

# **Navigating the Dual Financial Service System: Neighborhood-Level Predictors of Access to Brick-and-Mortar Financial Services**

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## **Abstract**

The availability of retail financial services in low-to-moderate income (LMI) neighborhoods remains a controversial topic, with significant underexplored questions about the potential presence of alternative financial service providers (AFSPs) and the absence of banks and credit unions (BCUs). In LMI neighborhoods across the United States, consumers regularly utilize AFSPs, including payday lenders, for basic financial transactions and services. This article addresses the geographic relationship between retail financial services locations, neighborhood-level demographic variables, and mortgage lending activity in three U.S. metropolitan study areas: Las Vegas, Nevada; Los Angeles, California; and Miami, Florida. The neighborhood-level predictors of the presence of both AFSPs and BCUs are examined at the Census-tract level using Ordinary Least Squares (OLS) and simultaneous autoregressive (SAR) statistical models. The results reveal that sociodemographic variables, including median household income and race/ethnicity, have a significant predictive relationship on AFSP location, even when controlling for spatial clustering.

*Keywords:* consumer finance, financial inclusion, financial services, payday lending, unbanked and underbanked households

## **Introduction**

WHILE THE MAJORITY of Americans complete their basic financial transactions at banks and credit unions (BCUs) and maintain an ongoing relationship with these mainstream services, a significant number remain outside of the formal banking system (U.S. Federal Deposit Insurance Corporation

2016). Consumers operating outside of the formal banking system may be more likely to rely on cash instead of credit cards and checks, and may utilize informal, alternative financial service providers (AFSPs) for basic financial transactions and credit products (Friedline and Despard 2016; Friedline and Kepple 2017). The presence of brick-and-mortar AFSPs—including car title lenders, check cashing outlets, money transmitters, pawn shops, payday lenders, refund anticipation lenders, and rent-to-own establishments—in low-to-moderate income (LMI) neighborhoods remains a controversial topic (Caskey 1994; Graves 2003; Belsky and Calder 2005; Prager 2014; Barth, Hilliard, and Jahera 2015; Dunham and Foster 2015). At the same time, the potential absence of BCUs in LMI neighborhoods is also a concern (Smith, Smith, and Wackes 2008; Ergungor 2010; Morgan et al. 2016; Dahl and Franke 2017). While access to AFSPs may be beneficial in terms of convenience or assisting with emergency, short-term financial needs, concerns persist over the high prices charged by these establishments and other questions surrounding fairness (Caskey 2012; Friedline and Kepple 2017).

This article examines potential unevenness in retail financial service provider locations by neighborhood type. It is hypothesized that neighborhood-level demographic variables and mortgage lending activity have a predictive relationship on the locations of both AFSPs, in this case payday lenders, and BCUs. The analyses are carried out in three U.S. metropolitan study areas: Las Vegas, Nevada; Los Angeles, California; and Miami, Florida. Improving upon prior spatial analysis research, the presence of retail financial services is examined using Ordinary Least Squares (OLS) and simultaneous autoregressive (SAR) models to test predictive relationships. The results of the analyses reveal that sociodemographic variables, including median household income, race, and educational attainment, have a significant predictive relationship of both payday lender and BCU location, even after controlling for spatial autocorrelation. These findings bring attention to the issue of availability of financial services in LMI and minority neighborhoods and contribute to the discourse on economic inequality across metropolitan areas in the United States.

## Literature Review

As a matter of public policy, financial inclusion is a term used to refer to a “state in which all working-age adults have effective access to credit, savings, payments, and insurance from formal service providers” (G20 Global Partnership for Financial Inclusion 2011, p. 1). Access to affordable financial products and services is a necessary condition for the successful asset-building strategies of LMI households (Barr and Blank 2011). Effective

access refers to the availability of safe and affordable financial products that are appropriate to the needs of consumers and also economically viable for the provider. Conversely, financial exclusion refers to a state whereby people lack access to financial services and instead rely on informal options, or options that have less-than-favorable terms (G20 Global Partnership for Financial Inclusion 2011). Still other definitions make a distinction between *access to* and *usage of* financial services (Kempson and Whyley 1999). Carbo, Gardener, and Molyneux (2005) extend the definition of financial exclusion to also consider self-exclusion and the reluctance of certain societal groups to engage with mainstream financial institutions for a variety of reasons. Access to financial services is not necessarily a predictor of actual utilization of these services (Demirguc-Kunt et al. 2014).

