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The Dark Side of Bank Branch Closures

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Keywords: *Bank branch closures; Nighttime lights (NTL); Non-tradable demand; Bank mergers;*

JEL classification: *G21; R11; R12; O18*

1. Introduction

Bank branch closures have received sustained attention in public debate and media reporting, reflecting growing concerns about the consequences for local economies. While the number of closures started accelerating during the Global Financial Crisis (Amberg and Becker, 2024; Keil and Ongena, 2024), likely reflecting the surrounding acute stress and restructuring pressures (Nguyen, 2019), the trend has not stabilized since. Instead, closures have continued at a steady pace over the past decade, with banks collectively eliminating thousands of branches each year. Rishad and Shah (2025) report a sharp increase in net branch closures in the first quarter of 2025, with U.S. Bancorp and Wells Fargo & Co. among the most active institutions in reducing their physical footprint. These developments suggest that branch networks are undergoing a structural contraction rather than a temporary adjustment.

Although technological innovation and the expansion of mobile banking may offset some of the adverse effects of branch closures, important limitations remain, particularly for vulnerable households and residents of remote or low-density areas (Brown et al., 2015; Célerier and Matray, 2019). For instance, the closure of branches in areas with low population density can create so-called banking deserts (Bonfim et al., 2021; Barca and Hou, 2024; Van Leuven et al., 2024), excluding their inhabitants from important financial services. Because access to banking services is closely tied to local commerce and household financial stability (Gama et al., 2024; Cardamone and Trivieri, 2024), the withdrawal of branches may alter the economic trajectory of those communities.

Understanding these concerns requires recognising the essential economic functions that physical branches provide within their communities. Branches serve as more than a venue for routine financial transactions: they provide access to credit for small businesses, facilitate mortgage lending, and act as a point of financial advice and assistance for households, particularly through their role in local lending relationships (Bord et al., 2021). Their presence can also increase trust in the banking system and reduce informational barriers that many consumers, particularly those with limited financial literacy, face when engaging with formal financial institutions (Niţoi and Pochea, 2024). Conversely, when branches close, communities may experience a reduction in financial circulation, fewer opportunities for local investment, and increased reliance on costlier or less secure alternatives such as payday lenders (Barca and Hou, 2024; Di Maggio et al., 2024). Evidence shows that branch closures are associated with reduced local small business lending (Nguyen, 2019), higher corporate lending costs (Bonfim et al., 2021), increased financial exclusion (Martin-Oliver, 2019) and lower rates of firm creation (Cardamone and Trivieri, 2024). This withdrawal of financial infrastructure can be particularly damaging in rural or economically fragile areas, where residents must travel long distances to reach the nearest branch or may lack reliable internet access for digital banking. As a result, branch closures may not only reflect existing economic decline, but may also contribute to it, creating a reinforcing cycle that deepens local disparities in economic development (Coccorese and Shaffer, 2021; Cardamone and Trivieri, 2024).

To assess these potential effects, this paper provides novel empirical evidence on the causal impact of bank branch closures on non-tradable local demand, measured using satellite-derived nighttime-light intensity at the census-tract level. Firms in the non-tradable sector include local retail, personal and household services, hospitality, construction, and other place-bound services that primarily serve local residents and firms. Because non-tradable activity relies on local customers and labour markets, and relationship-based access to nearby financial intermediaries, it is inherently less diversified and highly dependent on local credit availability (Müller and Verner, 2023; Andrieş et al., 2025). As a result, the withdrawal of physical bank branches can disproportionately reduce non-tradable local demand, making it critical to study how branch closures affect this sector and local economic resilience.

For our analysis, we draw on the empirical strategy developed by Nguyen (2019), which uses an instrumental variables framework to address the endogeneity of branch closing decisions. A central concern is that local economic conditions may themselves influence where banks choose to close branches; for example, declining activity may reduce deposit bases and make certain locations unprofitable. In such cases, simple comparisons between tracts with and without closures would confound the effect of closures with pre-existing economic decline. To generate plausibly exogenous variation, we follow Nguyen (2019) and exploit tract-level exposure to post-merger branch consolidation. When two large banks merge, the combined institution often consolidates overlapping branch networks to reduce fixed costs. This consolidation is driven primarily by network redundancy rather than local economic performance, making exposure to merger-driven closure risk a suitable instrument. We therefore construct an exposure measure that captures whether a census tract contained branches from both merging banks prior to the merger.

Our analysis is based on U.S. data, which is particularly well-suited for this strategy given the frequency of large bank mergers, the availability of detailed branch-level regulatory data, and the consistent statistical geography. Importantly, closures and outcomes are measured at the census tract level, which is a central advantage for our setting. Census tracts are small enough to capture the localized effects of branch withdrawal, yet large enough that satellite-derived nighttime light intensity is reliably measured and not dominated by noise. Thus, the tract corresponds to both the level at which branch closures occur and the spatial scale at which changes in place-based economic activity are most likely to be detected through nighttime luminosity.

Over the past decade, nighttime lights (NTL) have become a widely used proxy for economic activity, particularly as a way to capture dimensions of local economic vibrancy that are difficult to observe using standard administrative statistics. Seminal work shows that satellite-based measures of nighttime illumination are informative about income and economic activity at national and subnational scales, especially when official statistics are noisy, infrequently measured, or highly aggregated (Henderson et al., 2012; Pinkovskiy and Sala-i-Martin, 2016). More recent evidence demonstrates that NTL continues to provide meaningful signals of economic activity even at relatively fine spatial scales and in data-constrained environments (e.g., Gibson et al. 2020). Although our analysis is conducted at the U.S. census-tract level, where standard administrative data such as income, employment, and business counts are available, these measures primarily reflect formal and low-frequency economic outcomes. In contrast, shocks to local financial intermediation are likely to affect the non-tradable sector through changes in place-based economic activity within existing establishments, which are not well captured by conventional administrative statistics. In this context, nighttime lights provide a complementary, high-frequency, and spatially granular measure of local economic activity that is well suited to studying the localized effects of bank branch closures.

Importantly, we do not interpret nighttime lights as a comprehensive measure of local income or output. Rather, at the spatial scale of census tracts, nighttime illumination is particularly informative about non-tradable, place-bound economic activity, such as retail, personal services, and other consumer-facing businesses, that must be produced and consumed locally and therefore cannot be traded across space. These activities depend disproportionately on localized demand, foot traffic, and access to nearby financial services, and are thus plausibly the margin most directly affected by bank branch closures. Because non-tradable activity is tightly linked to the intensity with which local commercial and residential space is utilized, changes in nighttime luminosity provide a meaningful proxy for shifts in this component of local economic activity following the withdrawal of physical banking infrastructure (Shilpi et al., 2024).

