access.

4.3. **Empirical Model and Results.** We now turn to regression analysis where we can consider changes in a more general setting and not in isolation. We start by considering how distance varies for different groups in 2024. We then see how distances changed over the past decade. Finally, we consider the 2024 level and 10-year change in our relative access measure.

In each regression, we include block characteristics to focus on observational equivalent comparisons relative to the proportion of white households. Racial coefficients are all set relative to the proportion of white households.

Starting with distances in 2024, the first set of regressions on distance to the nearest branch take the following form:

$$d(c_i, b_{24}) = \alpha + \beta X(c_i) + \gamma d(c_i, z_{23}) + \varepsilon_i \tag{4.9}$$

where $d(c_i, b_{24})$ is the 2020 census block (c_i) distance to the nearest 2024 branch b_{24} (measured in miles). $X(c_i)$ includes the racial and ethnic makeup of the block, the age distribution of the population within each block, indicator variables for low- and middle-income tracts[14], and the average tract credit score. $d(c_i, z_{23})$ includes the 2020 census block (c_i) distance to the nearest 2023 grocery store, to the nearest 2022 restaurant, and to the nearest 2022 gas station, which helps control for zoning and local regulations. α is a constant term, while β and γ are coefficients representing how distance varies as census block characteristics vary. Finally, ε_i is the error term.[15] To simplify the presentation, we conduct separate regressions for each of the density groups described above and weight by the number of households in each census block.

Regression results for distance to the nearest branch are reported in Table 9. Households' distance to the nearest bank branch tends to be highly correlated with the distances to the nearest SNAP grocery store, the nearest restaurant, and the nearest gas station/convenience store. This is likely driven by commercial zoning regulations and banks' desire to co-locate near other businesses (to provide services to them and for the additional

[14]Low-income tracts have average family incomes that are less than 50 percent of the area median family income for the county or area in which it is located; moderate-income tracts have average family incomes that are less than 80 percent, but greater than or equal to 50 percent, of the area median family income.

[15]We account for correlation within census tracts, and therefore report clustered standard errors. Regressions include incorporated-place fixed effects and county fixed effects in unincorporated areas.

foot traffic they may bring). Most age categories tend to live closer to branches. In rural areas, these trends switch signs, where households reside further from branches.

Our results vary across race and ethnicity. Overall, black and Hispanic households in urban areas generally have to travel somewhat further than white households to visit their nearest bank branch. Several other groups in more specific environs have to travel further than white households to visit their nearest bank branch: Asian households in high-density urban blocks, Native American households in hyper-dense urban blocks, and Pacific Islander households in low-density urban blocks. Households in moderate-income census tracts in high-density urban areas had to travel slightly further than households located outside moderate-income tracts. Black households and Asian households tend to live closer to bank branches in rural areas, while Hispanic households and Native American households tend to live further away.

While we observe that some groups have to travel somewhat further to the nearest branch, we do not yet know if distances have changed over the past decade. To see how distances have changed, we consider a regression on changing distances. This next regression takes the form:

$$\Delta d(c_i, b_{24}, b_{14}) = \alpha + \beta X(c_i) + \lambda_h \Delta h_i + \lambda_e \Delta e_i + \gamma \Delta d(c_i, z_{23}, z_{14}) + \varepsilon_i \tag{4.10}$$

where $\Delta d(c_i, b_{24}, b_{14})$ is the difference between the 2020 census block distance to the nearest branch in 2024 and that to the nearest branch in 2014 (measured in miles). $X(c_i)$ includes the racial and ethnic makeup of the block, the age distribution within each block, indicator variables for low- and middle-income tracts, and the average tract credit score. Δh_i is the log change in nearby households from 2010 to 2020 and Δe_i is the log change in nearby employment from 2010 to 2020. α is a constant term, β, λ_h, and λ_e are coefficients, andε_i is again the error term. Note that this regression holds 2020 census blocks and their characteristics fixed, while examining the effects of changes in nearby households and changes in nearby employment on changes in the distance to the nearest branch.

Regression results are reported in Table 10. The change in households' distance to their nearest bank branch tends to be highly negatively correlated with changes in the number of nearby households, the change in nearby employment, and changes in distance to the nearest grocery store. Changes in distance by proportion of age groups are mixed in sign, but tend to be small in magnitude and sometimes significant. Most age groups across densities experience some increase in distance. Differential changes in distance to the nearest branch across race and ethnicity tend to be small in magnitude, but are statistically significant for a few groups. For black households, the distance to the nearest bank branch increased about .025 miles more than white households in hyper-dense urban areas. Hispanic, Asian, and Native American households had changes in distances in line with those of white households, though some coefficients are negative and significant, but very small in magnitude. In other words, while distances increased slightly for all households, we are not observing changes in distance for racial groups that are considerably large than changes for white households, after controlling for other factors.

We now turn to the relative access level regression. Similar to Equation 4.9, we regress the level of relative access in 2024 on census block characteristics. The results are shown in Table 11. The results for various races are stronger than in the distance level regression. Relative to white households, almost all other races in all density groups have relatively lower relative access to branches, though small in most cases. A few notable exceptions exist. Access to branches is about one standard deviation lower for black households in hyper-dense urban blocks, and one standard deviation higher for Asian households in hyper-dense urban blocks. In the case of income, most values are close to zero and slightly positive in all cases, an indication that the loss of access is not more prevalent in poorer neighborhoods.

To see how relative access has changed over the past decade, we simply do a change in access similar to the change in branch distance in Equation 4.10, but with the change in relative access as a regressand. Results are shown in Table 12. For most urban densities, blocks with greater proportion of minority experienced a positive increase in relative access. In other words, these estimates indicate improving access. The small magnitude of theses coefficients in urban blocks and the insignificant and small coefficient estimates for more rural blocks indicate that access has either not declined as much or about the same as for blocks with more white households.

5. Employment Distance and Access to Bank Branches

Table 13 shows summary statistics for employment-weighted distance to the nearest bank branch. Again we focus on the pure branch effect, so hold employment locations constant while allowing bank branch locations to change. In hyper-dense urban areas, the average distance to the nearest bank branch rose from .23 miles to .26 miles, an increase of .03 miles. In high-density urban areas, the average distance rose from .44 miles to .50 miles, an increase of .06 miles. In medium-density urban areas, the average distance rose from .54 miles to .62 miles, an increase of .08 miles; in low-density urban areas, the average distance rose from .91 miles to 1.01 miles, an increase of .10 miles. For small towns, the average distance increased from .63 miles to .69 miles, an increase of .06 miles. And for rural areas, the average distance to the nearest bank branch changed the most, from 3.00 miles to 3.29 miles, an increase of .29 miles.

Next we consider employment with low and moderate access to branches. Table 14 shows employment with low and moderate branch access. In 2024, 1.39 million workers had low access to a bank branch, an increase of about 0.17 million from 2014. Essentially none of this change seems attributable to changes in bank branch locations. Similarly, in 2024, 22.74 million workers had moderate access to a bank branch, an increase of about 2.4 million from 2014. As before, essentially none of this change appears attributable to changes in bank branch locations.

Then we look at commercial businesses and their distances and access to their nearest bank branch. Table 15. Generally closer than households, probably because of zoning and co-location for convenience.

Overall, we again find mixed results regarding access to bank branches: Access has declined for some parts of the workforce while increasing for other parts. That said, among those experiencing declines in bank branch access, the distance to the nearest bank branch has increased only marginally (generally less than 0.1 miles).

6. Mobile Banking and Access to Bank Branches

Table 16 looks at household and employment access to branches, mobile data, and the union of branches and mobile data. The idea here is that households who might not live or work near a branch could have access to mobile banking. Likewise, households who might not have 5G data coverage might live or work near a branch. 1.68 million households with low access to a bank branch, 3.19 million households lack 5G data coverage, 0.36 million households lack 4G/5G data coverage. Taking into account physical access to bank branches and potential mobile access via 5G reduces the number of households with low access to banking to about 0.14 million households (less than 0.03 million households if including 4G data coverage), predominantly in rural areas.

A similar pattern emerges for employment. 1.39 million workers with low access to a bank branch, 1.47 million workers lack 5G data coverage, 0.19 million workers lack 4G/5G data coverage. Taking into account physical access to bank branches and potential mobile access via 5G reduces the number of workers with low access to banking to about 0.07 million workers (about 0.02 million workers if including 4G data coverage).

7. Branch Closings, Openings, and Net Changes

To further examine the dynamics of branch network changes, we estimate regressions for the percent change in nearby bank branches coming from gross branch closings, coming from gross branch openings, and the net change in nearby branches. These analyses provide insights into the factors associated with banks' decisions to close or open branches, as well as the overall shifts in branch presence across different areas.[16]

We estimate the following regression model for nearby branch closings, nearby branch openings, and the net change in nearby branches:

$$\Delta Y_i = \alpha + \beta X(c_i) + \lambda_h \Delta h_i + \lambda_e \Delta e_i + \gamma \Delta d(c_i, z_{23}, z_{14}) + \varepsilon_i \tag{7.1}$$

where ΔY_i is the log difference between nearby branches in 2014 less nearby branch closings and nearby branches in 2014 for the nearby branch closings regression, the log difference between nearby branches in 2014 plus nearby branch openings and nearby branches in 2014 for the nearby branch openings regression, and the log difference between nearby branches in 2024 and nearby branches in 2014 for the net change in nearby branches regression. The explanatory variables in each of these regressions are the same as in our earlier regressions.

Tables 17-19 present the results of these regressions. We find that branch closings are more prevalent in areas experiencing population declines and in low-income tracts. However, the magnitude of these effects varies across urban density groups. Branch openings are positively associated with employment growth and negatively associated with distance to other commercial services. This suggests banks tend to open branches in areas of economic growth and commercial activity. The net change results synthesize the closing and opening dynamics. We observe that net branch reductions are largest in low-density urban and rural areas, even after controlling for changes in population and employment. Moreover, across all three models, we find minimal evidence of differential effects by race or ethnicity after controlling for other factors.

These results provide a more nuanced understanding of the branch network changes underlying our earlier findings on distance and access. While branch closings have been widespread, they have been partially offset by strategic openings in growing areas. The net

[16]Many studies only look at branch closings in isolation without considering openings and the resulting net change.

effect has been a modest reduction in overall branch access, with the impacts varying across urban density groups but not substantially across racial or ethnic lines after controlling for other factors.