Addressing the domestic policy issue of financial exclusion, the U.S. Federal Deposit Insurance Corporation (FDIC) conducts the biennial *FDIC National Survey of Unbanked and Underbanked Households*. The 2015 survey collected responses from more than 36,000 households to provide estimates of the proportion of U.S. households that are unbanked, meaning they do not have an account at an insured institution, and the proportion that are underbanked, meaning they have a mainstream account, but also utilized an AFSP within the past twelve months. The survey finds that, in 2015, approximately 9 million U.S. households (made up of 15.6 million adults and 7.6 million children) were unbanked, while approximately 24.5 million U.S. households (made up of 51.1 million adults and 16.3 million children) were underbanked. These figures equate to approximately 7 percent and 19.9 percent of U.S. households, respectively (U.S. Federal Deposit Insurance Corporation 2016). The 2015 survey also finds that unbanked and underbanked rates are significantly higher in relatively lower-income households, less-educated households, younger households, Black and Latino households, and working-age disabled households.

Operating outside of the financial mainstream may be detrimental to the long-term financial stability of unbanked and underbanked households for a number of reasons. Reliance upon AFSPs possibly represents a financial burden to users because the price of services offered by AFSPs is likely higher than comparable services offered at mainstream BCUs (Cover, Fuhrman, and Garshick 2011). Absolute reliance on AFSPs may discourage the beneficial financial outcomes that are associated with maintaining a relationship with a BCU, and AFSP users lack the consumer protections that are in place at mainstream BCUs. Furthermore, consumers may be less likely to build a positive credit history, which may impede their ability to acquire a loan at

reasonable rates, for example to make investments in education or homeownership (U.S. Federal Deposit Insurance Corporation 2016).

Check cashing outlets are brick-and-mortar storefronts that primarily cash checks for a small fee. Some reasons that patrons may choose to utilize such services include cultural sensitivity and multilingual tellers, convenient locations, and a wide range of product offerings beyond check cashing (Dove Consulting 2000; Andre and Associates 2001; Kim 2001). Payday loans are typically made for \$500 USD or less and require a borrower to have a bank account and a guaranteed source of income through a job or government support program that can be verified (Gallmeyer and Roberts 2009).

While payday lenders may serve a legitimate purpose in helping borrowers meet short-term credit needs, payday loans carry high interest rates and have other features that may be less than ideal for borrowers. Payday loans carry an annualized interest rate that may be more than ten times that of a credit card (Bhutta 2014). Expressed as an annual percentage rate (APR), payday loan interest rates may be between 400 to 1,000 percent (Graves 2003; Caskey 2012). These loans can serve to trap borrowers in a cycle of debt (Stegman and Faris 2003). If a borrower is unable to pay off the loan within the specified time period, the payday lender may either deposit the borrower's original check that was offered as collateral, or renew the loan with additional interest and extension fees. The second option is referred to as a rollover. If the check is deposited, the borrower may be faced with the cost of a bounced check, and if a rollover occurs, the borrower may be faced with additional fees and interest that are prohibitive to repayment (Huckstep 2003). McGill and Monast (2006) estimate that 91 percent of payday loans are taken out by repeat borrowers. This suggests that payday loans are not only being used for emergencies, but as a strategy to meet routine expenditures.

Currently, thirty-two states allow payday lending to be carried out in check-cashing storefronts, with regulations on payday lending varying widely by state. At the federal level, there have been recent efforts to regulate the industry. In October 2017, the U.S. Consumer Financial Protection Bureau (CFPB) released their final rule on small dollar lending, which establishes consumer protections for certain consumer credit products, including requiring lenders to determine upfront whether customers can afford to repay their loans and other protections (U.S. Consumer Financial Protection Bureau, 2017).