Our results reveal that bank branch closures trigger a significant contraction in non-tradable local demand, with effects that are both spatially concentrated and socially differentiated. We document a distinct distance-decaying spillover pattern, confirming that branches function as critical nodes in a geographically embedded financial infrastructure whose removal reduces economic activity in host tracts and adjacent areas. Crucially, the burden of this financial withdrawal is not borne equally: the results are stronger in communities with older, lower-income, and less dense populations, as well as in counties with higher population mobility. This heterogeneity indicates that the local impact of financial disintermediation depends critically on underlying demographic and economic characteristics that shape communities' reliance on physical banking infrastructure.

This paper contributes to a growing literature on the local economic effects of financial sector consolidation by providing new evidence on how bank branch closures reshape non-tradable demand. While prior work has documented that consolidation reduces lending at the bank level and weakens relationship-based intermediation (Gilje et al., 2016; Bonfim et al., 2021; Célerier and Matray, 2019), far fewer studies trace these effects at the neighborhood scale or examine the spatial reach of closure shocks. By combining tract-level panel data with detailed branch closure data and constructing precise distance-based exposure measures, the paper advances this literature in four ways. First, it provides causal estimates of how the loss of a local branch affects non-tradable demand within the affected tract, using merger-driven consolidation as a plausibly exogenous source of variation (Nguyen, 2019). Second, it uncovers substantial heterogeneity across demographic and economic environments, highlighting that the consequences of branch withdrawal are disproportionately borne by vulnerable communities or financially marginalised communities, consistent with evidence on financial exclusion and uneven access to banking (Martin-Oliver, 2019; Allen et al., 2021; Brown et al., 2016). Third, it extends existing evidence by quantifying the geographic diffusion of closure shocks: nearby tracts experience measurable spillovers that decay sharply with distance complementing recent work on the spatial clustering and local information role of bank branches (Qi et al., 2024). Finally, whereas much of the existing literature relies on loan-level microdata, this paper identifies broader place-based real effects of bank branch closures using nighttime lights as an aggregate proxy for place-bound economic activity. Nighttime lights provide a spatially consistent and externally measured indicator of local economic conditions that is particularly informative about non-tradable, consumer-facing activity and the utilization of local commercial space (Gibson et al., 2020). Our results therefore complement prior evidence by showing that plausibly exogenous post-merger branch closures generate economically meaningful and spatially localized effects on this component of local economic activity.

The remainder of the paper is structured as follows: Section 2 discusses the related literature and constructs our hypotheses, Section 3 presents our data and empirical strategy, Section 4 outlines the results of our baseline estimates, Section 5 presents our robustness tests, Section 6 performs the subsample analysis, Section 7 conducts the spillover analysis and Section 8 concludes.

2. Related literature

2.1 Branch banking and local economies

Branch banking plays a crucial role in shaping local economic outcomes, as demonstrated by a growing body of research. One line of work highlights the importance of local banking for financial inclusion: Prina (2015) shows that physical proximity to banks in Nepal matters to customers and access to a local bank account enhances their financial wellbeing. Célerier and Matray (2019) exploit an exogenous expansion of bank branches and find significant gains in financial inclusion among low-income households. Similarly, Allen et al. (2021) document that the growth of Equity Bank's branch network in Kenya has improved local financial inclusion and enhanced the welfare of low-income households. A second strand examines the broader role of branch networks in shaping market functioning and firm outcomes. Bernini and Brighi (2018) show that expanding branch networks can reduce efficiency due to greater headquarters-branch distance, although efficient local banks and sufficient credit availability support local economies. Gilje et al. (2016) find that branch networks help integrate U.S. lending markets by facilitating the cross-regional reallocation of liquidity. Finally, Canta et al. (2023) document that competition measured by branch–firm distance lowers interest rates and boosts loan volumes, though it may hinder credit access for small or newly established firms.

Additional evidence further underscores local banking dynamics: Dlugosz et al. (2024) show that after natural disasters, branches with locally set rates raise deposit rates more aggressively and attract higher deposit inflows. Arcuri and Levratto (2020) find that local banking concentration reduces bankruptcy among medium-sized firms. Coccorese and Shaffer (2021) show that cooperative banks' local presence improves income, employment, and firm growth more than conventional banks. Finally, Gama et al. (2024) find that a higher share of cooperative branches in local branch density is associated with lower reliance on debt, while overall branch density corresponds to more conservative SME financing policies. Together, these studies suggest that branch banking is central to local economic performance, though its effects are not uniformly positive. This motivates the need for evidence on how the withdrawal of physical branches affects place-based economic activity.

2.2 Determinants of bank branch closures

The empirical literature on the determinants of bank branch closures identifies several economic, technological, and institutional forces shaping banks' decisions to maintain or withdraw physical branches. A foundational distinction is made by Deller and Sundaram-Stukel

(2012), who separate rational motives, such as technological change, economies of scale, and cost-efficiency, from behavioural motives arising from managerial strategies during expansion or consolidation. Much of the contemporary discussion emphasises the role of technological innovation. The expansion of online and mobile banking has reduced customers' demand for in-person services, lowering the profitability of physical branches and accelerating withdrawal (Brown et al., 2016; Keil and Ongena, 2024). Theoretical work by Hauswald and Marquez (2003, 2006) further suggests that advances in information processing enable banks to lend at greater distances without sacrificing screening precision, thus diminishing the need for local presence. Relatedly, banks may reorganise their branch networks to align with new technological infrastructures (Knott and Turner, 2019), while the rapid rise of FinTech platforms in consumer, mortgage, and small-business lending has intensified this shift (Buchak et al., 2018; Fuster et al., 2019; Balyuk et al., 2020).

Beyond technology, branch closures are also influenced by regional economic conditions. Morgan et al. (2016) show that local economic decline can make branches financially unsustainable, whereas Iyer et al. (2019) find that fragile banks may avoid closures if doing so risks losing deposits, implying that local deposit market characteristics shape closure decisions. Consolidation dynamics constitute another important driver: branch networks are often rationalised following mergers as overlapping locations are eliminated to cut fixed costs (DeLong, 2001; Degryse and Ongena, 2004; Nguyen, 2019).