8. Conclusion

In this paper, we show that the dramatic changes in the number of branches has not appreciably altered access to branches. In other words, banks are still providing local access to branches, despite the changes in technology. While we do not directly attempt to gain insights into bank customer demand or the degree of competition, our results indicate that local proximity, through revealed preference, is still important to households and businesses.

In our analysis, we use highly granular geographic data, group census blocks by households and employment density, and allow for more flexible radial distances to evaluate distances and access to bank branches. In the decade from 2014 and 2024, we find that (1) the distance from households and businesses to their nearest branch has not changed appreciably for most locations (with little differences across racial groups), and (2) the number of households and employment with low access to bank branches increased only slightly. In areas with low access to bank branches, households and businesses seem to have adequate access to mobile banking.

Finally, our methodologies of calculating distance using granular geography, of grouping blocks with flexible radial distances, and of applying a continuous measure of access can also be applied to other industries. For example, questions on access to food, healthcare, and other important services all might benefit from our methodologies, rather than using census tracts, zip codes, and even county-level geographic data.

9. Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used a generative AI as part of a Board trial program to help edit the paper. After using this tool/service, the authors reviewed and further edited the content as needed and take full responsibility for the content of the published article.

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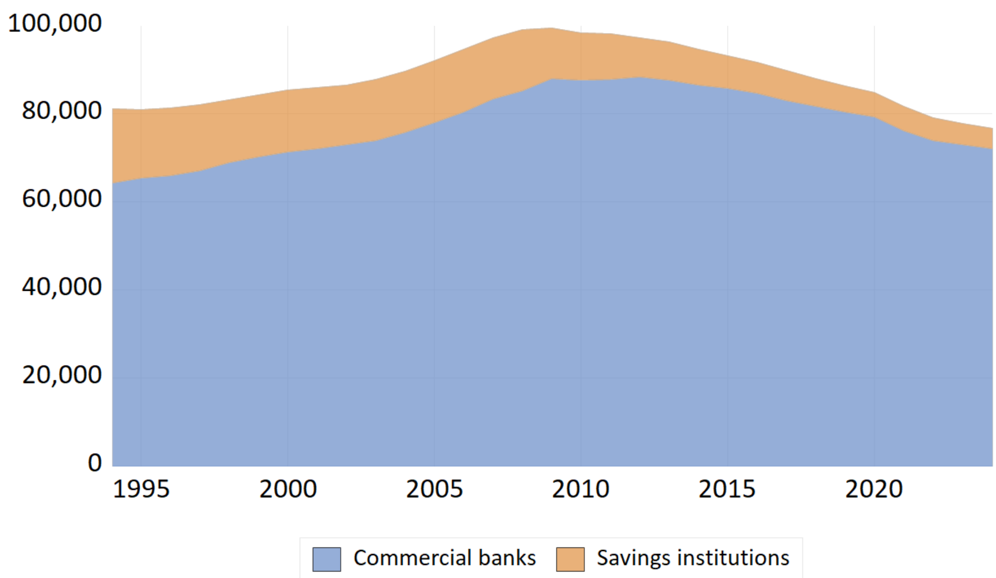
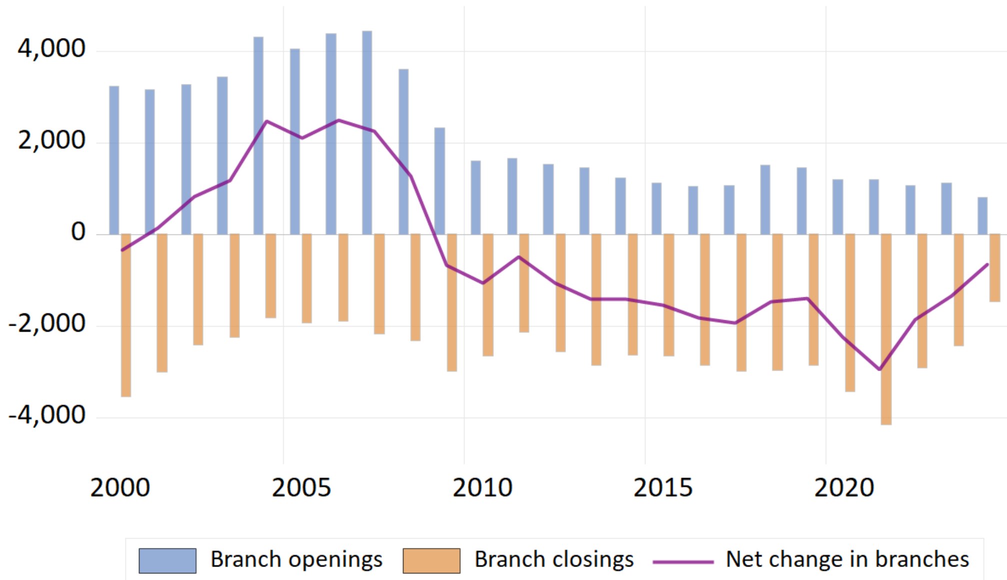
Figures and Tables

Figure 1. Number of Branch Offices



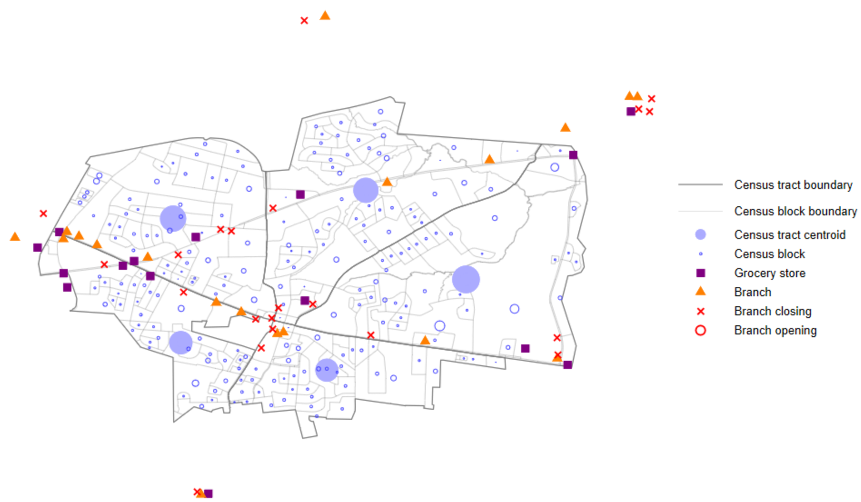
Source: FDIC BankFind Suite: Summary of Deposits – Summary Tables.

FIGURE 2. Number of Branch Closings and Openings

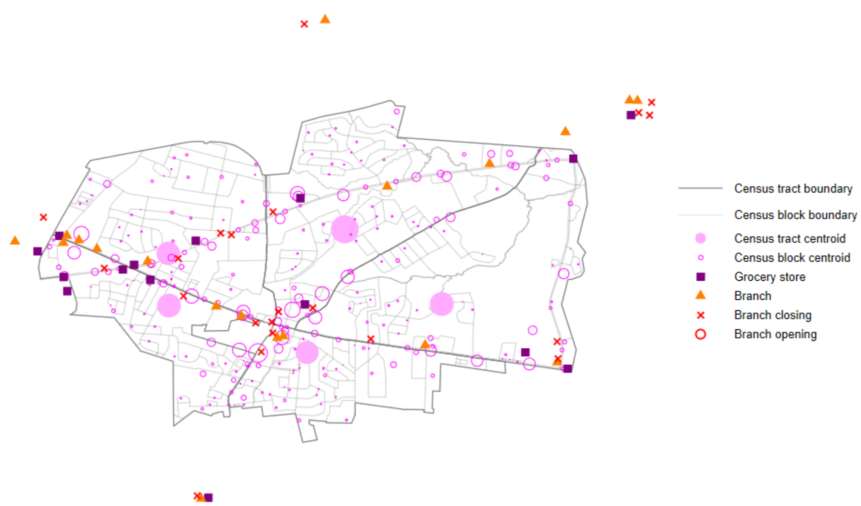


Source: FDIC BankFind Suite: Events & Changes Tables.

Figure 3. Distribution of Households & Employment within Census Tract



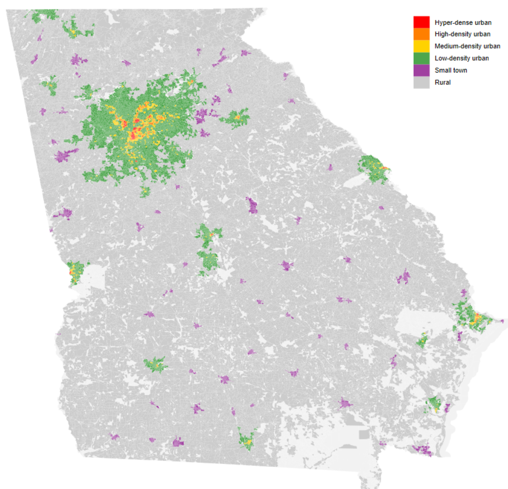
(A) Households



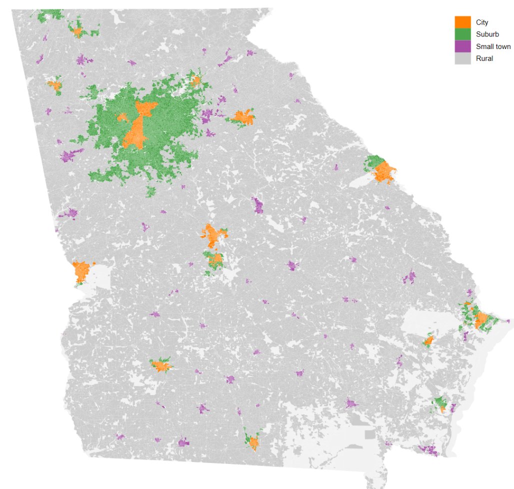
(B) Employment

Note: Example census tracts, with census blocks, bank branches, and grocery stores.