LMI neighborhoods in the United States have a history defined by financial exclusion, including redlining that was addressed by the federal govern-

ment during the Civil Rights Era (Squires 1992; Denton 1996), and also reverse-redlining and targeting in the form of subprime and predatory mortgage lending leading up to the financial crisis of 2007–08 (Apgar and Calder 2005; Immergluck and Smith 2005; Darden and Wyly 2013). More theoretically informed scholarship views the landscape of consumer finance options as the observable result of larger market changes and an evolving social contract that serves to transfer the responsibility for financial security from the state to the individual citizen (Carbo, Gardener, and Molyneux 2005; Leyshon, French, and Signoretta 2008). Clark (2014) notes a growing importance and influence of finance in everyday life, requiring ever-greater individual-level financial literacy to navigate an increasingly complex landscape of financial services. These and other forces have led to an increasingly bifurcated, two-tiered (Squires and O'Connor 1998) or dual (Belsky and Calder 2005) financial service system, whereby different segments of society are served with different types of financial products and services.

### Prior Spatial Analysis Studies

An overriding question in the existing research on retail financial markets is whether location decisions are driven purely by economic considerations, or whether other factors come into play. The concept of financial exclusion was forwarded as a geographic phenomenon to address bank branch closures in low-income wards in the United Kingdom during the 1990s (Leyshon and Thrift 1993, 1995), and later expanded to refer to constrained access of individuals to mainstream financial services (Kempson and Whyley 1999). The concept of banking deserts refers to areas that have been abandoned by mainstream financial services (Thrift and Leyshon 1997). Existing geographic studies raise concerns that the prevalence of AFSPs and absence of BCUs in LMI and minority urban neighborhoods is not only a sign of economic distress in these neighborhoods, but also may present an ideal climate for predatory financial practices to occur (Karger 2005; Cover, Fuhrman, and Garshick 2011). Gallmeyer and Roberts (2009) argue that payday lending locations function as both an indicator and an exacerbating factor of community economic distress. Much of the ongoing research relies on the premise that the spatial organization of payday lenders may influence the potential risks to certain demographics of consumers who use their services (Stegman and Faris 2003).

A number of studies test the hypothesis that AFSPs are disproportionately located in low-and moderate-income neighborhoods and in areas that have comparatively higher percentages of minority residents. The rapid expansion of the AFSP industry in the 1990s, and the proliferation of the payday lend-

ing industry in particular, sparked research about the spatial distribution of AFSPs. Caskey (1994) uses the term “fringe banks” to describe money-service businesses (check cashers, pawnshops, and payday lenders) that operate outside of the realm of mainstream banking. He introduces a number of empirical methods, including regression analysis, to address the possible higher-than-average prevalence of AFSPs in low-income neighborhoods.

Technological advances in geographic information systems (GIS) have enhanced the ability of researchers to analyze spatial relationships. Graves (2003) gathers payday lender and bank location data in seven metropolitan areas in Louisiana and Illinois to analyze the relationship between locations and socioeconomic indicators. Examining the characteristics of neighborhoods within a quarter mile of payday lenders, Graves finds that payday lenders are disproportionately located in Census block groups with a higher percentage of poor and minority (primarily Black) residents. The study also finds that neighborhoods in near proximity to payday lenders are served by fewer bank branches.

Burkey and Simkins (2004) analyze payday lender locations in North Carolina and seek to reveal the factors that make a geographic area likely to attract this type of service. Using multivariate regression analysis, the authors relate the number of payday lenders to a number of independent socioeconomic and demographic variables within ZIP Codes. The authors conclude that payday lenders tend to locate in urban areas with relatively higher minority concentrations, younger populations, lower median incomes, and areas where individuals have comparatively lower levels of education. The authors also find that race is a powerful predictor of the locations of payday lenders in North Carolina, even after controlling for income, “urban-ness,” income inequality, and average educational levels. Specifically, the regression analysis reveals a statistically significant positive relationship between an increasing percentage of Black residents and the number of payday lenders within a ZIP Code. Additionally, ZIP Codes with higher densities of payday lenders are found to have higher concentrations of recent immigrants (Burkey and Simkins 2004). Immigrant communities may offer a potentially lucrative market for payday lenders because of barriers to traditional banking and the precarious financial situation of many immigrants. (Caskey 1994; Gallmeyer and Roberts 2009).