Recent empirical work provides additional evidence on the determinants of closures. Qi et al. (2024) develop a model of credit-market competition to show that information sharing among banks encourages them to cluster branches in areas already served by competitors. Using an international sample, they find that such clustering reduces spatial credit rationing by enabling firms to obtain credit from more distant banks. Keil and Ongena (2024) analysing branching patterns across 3,143 U.S. counties over 26 years, show that the sharp decline in branches is driven not only by technology but also by bank fragility and consolidation. They show that large banks use internal technologies to reduce branches, whereas small banks close branches mainly when they face vulnerability or merge. More recently, Narayanan et al. (2025) find that U.S. bank branch openings and closings from 2001 to 2023 are primarily driven by deposit franchise value, with branches more likely to close or open in areas where depositors are highly rate-sensitive and digitally active, especially among large banks. In line with the previous findings, Islam and Singh (2025) show that geographically diversified banks are more willing to retrench from non-core local markets in response to adverse local fundamentals, reallocating activity toward core regions, while Lee et al. (2024) show that cultural characteristics, such as local religiosity, also shape banks' branching decisions, suggesting that social trust and community structure contribute to the geography of branch networks.

2.3 Consequences of bank branch closures

A separate strand of the literature examines the consequences or aftermath of bank branch closures, focusing particularly on lending, financial inclusion, and firm outcomes. Nguyen (2019) investigates bank branch closures during the 2000s and by instrumenting closures with branch consolidation, they find that closures lead to a persistent decline in local small business lending. Wang and Wu (2024) extend this research and with a U.S. sample between 2005 and 2019 and they find that branch closures of banks with mobile apps are associated with a lower reduction in small business lending compared to banks without mobile apps. Their findings suggest that digital channels could potentially attenuate but do not eliminate the effects of branch withdrawal. Other studies address loan pricing and firm dynamics. Bonfim et al. (2021) use Portuguese data to investigate how local loan conditions change after bank branch closures and find that firms forced to switch banks due to nearby closures lose the usual interest rate discounts enjoyed by voluntary switchers. Despite paying higher rates, these firms have lower default rates, suggesting they are higher-quality borrowers. More evidence by Amberg and

Beck (2024) suggests that widespread bank branch closures driven by digitalization in Sweden led to sharp declines in lending to small and young firms, resulting in lower local employment and sales and higher firm exit rates.

Other studies have focused more on the effects of branch closures on financial inclusion or firm creation. Martín-Oliver (2019) examines how bank branch closures during the Great Recession affected access to financial services in Spain, showing that branch distances increased due to reduced demand and the conversion of not-for-profit cajas into for-profit banks. These changes widened inequalities in access, underscoring the need for policies promoting financial inclusion. Cardamone and Trivieri (2024) use data from Italy between 2000 and 2020 and find that bank branch closures hinder new firm creation, with the negative effect being more pronounced when older branches are shut down. One underlying mechanism is that physical proximity strengthens the production and use of soft information in small-business lending, improving screening and reducing default risk (Agarwal and Hauswald, 2010). Complementing this evidence, Ho and Berggren (2020) analyse Swedish municipalities between 2007 and 2013 using spatial econometric techniques and show that greater weighted distance to the nearest bank branch significantly increases information asymmetries and monitoring costs for banks, thereby reducing new firm formation.

3. Data & Methodology

3.1 Data

To examine how local bank branch closures affect non-tradable local demand across U.S. census tracts, we combine detailed geospatial, financial, and socioeconomic data. Our primary outcome variable is nighttime luminosity (NTL), drawn from the *Harmonized Global Nighttime Lights* dataset (Li et al., 2020), which integrates DMSP–OLS (1992–2013) and VIIRS (2014–2020) satellite data into a consistent annual panel. NTL is widely used as a proxy for place-based economic activity, particularly at fine geographic scales where standard income or output measures are too aggregated or slow-moving to capture localized variation. In the context of bank branch closures, NTL is especially informative about changes in local, place-bound economic activity such as retail, services, and household consumption that constitute non-tradable local demand (e.g., Nguyen and Noy, 2020; Chronopoulos et al., 2021; Shilpi et al., 2024).[1]

Data on bank branches is obtained from the Federal Deposit Insurance Corporation's (FDIC) Summary of Deposits (SOD), which provides annual information on the geographic location, ownership, and balance sheet characteristics of all U.S. bank branches from 1994 to present. Each branch record includes latitude and longitude which allows for precise spatial linkage with the NTL data. Information on mergers and acquisitions (M&A) is sourced from the FDIC Events & Changes database, which lists the acquiring and target institutions, their certification numbers, and the year of merger approval. Following Nguyen (2019), this information is used to construct an instrument for branch closures based on merger-induced consolidation exposure.

County-level demographic and economic controls including population size, population density, income growth and age, gender and racial composition are drawn from the U.S. Census Bureau, the Bureau of Economic Analysis (BEA) and the SEER Data Dictionary for U.S. County Population Estimates. Similarly to Nguyen (2019), we remove all tracts without M&A exposure and without at least 2 bank branches on average.[2] The resulting dataset is a tract-year panel spanning 1994–2020, with 259,276 tract-year observations after cleaning and merging.

[1] Appendix Table A1 examines retail establishment counts as an extensive-margin measure of non-tradable local activity; consistent with slow adjustment and measurement noise at the tract level, effects are detectable primarily in subsamples with greater reliance on local banking services.

[2] In Section 5, we assess robustness by re-estimating the baseline specification on a sample that includes tracts with fewer than two branches on average.

3.2. Empirical Strategy

To estimate the causal effect of bank branch closures on non-tradable local demand, we adopt an identification strategy based on the seminal work of Nguyen (2019), leveraging spatial and temporal variation in merger-driven branch consolidation as a plausibly exogenous source of closure exposure. The main regression specification is:

$$\Delta \text{lnNTL}_{i,t} = \alpha_i + \gamma_t + \beta_1 \, \text{CLOSED}_{i,t-1} + \mathbf{X}'_{i,t-1}\delta + \varepsilon_{i,t} \tag{1}$$

where ΔlnNTL_{it} is the two-year difference[3] in the log of nighttime lights in tract i and year t ($\Delta\text{lnNTL}_{i,t} = \ln(NTL_{i,t+1}) - \ln(NTL_{i,t-1})$), α_i and γ_t denote tract and year fixed effects, respectively, and $\mathbf{X}_{i,t-1}$ is a vector of lagged demographic and economic controls. The key endogenous variable, CLOSED, equals 1 if the tract i has experienced a closure in year t. Because branch closures are potentially endogenous to local economic conditions, we employ an instrumental variables (IV) approach, using the tract's exposure to merger-induced consolidation as an instrument. The instrument is defined as:

$$\text{M\&A}_{i,t} = \sum_{b \in \text{Banks}} \text{BranchShare}_{i,b,t_0} \times \text{Merger}_{b,t}, \tag{2}$$

where $\text{BranchShare}_{i,b,t_0}$ is the share of bank b's branches located in tract i in the pre-merger year t_0, and $\text{Merger}_{b,t}$ is an indicator equal to one if bank b participates in a merger in year t. This variable captures the predicted probability of branch closures due to mergers, independently of local economic performance. The corresponding two-stage least squares (2SLS) specification estimated is:

[3] A two-year difference is commonly used in the literature to reduce noise in NTL data (e.g. Nguyen and Noy, 2020).