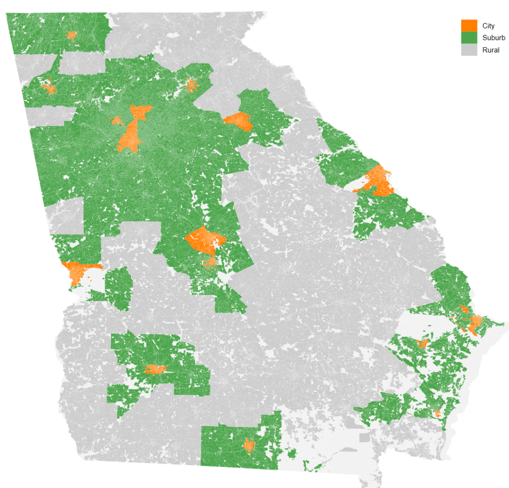
Figure 4. Urban Density—Georgia (2010)



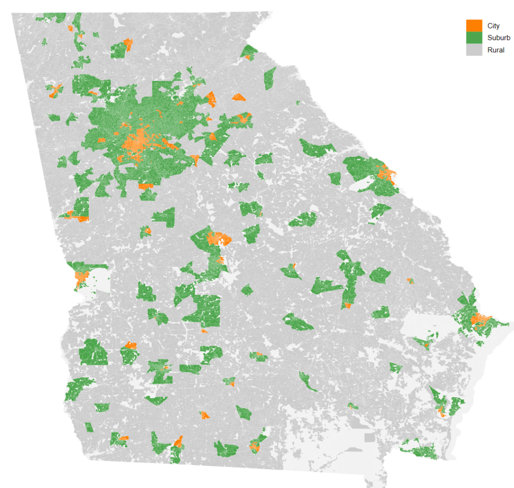
(a) Density



(b) NCES



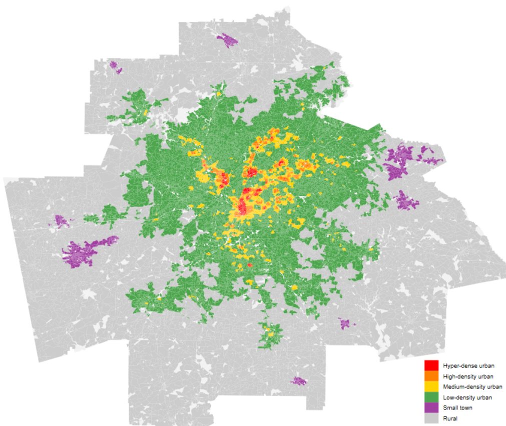
(c) Barca et al.



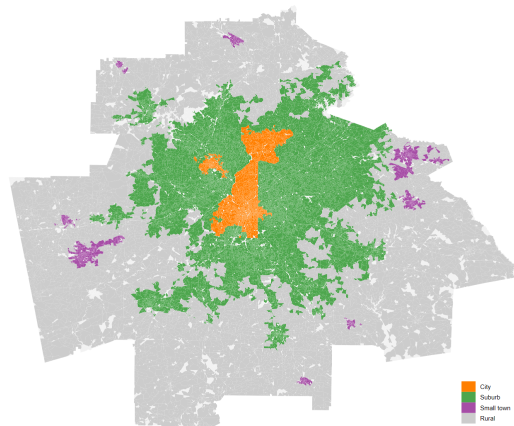
(d) UPSAI

Note: Empty areas are those with no households or employment.

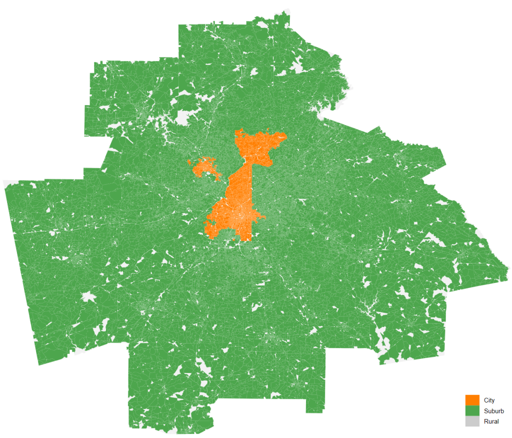
Figure 5. Urban Density—Atlanta Metro Area (2010)



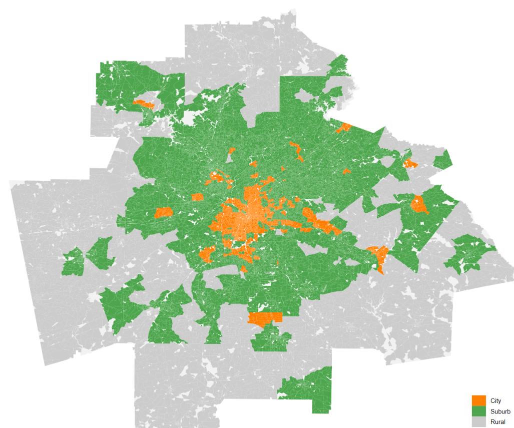
(a) Density



(b) NCES



(c) Barca et al.



(d) UPSAI

Note: Empty areas are those with no households or employment.

FIGURE 6. Branch Access in Georgia (2024)

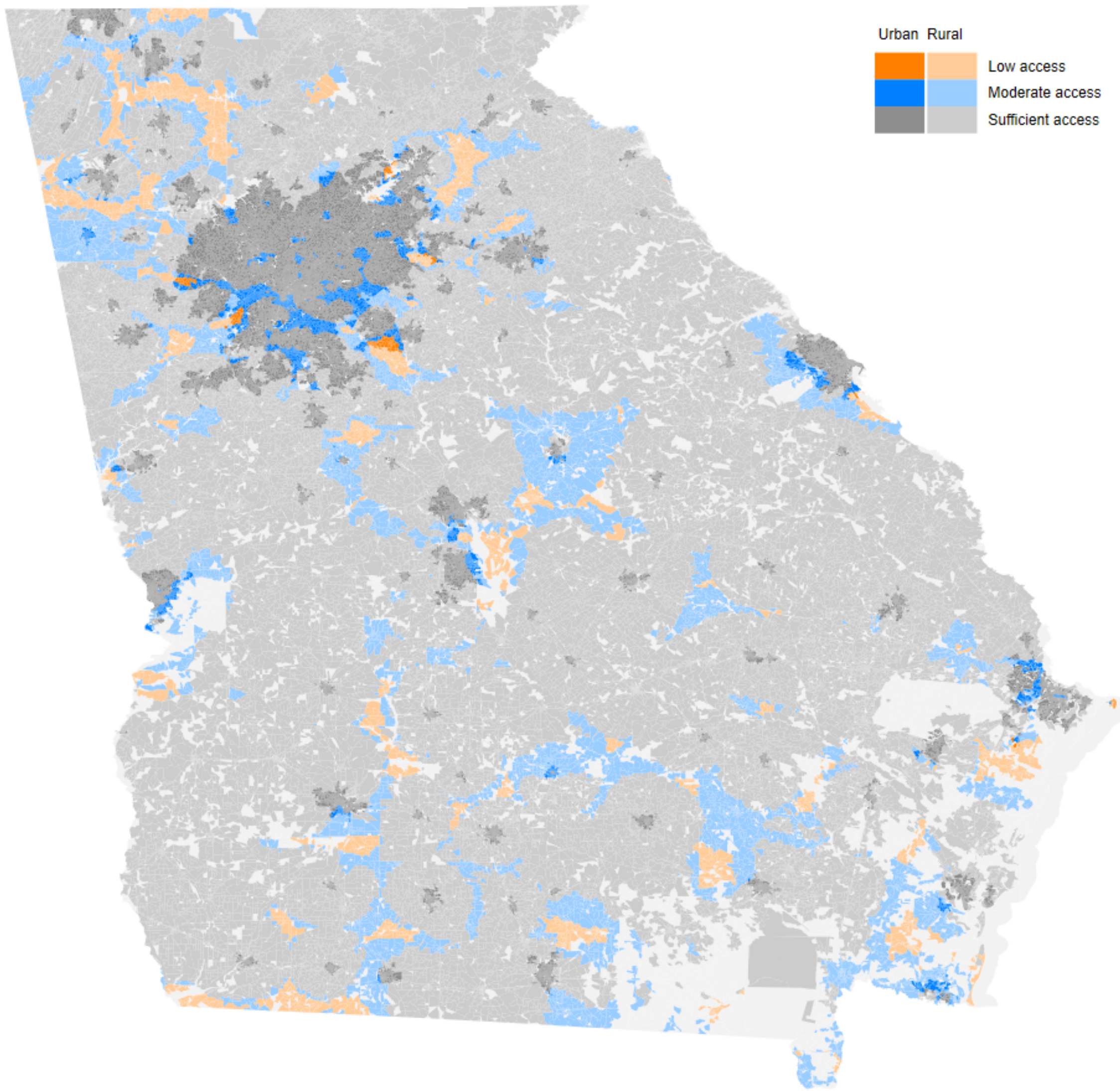


Figure 7. Branch Access in Atlanta Metro Area (2024)