A study authored by Sawyer and Temkin (2004) for the now-defunct Fannie Mae Foundation addresses whether AFSPs are disproportionately located in minority and low-income neighborhoods, and investigates the prevalence

of mainstream financial institutions as compared to the concentration of AFSPs (check cashing outlets, payday lenders, and pawnshops) in eight metropolitan counties across the nation. The study areas are Cook County, Illinois (Chicago); Fulton County, Georgia (Atlanta); Harris County, Texas (Houston); Jackson County, Missouri (Kansas City); Los Angeles County, California; Miami-Dade County, Florida; Shelby County, Tennessee (Memphis); and Washington, D.C. Using Census tract-level data, the authors find that AFSPs are disproportionately located in minority and low-income neighborhoods in seven of the eight study areas. AFSPs are found to cluster in neighborhoods that are disproportionately Latino in all eight sites, but AFSPs are clustered disproportionately in Black neighborhoods in only two of the study areas (Sawyer and Temkin 2004).

Oron (2006) examines the relations between demographic variables (race, income, education, and the percentage of the local population employed by the military) and the geographic distribution of payday lending storefronts at the ZIP Code level for the entire state of Washington. The percentage of the population that is Black is found to be a statistically significant predictor of the number of payday lenders in a given ZIP Code. Payday businesses are found to be located more frequently in Black population centers by a factor of almost two after adjusting for population size, as well as economic and educational factors. Oron concludes that payday lenders are located in localities with a high percentage of Black residents. In addition to race, a strong relationship between payday lenders and ZIP Codes that have comparatively higher rates of poverty and lower rates of education is observed. Oron also finds that there are fewer bank branches on a per capita basis in Black population centers when compared with the rest of the state, and that bank branch location is positively associated with income and ZIP Codes having a large proportion of full college-degree holders.

Further incorporating spatial regression to analyze predictors of AFSP location, Damar (2009) examines the predictors of the locations of payday lenders in Oregon from 2002 to 2004. Using fixed-effects logit regressions of ZIP Code data, the author finds that payday lenders are more likely to locate in ZIP Codes that have comparatively more bank branches, larger populations, and higher percentages of Latinos. In regards to the relationship between AFSPs and mainstream financial institutions, the results of the analysis suggest that payday lenders are locating in areas already being served by banks.

Gallmeyer and Roberts (2009) use GIS and multivariate logistic regression to examine the interaction between payday lending locations and socio-economic variables across the Front Range communities of Colorado. The authors identify distinct patterns in the socioeconomic characteristics of communities that host payday lenders. Specifically, their results indicate that race/ethnicity, immigration, income, poverty, age groups, and military personnel concentration all affect the likelihood of payday lending locating in a neighborhood. Age is another factor that the authors address as a potential predictor of the presence of payday lenders. The authors also note that elderly populations may potentially be popular locations for payday lenders.

Cover, Fuhrman, and Garshick (2011) use GIS and multiple regression to examine AFSPs (including payday lenders, check cashers, pawn brokers, and money transmittal companies) in four small-to-moderate-sized metropolitan areas: Boise-Nampa, Idaho; Yakima, Washington; Rapid City, South Dakota; and Waterloo-Cedar Falls, Iowa. Testing whether AFSPs are more geographically accessible to predominantly minority neighborhoods, the authors find that, while market factors including zoning are powerful predictors of fringe bank locations, race/ethnicity is a strong predictor of location in two of the four study areas.