First stage:

$$\text{CLOSED}_{i,t-1} = \pi_0 + \pi_1 \text{ M\&A}_{i,t-1} + \text{X}'_{i,t-1}\rho + \alpha_i + \gamma_t + \nu_{it} \quad (3)$$

Second stage:

$$\Delta\text{lnNTL}_{i,t} = \alpha_i + \gamma_t + \beta_1 \widehat{\text{CLOSED}}_{i,t-1} + \text{X}'_{i,t-1}\delta + \varepsilon_{it} \quad (4)$$

where the predicted value $\widehat{\text{Closed}}_{i,t-1}$ isolates exogenous variation in closures arising from merger-induced consolidation rather than local demand shocks. The model is estimated with tract and year fixed effects to absorb time-invariant location characteristics and common national shocks, respectively. Standard errors are clustered at the tract level to account for serial correlation within tracts. The coefficient of interest, β_1, captures the causal effect of a merger-induced bank branch closure on changes in local nighttime luminosity. A negative and statistically significant estimate of β_1 implies that branch closures are followed by declines in place-based, non-tradable economic activity, consistent with the view that local bank presence facilitates credit provision and supports small-business and consumer-facing activity.

Following Nguyen (2019) and related spatial-econometric literature, the control vector $\text{X}_{i,t-1}$ includes: log population size (LNPOP), population density (POP_DENSITY), annual income per capita growth (INCOME), the log of average total assets of local branches (LNTA), the share of population aged 65+ (65+ SHARE), the share of female population (FEMALE SHARE), and the share of Black population (BLACK SHARE). These variables capture changes in local demographics, income dynamics, and banking market characteristics that might otherwise confound the relationship between branch closures and local activity. All controls are lagged one year to mitigate reverse causality from contemporaneous NTL changes to closures or demographics. Table 1 presents the definitions and descriptive statistics of all variables used in our analysis.

[Table 1]

4. Baseline IV estimates

Table 2 presents the main IV estimates of the effect of bank branch closures on non-tradable local demand, measured by changes in nighttime luminosity (ΔlnNTL). Columns (1)–(3) report results for the specification without demographic and economic controls, while Columns (4)–(6) include the full set of lagged covariates. Across all specifications, the first stage shows a strong and statistically significant relationship between merger exposure (M&A) and the probability of a branch closure (CLOSED). The estimated first-stage coefficient on merger exposure is approximately 0.12, highly significant at the 1% level, and yields first-stage F-statistics well above conventional thresholds, indicating that merger exposure is a strong predictor of actual closures. The reduced-form results in Columns (2) and (5) indicate that greater merger exposure is associated with a decline in ΔlnNTL, thereby validating the relevance of our instrument and confirming the potential existence of a causal channel. For illustration purposes, we also present the change in NTL for a tract after a bank branch closure in Figure 1.

[Figure 1]

The second-stage IV estimates in Columns (3) and (6) constitute the main plausibly causal results. In both specifications, the coefficient of CLOSED is negative and statistically significant. The estimated magnitude of the coefficient implies that a branch closure reduces tract-level economic activity by roughly 8.8 percentage points, relative to the counterfactual of no closure, nearly one standard deviation of ΔlnNTL. The magnitude is economically meaningful and closely aligned with previous findings, that document declines in small-business lending and business creation after bank branch closures (e.g. Nguyen, 2019; Cardamone and Trivieri, 2024; Wang and Wu, 2024).

[Table 2]

Including lagged demographic and socioeconomic controls slightly strengthens the precision of the estimates but leaves the point estimate virtually unchanged, suggesting that the effect of closures is not driven by differential pre-closure trends in population, income, demographic composition, or local bank size. The coefficients of the control variables are consistent with economic intuition. The coefficient of LNPOP is negative and statistically significant in the full specification. This implies that tracts with larger populations experience slightly lower short-run growth in nighttime lights, which is consistent with the idea of luminosity saturation in more populous areas. The coefficient of POP_DENSITY is positive and highly significant. Consistent with expectations from localized economic activity, denser urban tracts experience higher levels of commercial activity, consumer foot traffic, and infrastructure utilization, which translate into modest but measurable short-run increases in nighttime luminosity. The coefficient of INCOME is also strongly positive and significant, suggesting that higher household income growth translates into greater local spending, retail activity, and service demand. LNTA at the tract level has a positive and significant coefficient indicating that tracts served by larger banks tend to exhibit slightly stronger growth in economic activity. Finally, the demographic composition variables show mixed but meaningful patterns. The coefficient of 65+ SHARE is negative but only significant in the reduced form regression suggesting that tracts with a higher elderly share experience slightly weaker economic dynamism. On the other hand, the coefficients of FEMALE SHARE and BLACK SHARE are positive and highly significant although they should be interpreted with caution. The female share varies little spatially, so even small year-to-year demographic shifts may show up as "effects". Regarding BLACK SHARE, because tract fixed effects absorb persistent racial composition, the coefficient likely captures short-run demographic shifts correlated with local redevelopment, migration, or gentrification. In many cities, increases in population share for specific groups coincide with changes in urban activity patterns (e.g. Hwang and Sampson, 2014).

5. Robustness tests

To assess the stability of the baseline estimates, we conduct a series of robustness checks that alter both the measurement of branch closures and the construction of the outcome variable, as well as the estimation sample. Across all exercises, the estimated effects of branch closures on non-tradable local demand remain consistent in magnitude, sign, and statistical significance, thereby strengthening the credibility of our main findings.

First, we use alternative measurements of our key variables and these results are presented in Table 3. The baseline analysis measures treatment using a binary indicator for whether at least one branch closes in a tract–year. As a first robustness check, we replace this indicator with the number of closures occurring in the tract (CLOSED_N). In this way, the identifying variation comes from both the extensive and intensive margins of branch consolidation. The IV estimates continue to show a negative and statistically significant effect of branch closures on changes in local nighttime luminosity, confirming that the results are not driven by the binary specification. Moreover, following Nguyen (2019), we replace the baseline CLOSED variable with a post-merger closure indicator (CLOSED_POST) that equals one only when a closure occurs after a merger approval affecting the tract. This specification explicitly ties branch contraction to merger-driven consolidation, isolating the channel emphasized in the identification strategy. The IV estimates using this alternative treatment yield similar coefficients to the baseline model, confirming that the results are not sensitive to how closures are temporally coded.