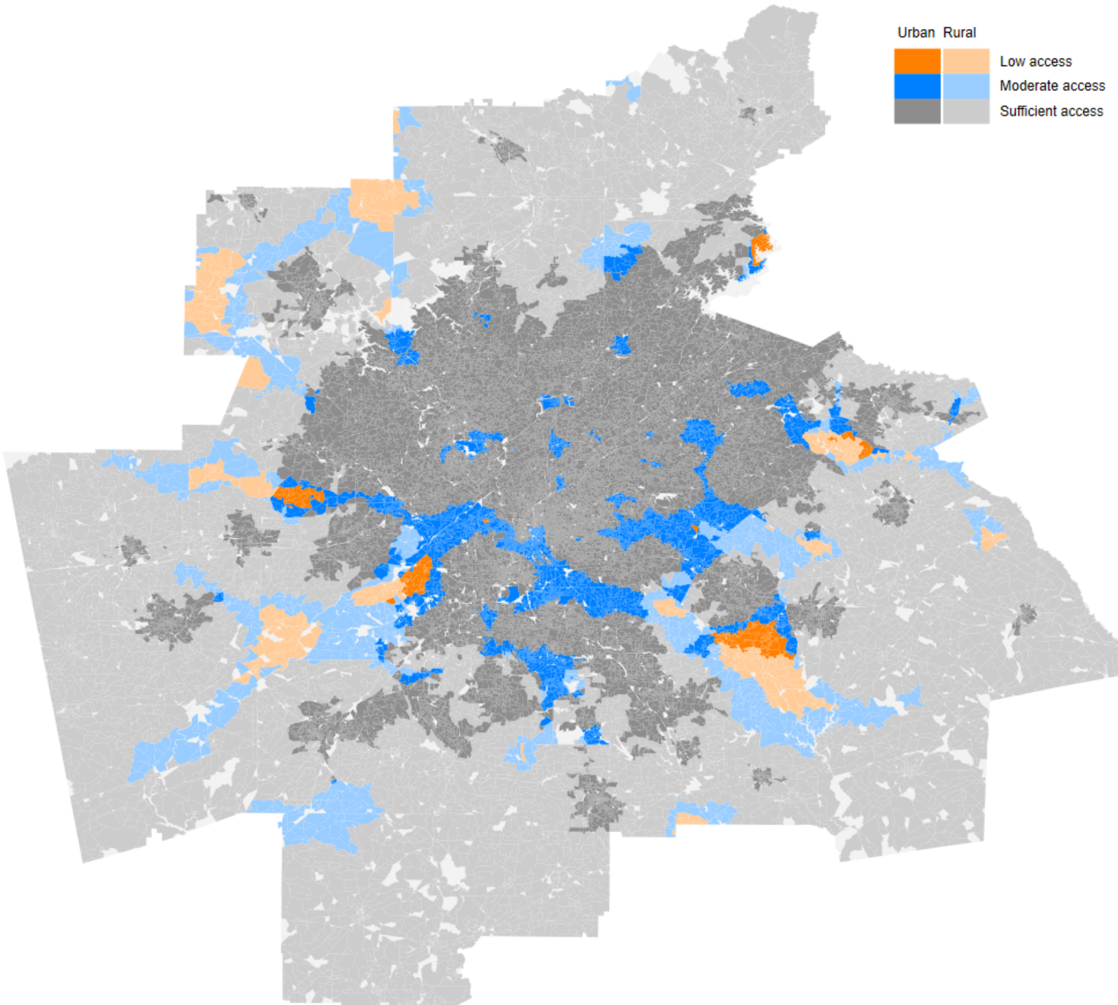


Table 1. Nearby Population and Employment Densities

	Mean	St.Dev.	p25	p50	p75	p90
Hyper-dense urban						
d	38.92	48.32	15.84	22.39	42.62	78.90
Population	28.34	24.47	13.38	18.77	33.31	63.91
Employment	20.47	45.03	4.60	9.17	17.21	36.98
High-density urban						
d	8.67	1.63	7.28	8.33	9.83	11.21
Population	7.67	1.98	6.54	7.51	8.96	10.37
Employment	3.18	2.25	1.46	2.54	4.35	6.50
Medium-density urban						
d	8.18	.68	4.58	5.14	5.75	6.17
Population	4.70	.93	4.17	4.71	5.37	5.87
Employment	1.72	1.19	.81	1.39	2.36	3.51
Low-density urban						
d	2.43	1.01	1.62	2.52	3.30	3.76
Population	2.25	.97	1.46	2.29	3.05	3.55
Employment	.72	.66	.24	.50	.99	1.66
Small town						
d	2.65	1.79	1.33	2.31	3.54	4.86
Population	2.34	1.58	1.17	2.04	3.13	4.43
Employment	.97	1.14	.22	.60	1.33	2.30
Rural						
d	.42	.63	.06	.17	.47	1.22
Population	.39	.58	.06	.16	.44	1.11
Employment	.12	.29	.01	.02	.08	.33

Notes: Household-weighted densities within $\sqrt{1/\pi}$ mile of each census block, measure in thousands. $d = \sqrt{p^2 + j^2}$, where p is population density and j is employment density.

TABLE 2. Households by Density Group

	Urban census blocks, by density					
	Hyper	High	Medium	Low	Small Town	Rural Blocks
NCES Locale definitions						
City	9.52	9.52	9.52	9.52	0	0
Suburban	2.33	7.82	10.72	23.83	0	0
Small town	0	0	0	0	9.77	0
Rural	0	0	0	0	0	24.17
Kolko (2015) ZCTA level						
City	10.48	7.36	3.98	3.01	.27	.23
Suburb	1.37	9.96	16.13	28.47	3.71	4.59
Rural	$< .01$	.02	.13	1.86	5.79	19.18
Unmatched	$< .01$	$< .01$	$< .01$	.01	$< .01$	.16
UPSAI Census-tract level						
City	10.22	8.28	5.96	4.38	2.35	.45
Suburb	1.60	9.00	14.10	25.83	5.36	4.21
Rural	.03	.06	.17	3.14	2.04	19.51
Unmatched	0	$< .01$	$< .01$	$< .01$	.01	.01
Barca & Hou (2024)						
City	9.52	9.52	9.52	9.51	.10	.22
Suburb	2.33	7.82	10.72	23.74	3.23	12.33
Rural	.00	$< .01$	$< .01$	.09	6.44	11.61

Source: Authors tabulations using Census data and definitions from NCES, Kolko (2015), Bucholtz et al. (2020), and Barca and Hou (2024).
Notes: Households (millions) by density group and by city-suburb-rural group. NCES Locale definitions: City is inside a principal city and inside an urbanized area. Surburban is outside a principal city and inside an urbanized area. Town is inside an urban cluster. Rural is inside a Census-defined rural area. Barca definitions: City is principal city inside metro area. Suburb is outside principal city but inside metro area. Rural is outside metro area.

Table 3. Data Distribution Across Urban Density Groups

	Year	Urban census blocks, by density Hyper	High	Medium	Low	Small Town	Rural Blocks	Total
Population (millions)	2020	33.8	53.2	58.1	92.4	27.7	66.3	331.4
	2010	31.5	47.5	52.9	88.1	25.6	63.2	308.7
Households (millions)	2020	13.3	19.6	22.2	35.4	10.9	25.4	126.8
	2010	11.9	17.3	20.2	33.3	9.8	24.2	116.7
Employment (millions)	2020	30.3	31.0	27.9	40.5	14.5	21.0	165.3
	2010	26.4	25.6	23.3	34.0	12.3	19.2	140.9
Bank branches	2024	9.1	11.7	12.6	16.7	11.7	12.2	74.0
	2014	10.7	13.4	15.4	22.8	12.7	14.8	89.8
Bank branch net closings	2014-24	3.6	4.4	4.7	6.1	2.9	3.0	24.7
Bank branch net openings	2014-24	1.6	1.5	1.6	2.3	1.0	0.8	8.8
Credit union branches	2024	1.9	3.1	3.8	6.0	3.1	2.1	20.0
SNAP retailers	2023	26.6	36.8	40.5	58.4	31.8	46.3	240.4
SNAP grocery stores	2023	10.3	11.2	11.0	13.7	7.4	8.1	61.7
SNAP large grocery stores	2023	4.6	7.5	8.1	11.3	5.9	5.5	42.8
Elementary schools	2023	3.8	7.5	9.2	14.3	5.6	15.9	56.4
High schools	2023	1.4	1.9	2.3	4.7	2.5	8.5	21.3
Fire stations	2024	1.5	3.0	3.8	9.6	4.8	29.3	51.9
Police stations	2024	1.0	1.5	1.6	3.6	4.2	8.2	20.0
Post offices	2024	1.3	1.8	1.8	3.8	3.2	18.9	30.8
Hospitals	2024	.8	1.1	.9	1.0	1.4	1.4	6.6
Doctor's offices	2022	55.0	65.7	56.4	78.3	24.3	21.5	301.3
Dentist offices	2022	33.3	50.4	48.5	59.4	18.9	14.1	224.6
Full-service restaurants	2022	88.4	91.4	81.2	99.3	37.4	41.4	439.1
Fast-food restaurants	2022	21.0	29.6	31.3	42.0	19.4	16.0	159.3
Pizza restaurants	2022	9.9	14.1	15.5	20.6	9.4	8.1	77.6
Coffee/doughnut/bagel shops	2022	9.6	10.6	10.5	13.3	4.7	4.2	52.8
Gas stations/conv. stores	2022	13.6	23.8	26.4	43.8	20.3	33.7	161.6

Source: Authors tabulations from Census data, NETS employment data, S&P Global Capital IQ Pro Platform branch data, USDA SNAP retailer data, and USGS National Structures Dataset data. Notes: Distribution of data across density groups (measured in thousands unless otherwise noted).

Table 4. Household Distance to Nearest Bank Branch

	Mean	St.Dev.	p25	p50	p75	p90
Hyper-dense urban						
2014	.33	.24	.16	.28	.45	.66
Oaxaca	.32	.24	.15	.27	.43	.64
2024	.35	.26	.17	.29	.47	.69
High-density urban						
2014	.56	.37	.30	.48	.73	1.02
Oaxaca	.57	.40	.30	.48	.74	1.05
2024	.63	.43	.33	.54	.84	1.17
Medium-density urban						
2014	.68	.45	.36	.59	.88	1.24
Oaxaca	.71	.50	.37	.61	.92	1.32
2024	.79	.53	.41	.67	1.02	1.44
Low-density urban						
2014	1.11	.82	.56	.91	1.43	2.13
Oaxaca	1.15	.83	.58	.94	1.48	2.19
2024	1.24	.88	.63	1.03	1.60	2.36
Small-town urban						
2014	.98	1.21	.37	.64	1.12	2.02
Oaxaca	.97	1.08	.38	.66	1.15	1.99
2024	1.04	1.24	.40	.71	1.23	2.13
Rural						
2014	3.96	4.70	1.54	3.19	5.26	7.73
Oaxaca	3.93	4.62	1.58	3.20	5.21	7.63
2024	4.24	4.79	1.75	3.46	5.61	8.18

Notes: Household-weighted summary statistics for distance to nearest bank branch, measured in miles.