Dunham and Foster (2015) examine the prevalence of ASPs and BCUs in neighborhoods across southeastern Pennsylvania. Using spatial regression analyses, they find that AFSPs are disproportionately located in close proximity to neighborhoods with comparatively lower levels of educational attainment and higher rates of subprime mortgage lending. Conversely, they find that BCUs are disproportionately located in close proximity to neighborhoods with comparatively higher levels of median household income and educational attainment, and a lower percentage of black residents.

Building on the aforementioned research, this study examines neighborhood (Census tract)-level data across three metropolitan areas. A method is developed to calculate the mean distance between Census tracts and both AFSPs and BCUs. In addition to OLS analysis, this study incorporates SAR models to account for spatial autocorrelation, which has become an increasingly common practice in spatial analysis. Finally, in addition to sociodemographic variables, this study incorporates mortgage lending variables to provide a nuanced examination of how actual financial outcomes, not just sociodemographic variables, predict AFSP and BCU location.

## Study Areas

This research examines Census tract-level data across three metropolitan areas. Las Vegas, Nevada; Los Angeles, California; and Miami, Florida were chosen because they are places that have experienced comparatively higher-than-average rates of subprime lending (Mayer and Pence 2008), higher rates of mortgage foreclosure (RealtyTrac 2009), and greater declines in property values after the subprime mortgage crisis of 2008 (Pew Charitable Trusts 2013). These cities also have relatively high levels of income inequality as measured by Gini coefficient. Of the twenty-five most populous counties in the nation, Miami-Dade County has a Gini coefficient of 0.503, making it the second-most income-unequal county behind only New York County (Manhattan). The Gini coefficient in Los Angeles County is 0.489, the sixth highest in the nation. The Gini coefficient of Las Vegas is 0.434, making it the twenty-first highest in the nation (U.S. Census Bureau 2012).

The Las Vegas metropolitan area is comprised of Clark County only. According to the U.S. Census Bureau, Clark County has a combined population of 2,000,759 (U.S. Census Bureau 2014). As of 2010, 62 percent of the residents of Clark County identify as White, 32 percent as Latino, 11 percent as Black, and 6 percent identify as Asian. The population of Clark County increased by an estimated 22 percent between 2000 and 2010; and increased by 85 percent between 1990 and 2000. This growth places Clark County among the fastest-growing counties in the nation (U.S. Census Bureau 2014).

The Los Angeles metropolitan area, consisting of Los Angeles and Orange Counties, is the second largest U.S. metropolitan area in terms of population. The two counties have a combined population of 13,052,921. Los Angeles has a population of 9,819,000, making it the most populous single county in the nation. The population of Los Angeles increased by 3 percent between 2000 and 2010 (U.S. Census Bureau 2014). As of 2010, 50 percent of the residents of Los Angeles County identify as White, 48 percent as Latino, 11 percent as Asian, and 10 percent as Black (U.S. Census Bureau 2014).

The Miami metropolitan area is comprised of Miami-Dade, Broward, and Palm Beach Counties. The three counties have a combined population of 5,762,717. Miami-Dade County alone has a population of 2,496,435. The population of Miami-Dade County increased by 11 percent between 2000 and 2010 (U.S. Census Bureau 2014). As of 2010, 74 percent of the residents of Miami-Dade County identify as White, 65 percent as Latino, 19 percent as Black, and 1 percent as Asian (U.S. Census Bureau 2014).

## Data and Methods

To understand the spatial distribution of financial service providers, the locations of both payday lenders and BCUs were geocoded using GIS. Payday lender location was gathered using official state documentation acquired from the respective regulatory authorities in each state. Random spot checking of the data was completed by reviewing telephone books to ensure some measure of accuracy. BCU branch address data was gathered from the FDIC Summary of Deposits (U.S. Federal Deposit Insurance Corporation 2015) and geocoded using ArcGIS. Figures 1, 2, and 3 display the geographic distribution of BCU and AFSP locations in Las Vegas, Los Angeles, and Miami, respectively.