Second, the baseline analysis defines the outcome as the two-year log-difference in nighttime lights intensity (ΔlnNTL), which smooths short-run fluctuations and reduces measurement noise. We redefine the dependent variable using the one-year difference (ΔlnNTL_1), capturing more immediate local effects. The IV estimates remain negative and significant, indicating that branch closures lead to an observable reduction in non-tradable local demand even within a one-year window. To examine longer-term effects, we also compute the three-year log-difference in NTL (ΔlnNTL_3). The point estimate remains negative but becomes statistically insignificant, reflecting the expected attenuation of precision as the differencing window lengthens and additional noise accumulates. The sign and magnitude, however, remain comparable to the baseline, and all other covariate patterns are stable, suggesting no evidence of a reversal of the effect over a longer horizon.

[Table 3]

In the second set of tests, we use alternative samples and these results are presented in Table 4. First, given that the COVID-19 pandemic significantly disrupted economic activity and local mobility patterns, we re-estimate the baseline model excluding 2020. Dropping this year yields coefficients that are nearly identical to the baseline, indicating that the pandemic does not drive the estimated relationship between bank closures and nighttime lights. For completeness, we present all remaining results with ΔlnNTL and ΔlnNTL_1 to capture both noiseless and immediate effects, respectively. Second, we extend the analysis to an expanded sample that includes tracts with fewer than two branches on average which were excluded from the baseline to ensure that measured closures reflect meaningful branch contraction rather than entry/exit noise in thin banking markets. Including these tracts approximately doubles the sample size and introduces more heterogeneity in exposure to branch networks. Despite this, the IV coefficient on closures remains negative and statistically significant, and its magnitude changes only slightly, suggesting that the baseline exclusion rule does not bias the results.

[Table 4]

6. Subsample analysis

To explore the heterogeneity in the local effects of bank branch closures, we estimate the baseline specification separately across subsamples defined along key community characteristics. With the exception of the elderly share where we use a 90/10 split to isolate communities with unusually old populations, all other subsamples are split at the county-level median of the respective characteristic. Table 5 presents the results.

[Table 5]

6.1 Elderly population share (65+ share)

Columns (1)–(4) show that the negative impact of closures on nighttime lights is concentrated in counties with a high share of residents aged 65 and above. In these areas, closures reduce ΔlnNTL_1 by 0.300 and ΔlnNTL by 0.225, both statistically significant at the 5% and 10% levels, respectively. In contrast, the estimates for counties with low elderly shares are considerably smaller and only the estimate in column (4) is significant. This pattern indicates that older communities, who may rely more on physical access to banking services and less on digital channels, experience a stronger decline in non-tradable local demand following bank exits.

6.2 Income

Columns (5)–(8) reveal pronounced asymmetry across income levels. In low-income counties, closures produce sizable and statistically significant declines in ΔlnNTL_1 (–0.098) and ΔlnNTL (–0.118). Conversely, in high-income counties the estimates are near zero and statistically insignificant. This provides evidence that lower-income communities are more vulnerable to disruptions in banking access and may lack substitutes to branch-related financial activities.

6.3 Population density

The results in columns (9)–(12) indicate that closures have strong effects in low-density areas, with coefficients of –0.120 (ΔlnNTL_1) and –0.140 (ΔlnNTL), both economically meaningful and statistically significant. High-density areas, however, display no detectable impact. This is consistent with the idea that rural or sparsely populated regions face higher search costs for financial services and have fewer nearby alternatives when a local branch closes.

6.4 Racial composition (Black population share)

Columns (13)–(16) show substantial heterogeneity across racial composition. In counties with low Black population share, the effect of closures is strongly negative and significant for both ΔlnNTL_1 (–0.114) and ΔlnNTL (–0.159). For communities with a high BLACK SHARE on average, the effect is smaller and statistically weak. This pattern suggests that racial composition proxies for broader socioeconomic and institutional differences across counties that shape the consequences of branch closures.

6.5 Staying-at-home patterns (pre-pandemic mobility levels)

The final set of subsamples (columns (17)–(20)) divides counties by the average share of the population staying at home on a typical day, a proxy for local mobility and pre-existing social activity conditions. We use data from the Bureau of Transportation Statistics (BTS) – Daily Mobility Statistics which spans across 2019-2025. As our baseline proxy, we use the average of all days in 2019 by county.[4] We find that in high-mobility counties, closures significantly reduce ΔlnNTL_1 (–0.096) and ΔlnNTL (–0.106), whereas in low-mobility counties the estimates are smaller and statistically insignificant. Economic activity in high-

[4] We exclude 2020 and other years to avoid the distortion by COVID-19, and 2019 is the only available year in our sample.

mobility counties is likely to be inherently mobile and dependent on easy access to transactional services (e.g. cash-intensive retail, sales, logistics). Our results suggest that bank closures disrupt the financial infrastructure supporting this mobile ecosystem, causing a significant slowdown in non-tradable local demand.

7. Spillover analysis

This section examines whether bank branch closures generate spatial spillovers in nearby tracts. We follow a tract–year panel design in which each census tract is assigned a ring-specific treatment indicator based on its distance to the nearest closure event. Using tract centroids from the TIGER shapefiles and the great-circle distance between every tract and all closure tracts, we construct six mutually exclusive one-mile rings (0–1, 1–2, …, 5–6 miles). For each ring r , we create a dummy that equals one for tracts located within the corresponding distance band in the year immediately following a closure in a neighbouring tract, and zero otherwise. We then re-estimate the baseline panel regression separately for each ring, including the same controls, tract fixed effects, and year fixed effects as in the main specification. This approach isolates how non-tradable local demand responds in tracts that do not experience a closure themselves but are exposed to varying degrees of geographical proximity to one, allowing the estimated spillover effects to reflect spatial decay patterns in credit market disruptions. Each column in Table 6 corresponds to a distinct ring, and the coefficient of CLOSED NEIGHBOUR measures the change in non-tradable demand for tracts adjacent to (but not directly experiencing) a closure.

The results indicate a clear and economically meaningful spillover effect among the closest neighbours. Within 0–1 miles, ΔlnNTL_1 and ΔlnNTL decline by 9–10 percentage points, similar to magnitude of our baseline findings for closures within the same tract. This suggests that the effect is not strictly confined to the tract in which the branch disappears. Instead, closures carry a localized negative shock to the bank's surrounding service area, consistent with reductions in foot traffic, customer switching frictions, and disruptions in loan officer networks.