Table 5. Household Distance to Other Services (miles)

	Urban census blocks, by density				Small	Rural
	Hyper	High	Medium	Low	town	blocks
SNAP retailer	.16	.31	.42	.72	.57	2.39
SNAP grocery store	.26	.50	.68	1.17	1.08	4.37
SNAP large grocery store	.33	.59	.77	1.24	1.20	5.10
Doctor's office	.18	.33	.43	.71	.98	4.36
Dentist	.20	.36	.47	.79	.95	4.86
Gas station/conv. store	.21	.35	.45	.73	.69	2.81
Full-service restaurant	.11	.21	.29	.52	.55	2.75
Fast-food restaurant	.19	.36	.48	.82	.83	4.29
Pizza restaurant	.25	.47	.61	1.01	1.06	5.31
Coffee/doughnut/bagel	.29	.56	.75	1.29	2.69	7.78
Elementary school	.35	.49	.59	.98	1.01	3.12
High school	.67	1.05	1.28	1.86	1.77	4.39
Fire station	.51	.78	.89	1.14	.95	2.22
Police station	.89	1.54	1.77	2.27	1.49	4.79
Post office	.60	1.18	1.48	1.96	1.35	3.04
Hospital	1.16	2.02	2.54	3.63	3.88	9.22

Notes: Household-weighted average distance to other public and commercial services, measured in miles.

Table 6. Block-specific Radial Measures

	Initial r_0	Mean	p10	p25	Median	p75	p90
Hyper-dense urban	.75 — 1.125	1.12	.75	.78	1.07	1.35	1.57
High-density urban	1.50 — 1.75	2.12	1.56	1.73	1.99	2.38	2.88
Medium-density urban	2.00 — 2.25	2.85	2.08	2.33	2.74	3.27	3.81
Low-density urban	2.50 — 5.00	4.11	2.85	3.39	4.10	4.79	5.36
Small town	2.50 — 5.00	5.50	4.41	4.85	5.47	6.19	6.60
Rural (0-5 miles to urban area)	5.50 — 9.50	7.52	5.59	6.34	7.33	8.61	9.79
Rural (5-10 miles to urban area)	10.50—14.50	11.84	9.40	10.44	11.73	13.13	14.50
Rural (10-30 miles to urban area)	15.50—34.50	18.45	13.44	15.11	17.51	20.99	24.80
Rural (30-65 miles to urban area)	35.50—69.50	37.95	27.09	31.14	37.58	44.18	49.55
Rural ($\geq$65 miles to urban area)	75.00	62.71	48.49	55.75	63.03	71.96	75.00

Notes: Measured in miles.

Table 7. Household Absolute Access to Bank Branches

	Nearby branches per 10,000 nearby households & workers						
	= 0	(0, .5]	(.5, 1]	(1, 1.5]	(1.5, 2]	Mean	Median
2024	.67	1.84	7.70	14.83	20.09	2.68	2.44
Oaxaca	.44	1.05	3.90	8.46	13.17	3.24	3.06
2014	.44	.64	2.41	5.28	8.50	3.69	3.51

Notes: Number of households, measured in millions, by nearby bank branches per 10,000 nearby households and workers.

Table 8. Household Relative Access to Bank Branches

	Low Access			Moderate Access		
	2014	Oaxaca	2024	2014	Oaxaca	2024
Hyper-dense urban	.19	.19	.19	3.03	3.54	2.96
High-density urban	.08	.12	.13	2.81	3.17	2.97
Medium-density urban	.05	.07	.08	2.28	2.57	2.65
Low-density urban	.21	.25	.25	2.90	3.59	3.70
Small town	.14	.16	.16	.91	.98	1.05
Rural	.85	.87	.86	3.17	3.48	3.56
Total	1.53	1.66	1.68	15.10	17.33	16.89

Notes: Number of households with low or moderate access to bank branches, measured in millions. Low access is defined as zero nearby bank branches or two or more standard deviations below area mean nearby bank branches per nearby households and workers. Moderate access is defined as one or more standard deviations below, but less than two standard deviations below, area mean nearby bank branches per nearby households and workers.

Table 9. Household Distance to Nearest Bank Branch

	Urban census blocks, by density				Small	Rural
	Hyper	High	Medium	Low	Town	Blocks
Grocery store distance	.290***	.459***	.509***	.541***	.412***	.464***
	(.013)	(.009)	(.009)	(.007)	(.050)	(.013)
Restaurant distance	.594***	.363***	.294***	.305***	.120	.272***
	(.023)	(.017)	(.013)	(.010)	(.077)	(.020)
Gas station distance	.228***	.266***	.251***	.288***	.708***	.275***
	(.015)	(.019)	(.010)	(.010)	(.185)	(.024)
Black proportion	.183***	.138***	.158***	.118***	.063*	-.171***
	(.012)	(.013)	(.014)	(.017)	(.025)	(.038)
Asian proportion	-.012	.099***	.054**	-.135***	-.022	-.586**
	(.011)	(.018)	(.021)	(.024)	(.117)	(.225)
Hispanic proportion	.142***	.216***	.214***	.205***	.106*	.186*
	(.010)	(.013)	(.015)	(.021)	(.051)	(.085)
2-plus proportion	.039	.056**	.091***	.045**	.004	.063
	(.022)	(.020)	(.016)	(.015)	(.030)	(.034)
Other proportion	.189***	.081	-.019	-.054	.024	.167*
	(.056)	(.043)	(.041)	(.045)	(.066)	(.083)
Nat. American proportion	.189*	.070	.038	.162*	-.227	1.661***
	(.078)	(.071)	(.057)	(.081)	(.118)	(.476)
Pac. Islander proportion	.192*	.554	.537*	.561*	-.376	-.877
	(.086)	(.285)	(.251)	(.236)	(.400)	(1.095)
Ages 18-24 proportion	-.029*	-.062***	-.076***	-.077***	-.057**	-.018
	(.013)	(.015)	(.011)	(.014)	(.018)	(.017)
Ages 25-34 proportion	-.074***	-.141***	-.135***	-.149***	-.015	.042**
	(.009)	(.010)	(.009)	(.011)	(.019)	(.014)
Ages 45-54 proportion	.039***	-.009	-.004	.004	-.039*	.050***
	(.009)	(.009)	(.007)	(.009)	(.015)	(.014)
Ages 55-64 proportion	-.030*	-.043***	-.058***	-.054***	-.065***	.111***
	(.012)	(.012)	(.010)	(.012)	(.018)	(.018)
Ages 65+ proportion	-.073***	-.108***	-.139***	-.194***	-.074***	.035
	(.010)	(.011)	(.010)	(.013)	(.021)	(.023)
Female proportion	.018**	-.018***	-.016***	-.046***	-.001	-.048***
	(.006)	(.004)	(.004)	(.004)	(.004)	(.006)
Low-income tract	-.014*	-.039***	-.012	-.051**	-.113*	.065
	(.006)	(.010)	(.013)	(.020)	(.045)	(.154)
Moderate-income tract	-.001	-.021**	-.006	-.037**	.001	.115*
	(.005)	(.007)	(.007)	(.011)	(.025)	(.049)
R-squared	.434	.448	.482	.594	.759	.846
Households (millions)	13.32	19.65	22.22	35.35	10.84	25.10

*** $p < .001$, ** $p < .01$, * $p < .05$. Clustered standard errors in parentheses (clustered on census tract). Dependent variable is the distance from 2020 census block to nearest 2024 bank branch (miles). Explanatory variables include the distance to the nearest 2023 SNAP large grocery store, distance to the nearest 2022 restaurant, distance to the nearest 2022 gas station/convenience store, demographic proportions, and indicator variables for low-income and moderate-income Census tracts. Regressions weighted by households and include incorporated-place fixed effects and county fixed effects in unincorporated areas.

Table 10. Change in Distance to Nearest Bank Branch

	Urban census blocks, by density				Small	Rural
	Hyper	High	Medium	Low	Town	Blocks
Δ Nearby households	-.049***	-.243***	-.478***	-.704***	-1.146	-1.456***
	(.011)	(.040)	(.044)	(.085)	(.740)	(.229)
Δ Nearby employment	-.014	-.023	.047**	.085***	-.667*	.260*
	(.009)	(.017)	(.017)	(.025)	(.337)	(.105)
Δ Grocery store distance	.045***	.111***	.089***	.058***	-.040	.002
	(.010)	(.022)	(.012)	(.010)	(.055)	(.009)
Δ Restaurant distance	.021	.028	.033**	.025***	.001	-.022
	(.015)	(.016)	(.011)	(.007)	(.018)	(.027)
Δ Gas station distance	.012	.002	.007	.005	-.060	.002
	(.015)	(.018)	(.012)	(.008)	(.039)	(.007)
Black proportion	.028***	.008	.019	.008	.038	.033
	(.008)	(.009)	(.010)	(.011)	(.031)	(.029)
Asian proportion	-.008	-.011	-.039**	-.110***	.081	-.110
	(.006)	(.013)	(.015)	(.019)	(.158)	(.116)
Hispanic proportion	-.001	-.003	-.016*	-.032**	-.009	-.098*
	(.006)	(.008)	(.009)	(.012)	(.030)	(.049)
2-plus proportion	-.022	.001	.007	.021*	-.009	.060***
	(.015)	(.017)	(.011)	(.010)	(.016)	(.016)
Other proportion	-.039	.018	-.023	-.041	-.032	.080
	(.020)	(.027)	(.027)	(.028)	(.053)	(.049)
Nat. American proportion	.082	.070	.010	.020	-.064*	.440
	(.070)	(.057)	(.033)	(.042)	(.033)	(.449)
Pac. Islander proportion	.048	.331	.307	.395	.327	-.443
	(.048)	(.297)	(.231)	(.246)	(.539)	(.313)
Ages 18-24 proportion	-.004	-.007	.004	.034***	.035	.022*
	(.008)	(.010)	(.009)	(.009)	(.021)	(.011)
Ages 25-34 proportion	-.007	-.009	-.002	.006	.040	.054***
	(.006)	(.007)	(.007)	(.007)	(.031)	(.010)
Ages 45-54 proportion	.022***	.005	.007	.014*	-.058	-.001
	(.006)	(.006)	(.005)	(.006)	(.056)	(.009)
Ages 55-64 proportion	.015*	.007	-.006	.023**	-.086	.027*
	(.008)	(.007)	(.007)	(.008)	(.077)	(.011)
Ages 65+ proportion	-.001	-.006	-.022**	-.002	-.036	.024
	(.007)	(.007)	(.007)	(.009)	(.053)	(.015)
Female proportion	.006	-.002	.002	-.008**	-.002	-.009**
	(.004)	(.003)	(.003)	(.003)	(.003)	(.003)
Low-income tract	-.011**	-.026***	-.011	-.031*	-.040	-.065
	(.004)	(.007)	(.009)	(.012)	(.032)	(.083)
Moderate-income tract	-.011***	-.018***	-.010*	-.014	.021	.068*
	(.003)	(.005)	(.005)	(.007)	(.039)	(.029)
R-squared	.139	.185	.219	.265	.373	.453
Households (millions)	13.32	19.65	22.22	35.35	10.84	25.10

*** $p < .001$, ** $p < .01$, * $p < .05$. Clustered standard errors in parentheses (clustered on census tract). Dependent variable is the change in distance from 2020 census block to nearest 2024 branch relative to that from 2020 census block to nearest 2014 branch (miles). Explanatory variables include the log change in nearby households, the log change in nearby employment, the change in distances to other businesses, demographic proportions, and indicator variables for low-income and moderate-income Census tracts. Regressions weighted by households and include incorporated-place fixed effects and county fixed effects in unincorporated areas.