A value for distance was developed as follows. Euclidian distance between each Census tract in the study area and the nearest payday lender and BCU locations was calculated by creating a raster shapefile of each study area with 10m<sup>2</sup> cell resolution. A zonal statistics function was performed to calculate a measure of mean distance between the nearest payday lender location and every individual raster cell in each Census tract. The distance measure for each individual cell in the Census tract was then averaged, which provided a distance value for each Census tract. The same steps were completed to calculate a mean distance value of BCU location for each Census tract. These distance measures were then log transformed in order to reach a normal distribution. This resulted in a continuous variable suitable for regression analysis. The distance figures, distance to the nearest AFSP and to the nearest BCU, serve as the dependent variable in each set of analyses.

Demographic variables and 2010 Census tract boundaries were acquired from 2010 Census data. The choice of independent variables was informed by prior studies discussed in the literature review and include the following: population density, median household income, percentage of the population that is Black, percentage of the population that is Latino, percentage of the population that is Asian, percentage of the population that is age sixty-five or above, and percentage of the population age twenty-five and above that hold a high-school diploma. In cases where Census tracts did not have residents, they were omitted from the regression analysis.

Data on 2006 rates of mortgage lending were acquired from Home Mortgage Disclosure Act (HMDA) data made available by the Urban Institute (Urban Institute 2013).<sup>1</sup> Two mortgage variables are included in the analyses. Mortgage credit denial refers to when an individual applies for and is denied a mortgage. Subprime home purchase loans occur when a borrower acquires a