In the remaining rings, the coefficients remain small and statistically insignificant. The point estimates are close to zero for both the one-year and two-year outcomes. These results suggest that beyond the immediate neighbourhood, closures do not meaningfully depress economic conditions, and any exposure to bank-customer relationship disruptions appears highly localized.[5]

[Table 6]

8. Conclusions

Using a large panel of census tracts linked to detailed branch-level closure data, we estimate the plausibly causal effect of branch consolidation on place-based non-tradable local demand, measured through a tract-level difference-in-differences design with instrumental variables. The results consistently show that branch closures lead to economically meaningful declines in non-tradable local demand as measured by changes in nighttime lights intensity, even after controlling for local demographic, economic, and financial characteristics. These effects are robust across multiple specifications, including alternative definitions of closure intensity, different timing windows for the dependent variable, adjustments to the sample frame, and the exclusion of the COVID-19 period.

The analysis also highlights substantial heterogeneity in how communities absorb the shock of financial withdrawal. Subsample regressions reveal that closures have more pronounced

[5] There are only two small exceptions. First, in the 3–4 miles ring, in the one-year specification (Column 4), the estimate is positive and marginally significant (0.053**). The magnitude is small and disappears in the two-year outcome (Column 10), suggesting short-lived and economically negligible noise rather than evidence of increased non-tradable demand. Another specification shows a marginal negative effect at 4–5 miles (–0.032*, Column 11), but the two-year version is again insignificant, and the pattern is not consistent across other distances.

effects in areas with older populations, lower income, lower population density, and lower Black population shares, suggesting that communities with a higher reliance on in-person services, weaker economic fundamentals, or more limited access to substitutes are disproportionately harmed by the loss of access to bank branches. Moreover, we show a significant decline in non-tradable local demand specifically in counties with high daily mobility, suggesting that closures disrupt the financial logistics of mobile, transaction-dependent businesses. This heterogeneity underscores the importance of demographic structure and local resilience capacity in mediating the impacts of disruptions to financial intermediation.

Spatial spillover estimates further demonstrate that the effects of closures extend beyond the tracts in which they occur, but only over short distances. Non-tradable demand declines sharply within the first mile of a closure and spillover magnitudes fall to near zero beyond that radius. This highly localised spatial decay suggests that branch networks generate neighbourhood-scale externalities rather than broader regional effects.

Taken together, the findings provide new evidence that branch consolidation generates persistent and spatially heterogeneous effects on place-based economic activity. As retail banking continues to contract and digital finance expands, understanding which communities remain vulnerable to local economic shocks becomes increasingly important for both regulators and policymakers. Targeted interventions such as incentives for maintaining physical financial services in underserved areas or support for alternative community finance providers may help mitigate the uneven local fallout of branch closures.

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Tables and figures

Table 1. Variable definitions and descriptive statistics

VARIABLE	DEFINITION	OBS	MEAN	MEDIAN	ST.DV.	5TH PERC.	95TH PERC.
ΔlnNTL	The two-year difference in the natural logarithm of nighttime light average value for a tract.	240485	0.003	0.000	0.096	-0.142	0.158
ΔlnNTL_1	The one-year difference in the natural logarithm of nighttime light average value for a tract.	259276	0.001	0.000	0.082	-0.120	0.131
ΔlnNTL_3	The three-year difference in the natural logarithm of nighttime light average value for a tract.	230201	0.004	0.000	0.106	-0.158	0.177
CLOSED	Equals 1 if a tract has a bank branch closure, 0 otherwise.	259276	0.057	0.000	0.231	0.000	1.000
CLOSED_N	The number of bank branch closures in a tract in a given year.	259276	0.063	0.000	0.289	0.000	1.000
CLOSED_POST	Equals 1 for tract-years in which a bank branch in the tract closed in the year immediately following a merger, 0 otherwise.	259276	0.050	0.000	0.218	0.000	0.000
M&A	The pre-merger branch share of the merging banks in the tract.	259276	0.005	0.000	0.043	0.000	0.005
LNPOP	The natural logarithm of the population in the county of the tract.	259276	12.355	12.474	1.597	9.690	14.864
POP_DENSITY	Population per square mile in the county of the tract, expressed in thousands.	259276	0.958	0.352	2.796	0.019	3.063
INCOME	Annual income growth in the county of the tract.	259276	0.037	0.038	0.036	-0.019	0.088
LNTA	The natural logarithm of the average total assets in the bank branches of the tract.	259276	17.521	18.031	2.515	12.523	20.635
65+ SHARE	The ratio of people aged 65+ to total population in the county of the tract.	259276	0.143	0.138	0.041	0.086	0.220
FEMALE SHARE	The ratio of female population to total population in the county of the tract.	259276	0.508	0.509	0.012	0.490	0.524
BLACK SHARE	The ratio of Black population to total population in the county of the tract.	259276	0.122	0.081	0.125	0.006	0.398

Table 2. Baseline IV regressions

	(1) *FIRST STAGE* CLOSED	(2) *REDUCED FORM* ΔlnNTL	(3) *SECOND STAGE* ΔlnNTL	(4) *FIRST STAGE* CLOSED	(5) *REDUCED FORM* ΔlnNTL	(6) *SECOND STAGE* ΔlnNTL
CLOSED			-0.092***			-0.088***
			(0.033)			(0.031)
M&A	0.121***	-0.015***		0.124***	-0.016***	
	(0.014)	(0.005)		(0.014)	(0.005)	
LNPOP				0.021	-0.054***	-0.053***
				(0.007)	(0.003)	(0.003)
POP_DENSITY				0.003	0.007***	0.006***
				(0.005)	(0.001)	(0.001)
INCOME				0.001	-0.047***	-0.044***
				(0.013)	(0.008)	(0.008)
LNTA				0.006***	0.0004*	0.001**
				(0.000)	(0.000)	(0.0005)
65+ SHARE				0.062	-0.065**	-0.036
				(0.063)	(0.025)	(0.028)
FEMALE SHARE				0.062	0.413***	0.312***
				(0.145)	(0.091)	(0.098)
BLACK SHARE				0.051	0.096***	0.084***
				(0.051)	(0.016)	(0.017)
CONSTANT	0.093***	0.033***	0.034***	-0.323***	0.482***	0.495***
	(0.003)	(0.001)	(0.001)	(0.098)	(0.047)	(0.049)
TRACT FE	YES	YES	YES	YES	YES	YES
TIME FE	YES	YES	YES	YES	YES	YES
OBS.	222,544	240,504	240,504	222,544	240,504	240,504
N. OF TRACTS	11,025	11,209	11,209	11,025	11,209	11,209
R2 WITHIN	0.011	0.085	0.019	0.011	0.087	0.025
FIRST STAGE F-STAT	150.3			118.81		