Table 11. Relative Access to Bank Branches

	Urban census blocks, by density				Small	Rural
	Hyper	High	Medium	Low	Town	Blocks
Grocery store distance	-.111**	-.284***	-.221***	-.159***	-.130***	-.047***
	(.036)	(.014)	(.009)	(.006)	(.013)	(.002)
Restaurant distance	.168*	-.128***	-.078***	-.069***	.024	.013***
	(.080)	(.030)	(.018)	(.010)	(.018)	(.002)
Gas station distance	-.165**	-.122***	-.077***	-.044***	-.110***	.007*
	(.053)	(.022)	(.014)	(.008)	(.014)	(.003)
Black proportion	-.846***	-.502***	-.355***	-.347***	-.009	.017
	(.048)	(.029)	(.022)	(.019)	(.013)	(.016)
Asian proportion	1.025***	-.029	-.108**	.058	-.013	.029
	(.078)	(.051)	(.039)	(.039)	(.065)	(.053)
Hispanic proportion	-.236***	-.435***	-.444***	-.364***	-.143***	-.181***
	(.043)	(.026)	(.023)	(.021)	(.027)	(.024)
2-plus proportion	-.308**	-.129**	-.127***	-.147***	-.036*	-.054***
	(.111)	(.039)	(.024)	(.017)	(.016)	(.009)
Other proportion	.476	-.343***	-.240**	-.169**	-.051	-.041
	(.301)	(.101)	(.074)	(.054)	(.040)	(.028)
Nat. American proportion	-1.678***	.109	-.053	.026	.050	-.092
	(.319)	(.174)	(.089)	(.125)	(.057)	(.052)
Pac. Islander proportion	.641	-.678*	-.730***	-.543**	-.401	1.125**
	(.347)	(.303)	(.210)	(.166)	(.305)	(.387)
Ages 18-24 proportion	-.079	.099***	.159***	.101***	.030**	.036***
	(.057)	(.026)	(.020)	(.016)	(.011)	(.006)
Ages 25-34 proportion	-.388***	.063**	.090***	.023	.021**	-.014*
	(.043)	(.021)	(.015)	(.012)	(.007)	(.006)
Ages 45-54 proportion	.321***	.070***	.039**	.053***	.017*	-.002
	(.041)	(.017)	(.012)	(.010)	(.007)	(.005)
Ages 55-64 proportion	.509***	.056*	.020	.027*	.040***	.012
	(.058)	(.023)	(.016)	(.013)	(.010)	(.006)
Ages 65+ proportion	.216***	.114***	.080***	.050***	.062***	.082***
	(.050)	(.023)	(.017)	(.014)	(.015)	(.007)
Female proportion	.093**	.072***	.065***	.055***	-.006*	.008***
	(.029)	(.009)	(.006)	(.004)	(.003)	(.002)
Low-income tract	.108***	.020	.017	.102***	.059*	.008
	(.029)	(.021)	(.020)	(.019)	(.025)	(.044)
Moderate-income tract	.074**	.023	-.017	.049***	.036**	.064***
	(.024)	(.015)	(.012)	(.012)	(.012)	(.016)
R-squared	.451	.483	.521	.521	.878	.576
Households (millions)	13.32	19.65	22.22	35.35	10.84	25.10

*** $p < .001$, ** $p < .01$, * $p < .05$. Clustered standard errors in parentheses (clustered on census tract). Dependent variable is the number of nearby bank branches per 10,000 nearby households and workers (standardized by CBSA and state). Explanatory variables include the distance to the nearest 2023 SNAP large grocery store, distance to the nearest 2022 restaurant, distance to the nearest 2022 gas station/convenience store, demographic proportions, and indicator variables for low-income and moderate-income Census tracts. Regressions weighted by households and include incorporated-place fixed effects and county fixed effects in unincorporated areas.

Table 12. Change in Relative Access to Bank Branches

	Urban census blocks, by density				Small	Rural
	Hyper	High	Medium	Low	Town	Blocks
Δ Nearby households	.291***	.704***	1.207***	1.282***	1.905***	1.139***
	(.047)	(.060)	(.057)	(.063)	(.362)	(.058)
Δ Nearby employment	.318***	.133***	.059**	.156***	-.028	.102***
	(.028)	(.023)	(.023)	(.022)	(.131)	(.026)
Δ Nearby grocery stores	.002	-.033**	-.010	-.009	.010	-.004**
	(.025)	(.012)	(.008)	(.006)	(.019)	(.002)
Δ Nearby restaurants	-.145***	-.027	-.011	-.004	.009	.001
	(.039)	(.016)	(.011)	(.005)	(.014)	(.002)
Δ Nearby gas stations	.032	-.012	.010	.001	.003	.003*
	(.031)	(.014)	(.009)	(.005)	(.010)	(.001)
Black proportion	.078***	.054***	.077***	.098***	.013	.003
	(.022)	(.015)	(.012)	(.009)	(.008)	(.007)
Asian proportion	.304***	.137***	.076***	.119***	-.139*	-.047
	(.029)	(.020)	(.020)	(.019)	(.055)	(.036)
Hispanic proportion	.182***	.117***	.136***	.081***	.017	.001
	(.020)	(.013)	(.012)	(.010)	(.014)	(.010)
2-plus proportion	.021	-.043*	-.062***	-.033***	-.006	-.002
	(.051)	(.020)	(.012)	(.009)	(.012)	(.005)
Other proportion	.261*	-.000	.001	-.007	.056**	-.003
	(.111)	(.046)	(.039)	(.027)	(.021)	(.014)
Nat. American proportion	-.544***	.089	.114**	.108	.078***	.114***
	(.125)	(.064)	(.043)	(.060)	(.023)	(.030)
Pac. Islander proportion	-.209	-.093	-.002	-.151*	-.111	.430**
	(.247)	(.138)	(.096)	(.066)	(.259)	(.151)
Ages 18-24 proportion	-.036	.007	-.001	.008	-.008	.007*
	(.030)	(.014)	(.009)	(.007)	(.006)	(.003)
Ages 25-34 proportion	-.098***	.018	.003	-.020**	-.011	-.004
	(.021)	(.010)	(.008)	(.006)	(.006)	(.003)
Ages 45-54 proportion	-.055**	.007	.006	.017***	.012	.001
	(.018)	(.008)	(.006)	(.005)	(.010)	(.003)
Ages 55-64 proportion	-.065*	.016	.016*	.006	.015	-.005
	(.026)	(.010)	(.008)	(.007)	(.014)	(.003)
Ages 65+ proportion	-.056*	.026*	.039***	.019**	.004	-.011**
	(.022)	(.012)	(.008)	(.007)	(.011)	(.004)
Female proportion	-.013	-.010*	-.002	.003	-.000	.003**
	(.012)	(.004)	(.003)	(.002)	(.002)	(.001)
Low-income tract	.078***	.052***	.077***	.057***	-.007	.044*
	(.013)	(.011)	(.010)	(.010)	(.014)	(.020)
Moderate-income tract	.061***	.024**	.031***	.027***	-.017	.005
	(.010)	(.007)	(.006)	(.006)	(.010)	(.009)
R-squared	.335	.435	.483	.491	.873	.519
Household (millions)	13.32	19.65	22.22	35.35	10.84	25.10

*** $p < .001$, ** $p < .01$, * $p < .05$. Clustered standard errors in parentheses (clustered on census tract). Dependent variable is the number of nearby bank branches per 10,000 nearby households and workers (standardized by CBSA and state). Explanatory variables include the log change in nearby households, the log change in nearby employment, the change in distances to other businesses, demographic proportions, and indicator variables for low-income and moderate-income Census tracts. Regressions weighted by households and include incorporated-place fixed effects and county fixed effects in unincorporated areas.

Table 13. Employment Distance to Nearest Branch

	Mean	St.Dev.	p25	p50	p75	p90
Hyper-dense urban						
2014	.24	.29	.06	.15	.32	.55
Oaxaca	.23	.26	.06	.15	.31	.53
2024	.26	.28	.07	.17	.35	.59
High-density urban						
2014	.43	.37	.15	.34	.61	.91
Oaxaca	.44	.38	.15	.34	.62	.93
2024	.50	.43	.17	.40	.71	1.04
Medium-density urban						
2014	.52	.45	.17	.42	.75	1.10
Oaxaca	.54	.47	.18	.43	.77	1.14
2024	.62	.53	.22	.50	.88	1.29
Low-density urban						
2014	.84	.74	.29	.68	1.18	1.77
Oaxaca	.91	.78	.33	.74	1.25	1.89
2024	1.01	.85	.39	.84	1.39	2.08
Small town						
2014	.61	.89	.14	.36	.77	1.34
Oaxaca	.63	.81	.15	.38	.82	1.44
2024	.69	.93	.16	.42	.89	1.55
Rural						
2014	2.82	5.14	.56	1.70	3.63	6.23
Oaxaca	3.00	5.11	.63	1.96	3.97	6.51
2024	3.29	5.32	.73	2.17	4.35	7.13

Notes: Employment-weighted summary statistics for distance to nearest bank branch, measured in miles.

Table 14. Employment Relative Access to Bank Branches

	Low Access			Moderate Access		
	2014	Oaxaca	2024	2014	Oaxaca	2024
Hyper-dense urban	.29	.28	.21	5.93	6.42	6.20
High-density urban	.11	.12	.14	4.12	4.53	4.32
Medium-density urban	.06	.08	.10	3.02	3.32	3.37
Low-density urban	.18	.24	.26	3.84	4.76	4.83
Small town	.08	.11	.12	1.06	1.23	1.23
Rural	.50	.55	.57	2.37	2.71	2.80
Total	1.22	1.39	1.39	20.34	22.98	22.74

Notes: Number of workers with low or moderate access to bank branches, measured in millions. Low access is defined as zero nearby bank branches or two or more standard deviations below area mean nearby bank branches per nearby households and workers. Moderate access is defined as one or more standard deviations below, but less than two standard deviations below, area mean nearby bank branches per nearby households and workers.

TABLE 15. Commercial Business Distance to Nearest Branch

	Urban census blocks, by density				Small	Rural
	Hyper	High	Medium	Low	Town	Blocks
SNAP retailer	.32	.49	.55	.85	.61	3.54
SNAP grocery store	.30	.41	.44	.60	.49	2.87
SNAP large grocery store	.25	.35	.38	.54	.45	1.67
Doctor office	.25	.44	.54	.87	.61	2.49
Dentist office	.22	.39	.47	.74	.51	2.00
Gas station/conv. store	.31	.51	.61	.99	.68	3.42
Full-service restaurant	.23	.42	.53	.85	.59	3.22
Fast-food restaurant	.24	.39	.45	.73	.48	2.42
Pizza restaurant	.24	.40	.47	.72	.48	2.13
Coffee/doughnut/bagel	.21	.39	.49	.79	.55	2.69

Notes: Average distance to nearest bank branch, measured in miles.

TABLE 16. Household & Employment Access to Branches and Mobile Data

	Low Access	No 5G data	No 4G/5G	No 5G data & Low access	No 4G/5G & Low access
2020 Households					
Hyper-dense urban	.19	.00	.00	.00	.00
High-density urban	.13	.00	.00	.00	.00
Medium-density urban	.08	.00	.00	.00	.00
Low-density urban	.25	.05	.00	.00	.00
Small town	.16	.07	.00	.00	.00
Rural	.86	3.07	.35	.13	.02
Total	1.68	3.19	.36	.14	.03
2020 Employment					
Hyper-dense urban	.21	.00	.00	.00	.00
High-density urban	.14	.00	.00	.00	.00
Medium-density urban	.10	.00	.00	.00	.00
Low-density urban	.26	.03	.00	.00	.00
Small town	.12	.06	.01	.00	.00
Rural	.57	1.37	.17	.07	.02
Total	1.39	1.47	.19	.07	.02

Notes: Number of households and workers with low access to bank branches, measured in millions. Low access is defined as zero nearby bank branches or two or more standard deviations below area mean nearby bank branches per nearby households and workers. No 5G data is defined as no coverage with 5G data service. No 4G/5G data is defined as no coverage with 4G or 5G data service.

Table 17. Change in Nearby Bank Branches Due to Bank Branch Closings

	Urban census blocks, by density				Small	Rural
	Hyper	High	Medium	Low	Town	Rural
Δ Nearby households	-.143***	-.036	.122***	.249***	.381***	.193***
	(.028)	(.024)	(.023)	(.030)	(.094)	(.033)
Δ Nearby employment	.036*	.063***	.053***	.040**	-.021	-.052**
	(.018)	(.011)	(.011)	(.013)	(.044)	(.016)
Δ Nearby grocery stores	.003	.027**	.008	.026***	-.012	.007
	(.010)	(.009)	(.009)	(.007)	(.018)	(.006)
Δ Nearby restaurants	.185***	.070**	.054**	-.019	.044	-.006
	(.027)	(.022)	(.021)	(.025)	(.042)	(.014)
Δ Nearby gas stations	-.034**	.003	.014	.003	-.036	.013
	(.011)	(.010)	(.008)	(.007)	(.020)	(.009)
Black proportion	.025	.027**	.017*	.025**	.003	-.000
	(.014)	(.008)	(.007)	(.009)	(.002)	(.005)
Asian proportion	.087***	.074***	.045***	.014	-.043*	-.032**
	(.013)	(.010)	(.009)	(.008)	(.017)	(.013)
Hispanic proportion	.179***	.078***	.073***	.038***	-.003	.006
	(.012)	(.008)	(.007)	(.006)	(.004)	(.005)
2-plus proportion	.119***	-.007	-.024***	-.020***	.004	-.007*
	(.026)	(.011)	(.006)	(.006)	(.004)	(.003)
Other proportion	.542***	-.016	.016	.045	.017*	-.014
	(.050)	(.026)	(.020)	(.023)	(.007)	(.010)
Nat. American proportion	.120	.015	.004	.042	.020*	.040***
	(.088)	(.041)	(.019)	(.023)	(.008)	(.010)
Pac. Islander proportion	-.198	.060	-.007	-.041	.038	.025
	(.108)	(.057)	(.046)	(.035)	(.075)	(.039)
Ages 18-24 proportion	-.054**	-.015*	.000	-.003	-.001	.001
	(.017)	(.007)	(.004)	(.004)	(.002)	(.002)
Ages 25-34 proportion	-.065***	-.008	.002	-.011**	-.000	-.003
	(.012)	(.005)	(.004)	(.004)	(.001)	(.002)
Ages 45-54 proportion	-.019	.003	.004	.003	-.001	-.001
	(.011)	(.004)	(.003)	(.003)	(.001)	(.002)
Ages 55-64 proportion	-.002	.004	.003	-.000	.001	-.004
	(.015)	(.006)	(.004)	(.003)	(.002)	(.002)
Ages 65+ proportion	-.003	.012*	.023***	.007	.003	-.001
	(.012)	(.006)	(.004)	(.004)	(.002)	(.002)
Female proportion	.001	.002	.004*	.006***	.000	.002*
	(.008)	(.002)	(.002)	(.001)	(.001)	(.001)
Low-income tract	.017*	.009	.004	-.016**	-.002	.017
	(.007)	(.006)	(.006)	(.006)	(.003)	(.010)
Moderate-income tract	.029***	.014***	.007*	-.000	-.002	.003
	(.006)	(.004)	(.003)	(.004)	(.002)	(.004)
R-squared	.225	.371	.413	.324	.892	.324
Household (millions)	13.09	19.54	22.16	35.20	10.60	24.47

*** $p < .001$, ** $p < .01$, * $p < .05$. Clustered standard errors in parentheses (clustered on census tract). Dependent variable is the log difference between nearby bank branches in 2014—less nearby branch closings—and nearby bank branches in 2014. Explanatory variables include the log change in nearby households, the log change in nearby employment, the change in distances to other businesses, demographic proportions, and indicator variables for low-income and moderate-income Census tracts. Regressions weighted by households and include incorporated-place fixed effects and county fixed effects in unincorporated areas.

TABLE 18. Change in Nearby Bank Branches Due to Bank Branch Openings

	Urban census blocks, by density				Small	Rural
	Hyper	High	Medium	Low	Town	Blocks
Δ Nearby households	.182***	.242***	.368***	.371***	.241***	.342***
	(.022)	(.025)	(.029)	(.052)	(.044)	(.019)
Δ Nearby employment	.040***	.009	-.016	-.011	.068	-.001
	(.011)	(.009)	(.011)	(.010)	(.051)	(.006)
Δ Nearby grocery stores	.011*	.062***	.075***	.049***	.030	.017***
	(.005)	(.006)	(.009)	(.007)	(.016)	(.003)
Δ Nearby restaurants	.128***	.074***	.096***	.104***	.026	.030***
	(.014)	(.011)	(.014)	(.018)	(.016)	(.004)
Δ Nearby gas stations	.002	-.006	-.030***	-.015*	-.009	-.003
	(.006)	(.006)	(.008)	(.006)	(.010)	(.003)
Black proportion	.000	-.004	-.006	.003	.001	.003
	(.007)	(.004)	(.004)	(.002)	(.001)	(.002)
Asian proportion	-.021**	-.013*	-.023***	.010*	-.006	.012*
	(.007)	(.005)	(.006)	(.005)	(.005)	(.005)
Hispanic proportion	-.048***	-.016***	-.010**	-.008*	-.002	.001
	(.006)	(.004)	(.004)	(.003)	(.001)	(.003)
2-plus proportion	-.050***	-.011	-.008*	.002	-.003*	-.002**
	(.013)	(.006)	(.003)	(.002)	(.001)	(.001)
Other proportion	-.277***	.019	.014	-.009	.011***	.001
	(.025)	(.014)	(.011)	(.007)	(.003)	(.002)
Nat. American proportion	-.181***	-.002	.030*	.004	-.005*	-.001
	(.032)	(.027)	(.012)	(.009)	(.002)	(.004)
Pac. Islander proportion	.032	-.085***	-.051**	-.037**	.013	.035*
	(.032)	(.021)	(.019)	(.013)	(.029)	(.015)
Ages 18-24 proportion	.039***	.019***	.004	.004	.000	.002*
	(.010)	(.005)	(.003)	(.002)	(.001)	(.001)
Ages 25-34 proportion	.013	.011***	.005*	.003*	-.001	-.001*
	(.007)	(.003)	(.002)	(.002)	(.001)	(.001)
Ages 45-54 proportion	-.025***	-.001	-.003	.002	.001	.000
	(.006)	(.002)	(.002)	(.002)	(.001)	(.001)
Ages 55-64 proportion	-.029***	.004	.004	.005	.000	-.001
	(.009)	(.003)	(.002)	(.002)	(.001)	(.001)
Ages 65+ proportion	-.016*	.004	.005*	.008**	-.003*	-.001
	(.007)	(.003)	(.002)	(.003)	(.001)	(.001)
Female proportion	.003	-.002	-.002**	-.000	-.000	.000
	(.003)	(.001)	(.001)	(.001)	(.000)	(.000)
Low-income tract	.023***	.013***	.020***	.030***	-.001	-.001
	(.004)	(.003)	(.003)	(.003)	(.001)	(.005)
Moderate-income tract	.007*	.004*	.008***	.013***	-.001	.002
	(.003)	(.002)	(.002)	(.002)	(.001)	(.001)
R-squared	.355	.440	.509	.572	.904	.575
Household (millions)	13.15	19.58	22.19	35.26	10.63	24.57

*** $p < .001$, ** $p < .01$, * $p < .05$. Clustered standard errors in parentheses (clustered on census tract). Dependent variable is the log difference between nearby bank branches in 2014—plus nearby branch closings—and nearby bank branches in 2014. Explanatory variables include the log change in nearby households, the log change in nearby employment, the change in distances to other businesses, demographic proportions, and indicator variables for low-income and moderate-income Census tracts. Regressions weighted by households and include incorporated-place fixed effects and county fixed effects in unincorporated areas.