The table presents first-stage, reduced form and second-stage instrumental variables (IV) estimates. ΔlnNTL is the two-year difference in the log of nighttime lights. CLOSED equals 1 if the tract has experienced a closure, 0 otherwise. M&A is the pre-merger branch share of the merging banks in the tract. LNPOP is the natural logarithm of the population in the county of the tract. POP_DENSITY is the population per square mile in the county of the tract, expressed in thousands. INCOME is the annual income growth in the county of the tract. LNTA is the natural logarithm of the average total assets in the bank branches of the tract. 65+ SHARE is the ratio of people aged 65+ to total population in the county of the tract. FEMALE SHARE is the ratio of female population to total population in the county of the tract. BLACK SHARE is the ratio of Black population to total population in the county of the tract. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Table 3. Alternative variables

	(1)	(2)	(3)	(4)
	ΔlnNTL	ΔlnNTL	ΔlnNTL_1	ΔlnNTL_3
CLOSED			-0.074**	-0.058
			(0.029)	(0.036)
CLOSED_N	-0.075***			
	(0.027)			
CLOSED_POST		-0.068***		
		(0.024)		
CONTROLS	YES	YES	YES	YES
TRACT FE	YES	YES	YES	YES
TIME FE	YES	YES	YES	YES
OBS.	240,504	240,504	259,276	230,224
N. OF TRACTS	11,209	11,209	11,219	11,026
R2 WITHIN	0.024	0.059	0.012	0.083

The table presents second-stage instrumental variables (IV) estimates. ΔlnNTL_1, ΔlnNTL, and ΔlnNTL_3 are the one-, two-, and three-year difference in the log of nighttime lights, respectively. CLOSED equals 1 if the tract has experienced a closure, 0 otherwise. CLOSED_N is the number of closures in tract. CLOSED_POST equals 1 only when a closure occurs after a merger approval affecting the tract, 0 otherwise. The same controls as in Table 2 have been used. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Table 4. Excluding 2020 and extended sample

	(1)	(2)	(3)	(4)
	EXCL 2020	*EXCL 2020*	*EXTENDED SAMPLE*	*EXTENDED SAMPLE*
	ΔlnNTL_1	ΔlnNTL	ΔlnNTL_1	ΔlnNTL
CLOSED	-0.070**	-0.082**	-0.064**	-0.106***
	(0.030)	(0.032)	(0.026)	(0.030)
CONTROLS	YES	YES	YES	YES
TRACT FE	YES	YES	YES	YES
TIME FE	YES	YES	YES	YES
OBS.	248,883	230,298	527,548	502,232
N. OF TRACTS	11,219	11,208	23,181	23,134
R2 WITHIN	0.018	0.038	0.046	0.033

The table presents second-stage instrumental variables (IV) estimates. ΔlnNTL_1 and ΔlnNTL are the one-, and two-year difference in the log of nighttime lights, respectively. CLOSED equals 1 if the tract has experienced a closure, 0 otherwise. Columns 3 and 4 include tracts with less than 2 branches on average that are excluded in the baseline estimates. The same controls as in Table 2 have been used. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Table 5. Subsample analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	HIGH 65+ SHARE	*HIGH 65+ SHARE*	*LOW 65+ SHARE*	*LOW 65+ SHARE*	*LOW INCOME*	*LOW INCOME*	*HIGH INCOME*	*HIGH INCOME*
	ΔlnNTL_1	ΔlnNTL	ΔlnNTL_1	ΔlnNTL	ΔlnNTL_1	ΔlnNTL	ΔlnNTL_1	ΔlnNTL
CLOSED	-0.300**	-0.225*	-0.035	-0.067**	-0.098**	-0.118**	-0.029	-0.020
	(0.141)	(0.121)	(0.028)	(0.031)	(0.049)	(0.052)	(0.027)	(0.030)
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES
TRACT FE	YES	YES	YES	YES	YES	YES	YES	YES
TIME FE	YES	YES	YES	YES	YES	YES	YES	YES
OBS.	26178	24292	233098	216212	132136	122671	127140	117833
N. OF TRACTS	1125	1125	10094	10084	5632	5630	5587	5579
R2 WITHIN	0.015	0.007	0.054	0.045	0.024	0.031	0.063	0.096
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	LOW POP_DENSITY	*LOW POP_DENSITY*	*HIGH POP_DENSITY*	*HIGH POP_DENSITY*	*LOW BLACK SHARE*	*LOW BLACK SHARE*	*HIGH BLACK SHARE*	*HIGH BLACK SHARE*
	ΔlnNTL_1	ΔlnNTL	ΔlnNTL_1	ΔlnNTL	ΔlnNTL_1	ΔlnNTL	ΔlnNTL_1	ΔlnNTL
CLOSED	-0.120**	-0.140**	-0.006	0.008	-0.114**	-0.159***	-0.030*	-0.022
	(0.052)	(0.054)	(0.008)	(0.011)	(0.052)	(0.056)	(0.018)	(0.024)
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES
TRACT FE	YES	YES	YES	YES	YES	YES	YES	YES
TIME FE	YES	YES	YES	YES	YES	YES	YES	YES
OBS.	133857	124358	125419	116146	132609	123168	126667	117336
N. OF TRACTS	5665	5665	5554	5544	5667	5666	5552	5543
R2 WITHIN	0.013	0.026	0.144	0.188	0.001	0.007	0.063	0.114
	(17)	(18)	(19)	(20)				
	LOW STAYING AT HOME	*LOW STAYING AT HOME*	*HIGH STAYING AT HOME*	*HIGH STAYING AT HOME*				
	ΔlnNTL_1	ΔlnNTL	ΔlnNTL_1	ΔlnNTL				
CLOSED	-0.096**	-0.106**	-0.052	-0.071				
	(0.042)	(0.043)	(0.040)	(0.046)				
CONTROLS	YES	YES	YES	YES				
TRACT FE	YES	YES	YES	YES				
TIME FE	YES	YES	YES	YES				
OBS.	131482	121949	127794	118555				
N. OF TRACTS	5659	5657	5560	5552				
R2 WITHIN	0.023	0.016	0.036	0.038				