Table 19. Net Change in Nearby Bank Branches

	Urban census blocks, by density				Small	Rural
	Hyper	High	Medium	Low	Town	Blocks
Δ Nearby households	.145***	.279***	.541***	.623***	.634***	.541***
	(.033)	(.038)	(.037)	(.052)	(.082)	(.031)
Δ Nearby employment	.085***	.058***	.007	.030*	.058	-.029*
	(.021)	(.015)	(.015)	(.014)	(.066)	(.014)
Δ Nearby grocery stores	.011	.104***	.102***	.084***	.018	.027***
	(.011)	(.011)	(.012)	(.010)	(.023)	(.006)
Δ Nearby restaurants	.338***	.151***	.171***	.130***	.078	.029*
	(.028)	(.024)	(.023)	(.023)	(.043)	(.012)
Δ Nearby gas stations	-.027*	-.009	-.023*	-.010	-.045*	.008
	(.012)	(.011)	(.011)	(.008)	(.021)	(.008)
Black proportion	.024	.015	.011	.017**	.005*	.004
	(.015)	(.009)	(.007)	(.005)	(.002)	(.004)
Asian proportion	.047***	.053***	.014	.027**	-.046**	-.012
	(.013)	(.011)	(.010)	(.008)	(.015)	(.013)
Hispanic proportion	.089***	.045***	.050***	.025***	-.004	.008
	(.012)	(.008)	(.007)	(.006)	(.004)	(.005)
2-plus proportion	.027	-.019	-.031***	-.021***	.001	-.007***
	(.027)	(.013)	(.006)	(.004)	(.004)	(.002)
Other proportion	.134**	.003	.038	.003	.025***	-.007
	(.050)	(.029)	(.020)	(.013)	(.007)	(.007)
Nat. American proportion	-.104	-.002	.044*	.035	.012	.038***
	(.073)	(.048)	(.019)	(.027)	(.007)	(.009)
Pac. Islander proportion	-.123	-.041	-.067	-.095**	.050	.069
	(.088)	(.056)	(.048)	(.035)	(.080)	(.038)
Ages 18-24 proportion	.011	.013	.009	.005	-.000	.003
	(.020)	(.009)	(.005)	(.004)	(.002)	(.002)
Ages 25-34 proportion	-.032*	.010	.008	-.001	-.001	-.003*
	(.013)	(.006)	(.004)	(.003)	(.001)	(.001)
Ages 45-54 proportion	-.044***	.001	-.001	.006*	.001	.000
	(.011)	(.005)	(.004)	(.003)	(.001)	(.001)
Ages 55-64 proportion	-.040*	.008	.008	.005	.001	-.003
	(.016)	(.006)	(.004)	(.003)	(.002)	(.001)
Ages 65+ proportion	-.021	.014*	.025***	.018***	-.001	-.002
	(.014)	(.006)	(.004)	(.004)	(.002)	(.002)
Female proportion	.006	-.003	.001	.004***	-.000	.002***
	(.008)	(.003)	(.002)	(.001)	(.001)	(.001)
Low-income tract	.040***	.025***	.030***	.026***	-.004	.011
	(.008)	(.007)	(.006)	(.006)	(.003)	(.011)
Moderate-income tract	.033***	.016***	.015***	.017***	-.003	.005
	(.006)	(.005)	(.004)	(.003)	(.002)	(.004)
R-squared	.288	.418	.533	.590	.903	.574
Household (millions)	13.11	19.55	22.17	35.21	10.60	24.49

*** $p < .001$, ** $p < .01$, * $p < .05$. Clustered standard errors in parentheses (clustered on census tract). Dependent variable is the log difference between nearby bank branches in 2024 and nearby bank branches in 2014. Explanatory variables include the log change in nearby households, the log change in nearby employment, the change in distances to other businesses, demographic proportions, and indicator variables for low-income and moderate-income Census tracts. Regressions weighted by households and include incorporated-place fixed effects and county fixed effects in unincorporated areas.

Appendix A. Data Appendix

We compiled detailed geographic data on households, employment, bank branches, SNAP food retailers, public schools, fire stations, police stations, post offices, hospitals, doctor offices, dentist offices, restaurants, gas stations/convenience stores, and mobile data coverage in the United States.

The household data we use come from the 2010 and 2020 Census of the Population. We use the smallest geographic unit available, census blocks. Throughout our work, we include only census blocks with positive population and households, thereby excluding empty census blocks (such as those completely covered with water). Our data contain over 5.86 million populated census blocks in 2020 (covering a total population of 331.45 million and 126.82 million households) and nearly 6.21 million populated census blocks in 2010 (covering a population of 308.75 million and 116.72 million households). Note that 2020 census blocks were defined separately from 2010 census blocks so that a precise one-to-one correspondence does not exist. Race and ethnicity data also come from Census. LMI tracts are identified using the Federal Financial Institutions Examination Council's Census flat files. Each census block contains an internal latitude-longitude pair.

The employment data we use com from the Walls & Associates 2022 National Establishment Time-Series (NETS) Database. We calculate census-block-level employment-weighted centroids for 2010 and 2020. As in Barnatchez et al. (2017), we make employment and line-of-business adjustments to more accurately reflect official aggregate measures of employment. We include only census blocks with nonzero employment, leaving nearly 3.35 million census blocks in 2020 (covering 165.27 million employees) and over 3.09 million census blocks in 2010 (covering about 140.88 million employees). For both years, the data represent a January snapshot of employment information collected over the course of the previous year (and therefore reflect pre-pandemic labor market conditions in 2020). Each census-block centroid contains a latitude-longitude pair.

The bank branch data we use come from S&P Global Capital IQ Pro Platform. These data contain much-improved geographic information over Federal Deposit Insurance Corporation (FDIC) Summary of Deposits. We limit our sample to all full-service branches that existed in June 2014 and June 2024. Our data contain 73,956 full-service bank branches in 2024, compared to 89,788 full-service bank branches in 2014. The data allow us to identify bank branch openings and closing observed. We identify 24,661 bank branch net closures and 8,829 bank branch net openings over the 2014 to 2024 period. Each bank branch is associated with a latitude-longitude pair.

The SNAP food retailer data come from the U.S. Department of Agriculture's Historical SNAP Retailer Locator Data. These data include information on food retailers that are authorized to accept Supplemental Nutrition Assistance Program (SNAP) benefits, including grocery stores, convenience stores, farmers markets, food delivery routes, military commissaries, specialty food stores, and wholesalers. We keep retailers who were eligible on December 31, 2023. We also cleaned the geographic data to ensure that latitude-longitude geocoding is consistent across years, is not aggregated to a ZIP-code centroid, and lies within the correct reported county. We drop all farmers markets, delivery routes, wholesalers, specialty stores, and co-ops as well as any duplicates on location. The SNAP retailer data also define a set of grocery stores (super store, supermarket, large grocery store, medium grocery store, small grocery store, or military commissary) and a set of large grocery stores (super store, supermarket, large grocery store, and military commissary). Our SNAP retailer data contain 240,417 retailers at the end of 2023, including 61,675 grocery stores and the subset of 42,803 large grocery stores (236,425 retailers at the end of 2014, including 65,744 grocery stores and the subset of 41,993 large grocery stores). Each retailer is associated with a latitude-longitude pair.

The public schools data come from the Department of Education for the 2023-24 school year. School locations come from the National Center for Education Statistics (NCES) Education Demographic and Geographic Estimates data and school characteristics come from the NCES Elementary/Secondary Information System data. We retain all public K-12 schools, excluding alternative education schools. We drop duplicates on location and ensure that geocoding is consistent across years. Our data contain 91,679 public schools, including 56,445 elementary schools and 21,305 high schools. Each school is associated with a latitude-longitude pair.

The fire station, police station, post office, and hospital data we use come from the U.S. Geological Survey's National Structures Dataset. We collected these data as of June 30, 2024. We drop duplicates on location. Our data contain 51,863 fire stations, 20,032 police stations, 30,842 post offices, and 6,629 hospitals and medical centers. Each fire station, police station, post office, and hospital/medical center is associated with a latitude-longitude pair.

The doctor office, dentist office, restaurant, and gas station/convenience store data we use come from the Walls & Associates 2022 National Establishment Time-Series (NETS) Database. The data provide a snapshot of business locations as of January 2022 and January 2014. We use the NAICS and SIC codes contained in the data to classify business entities into doctor offices, dentist offices, full-service restaurants, fast-food restaurants, pizza restaurants, coffee/doughnut/bagel shops, and gas stations/convenience stores. We drop duplicates on location. Our data contain 301,252 doctor offices, 224,595 dentist offices, 439,106 full-service restaurants, 159,257 fast-food restaurants, 77,611 pizza restaurants, 52,777 coffee/doughnut/bagel shops, and 161,607 gas stations/convenience stores in 2022 (292,171 doctor offices, 186,138 dentist offices, 288,785 full-service restaurants, 160,303 fast-food restaurants, 75,999 pizza restaurants, 39,221 coffee/doughnut/bagel shops, and 167,573 gas stations/convenience stores in 2014). Each business is associated with a latitude-longitude pair.

The mobile data coverage data we use come from the Federal Communication Commission's Broadband Coverage Map as of June 30, 2024. We calculate whether each census block internal point (households) and centroid (employment) is covered by 5G data service or by 4G or 5G data service.

The top-level urban/rural designations for each census block come from Census. In addition, we use Census Tiger shape files to assign each bank and credit union branch, SNAP retailer, public school, fire station, police station, post office, hospital, doctor office, dentist office, restaurant, and gas station/convenience store to its appropriate census block. Average credit scores for each census block were calculated from the Federal Reserve Bank of New York/Equifax Consumer Credit Panel (2024) (Lee and van der Klaauw (2010)).