The table presents second-stage instrumental variables (IV) estimates. ΔlnNTL_1 and ΔlnNTL are the one-, and two-year difference in the log of nighttime lights, respectively. CLOSED equals 1 if the tract has experienced a closure, 0 otherwise. In columns 1-4, the sample is split using the 90^{th} percentile of the average 65+ SHARE, while in all other columns, the sample is split using the median of the average of the respective variable. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Table 6. Spillover analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	0-1 MILES	*1-2 MILES*	*2-3 MILES*	*3-4 MILES*	*4-5 MILES*	*5-6 MILES*	*0-1 MILES*	*1-2 MILES*	*2-3 MILES*	*3-4 MILES*	*4-5 MILES*	*5-6 MILES*
	ΔlnNTL_1	ΔlnNTL_1	ΔlnNTL_1	ΔlnNTL_1	ΔlnNTL_1	ΔlnNTL_1	ΔlnNTL	ΔlnNTL	ΔlnNTL	ΔlnNTL	ΔlnNTL	ΔlnNTL
CLOSED NEIGHBOUR	-0.094**	0.025	0.007	0.053**	0.026	0.014	-0.092**	-0.008	-0.013	0.023	-0.032*	-0.026
	(0.046)	(0.016)	(0.016)	(0.025)	(0.021)	(0.030)	(0.044)	(0.017)	(0.012)	(0.020)	(0.019)	(0.025)
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
TRACT FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
TIME FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
OBS.	240,504	240,504	240,504	240,504	240,504	240,504	259,276	259,276	259,276	259,276	259,276	259,276
N. OF TRACTS	11,209	11,209	11,209	11,209	11,209	11,209	11,219	11,219	11,219	11,219	11,219	11,219
R2 WITHIN	0.042	0.085	0.087	0.078	0.085	0.086	0.014	0.070	0.070	0.069	0.067	0.069

The table presents second-stage instrumental variables (IV) estimates. ΔlnNTL_1 and ΔlnNTL are the one-, and two-year difference in the log of nighttime lights, respectively. CLOSED NEIGHBOUR equals 1 if a neighbouring tract in the distance mentioned has experienced a closure, 0 otherwise. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

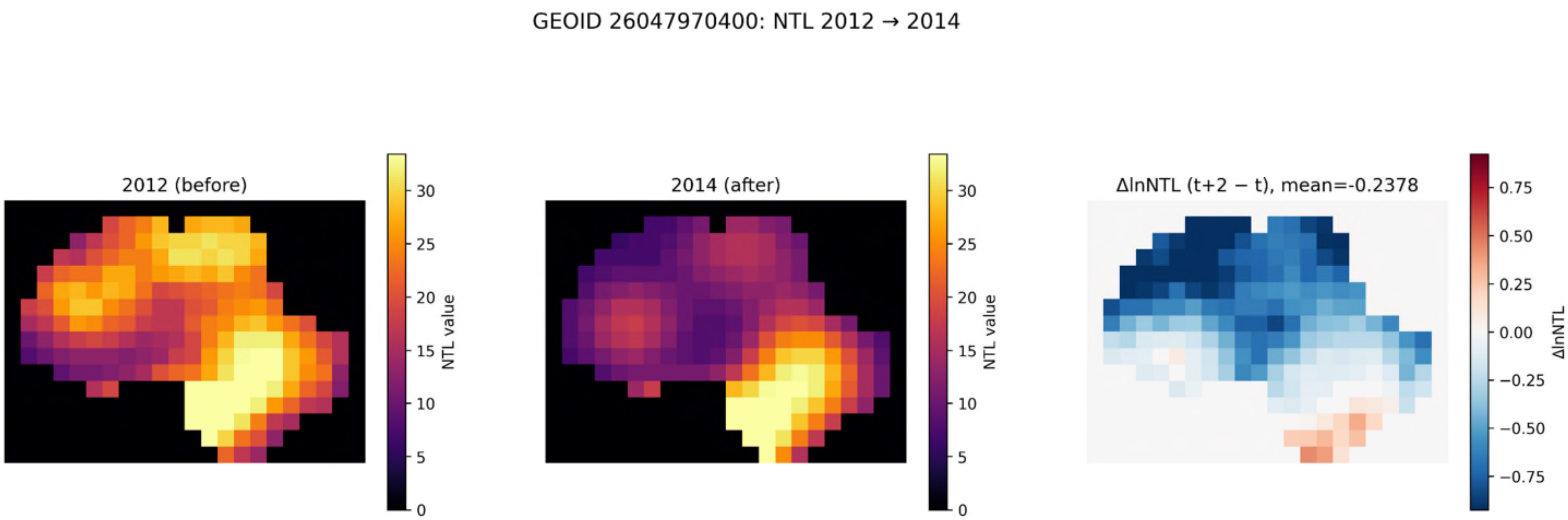

Figure 1. An example of change in NTL two years after a bank branch closure in a tract. This is an extreme example for illustration purposes.

Appendix

Table A1. Retail establishment counts as a complementary proxy for non-tradable local activity.

	(1)	(2)	(3)	(4)	(5)	(6)
	FULL SAMPLE	HIGH 65+ SHARE	LOW INCOME	LOW POP_DENSITY	LOW BLACK SHARE	LOW STAYING AT HOME
	ΔRETAIL	ΔRETAIL	ΔRETAIL	ΔRETAIL	ΔRETAIL	ΔRETAIL
CLOSED	-10.554	-2.022**	-1.867***	0.066	-2.182	-0.290
	(8.178)	(0.977)	(0.706)	(0.428)	(2.634)	(0.739)
CONTROLS	YES	YES	YES	YES	YES	YES
TRACT FE	YES	YES	YES	YES	YES	YES
TIME FE	YES	YES	YES	YES	YES	YES
OBS.	204,299	20,101	102,720	101,756	103,979	96,712
N. OF TRACTS	8,924	880	4,470	4,415	4,539	4,242
R2 WITHIN	0.000	0.000	0.004	0.019	0.000	0.016

The table presents second-stage instrumental variables (IV) estimates. ΔRETAIL is the two-year difference in the number of non-tradable retail establishments per tract-year collected from the National Neighborhood Data Archive (NaNDA). We define non-tradable retail stores as the ones in the following categories: clothing and shoes, furniture and appliances, hardware and garden, pet stores and pet supplies and shoe repairs. Results are qualitatively similar when using all retail categories. CLOSED equals 1 if the tract has experienced a closure, 0 otherwise. In column 2, the sample is split using the 90th percentile of the average 65+ SHARE, while in all other columns, the sample is split using the median of the average of the respective variable. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

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