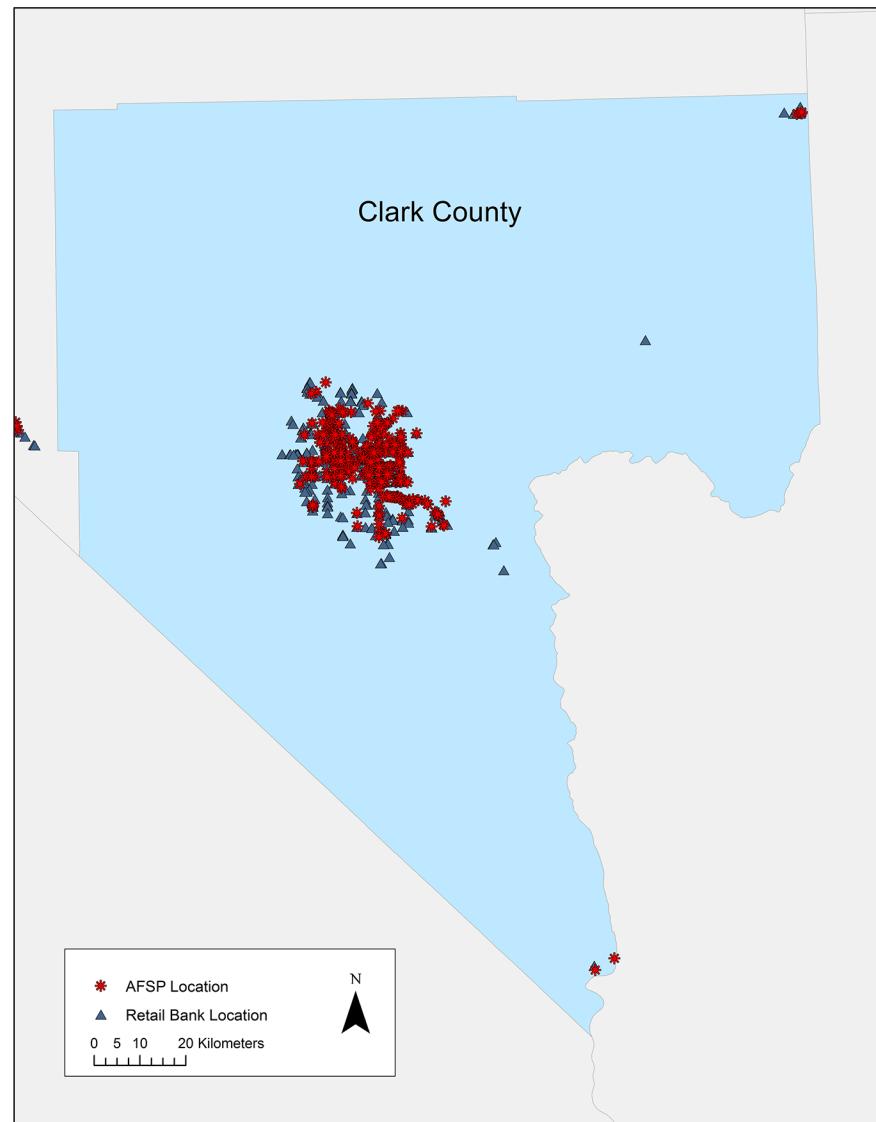


Figure 1.—Las Vegas Study Area AFSP and Bank Locations (Clark County, Nevada).

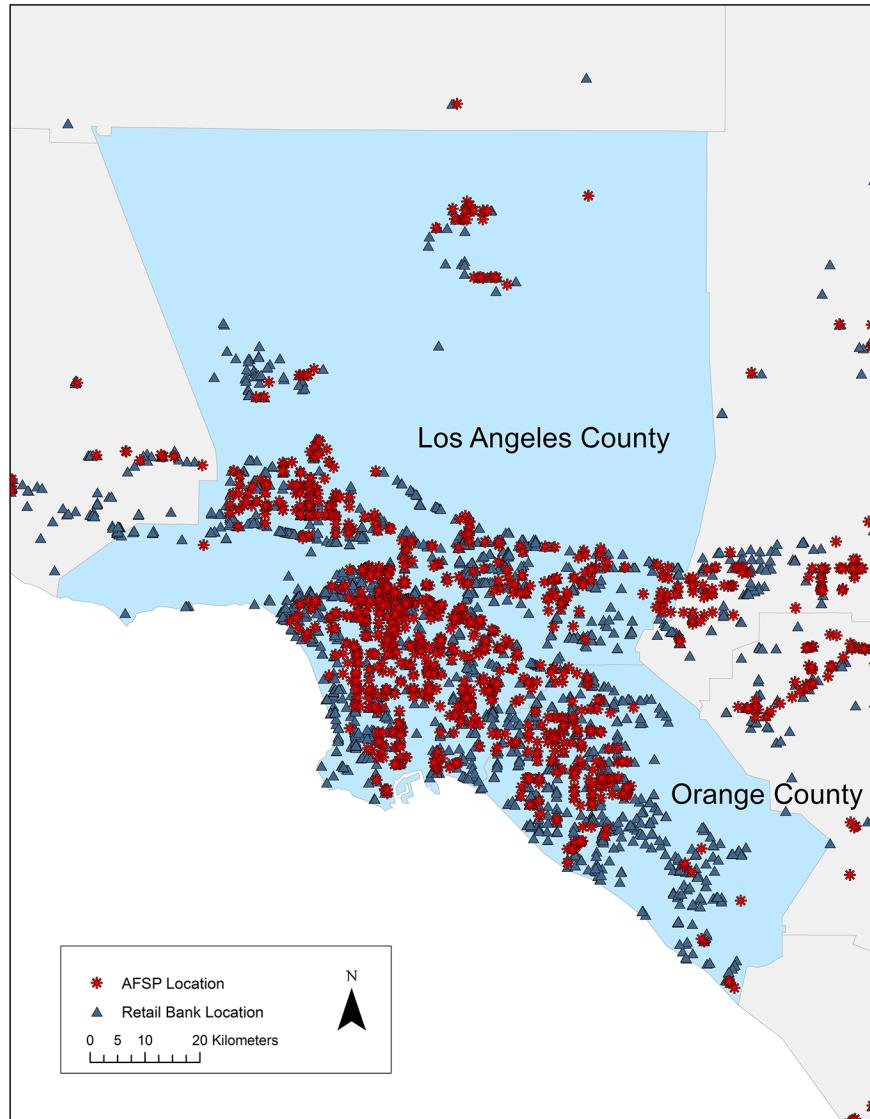


Figure 2.—Los Angeles Study Area AFSP and Bank Locations (Los Angeles and Orange Counties).

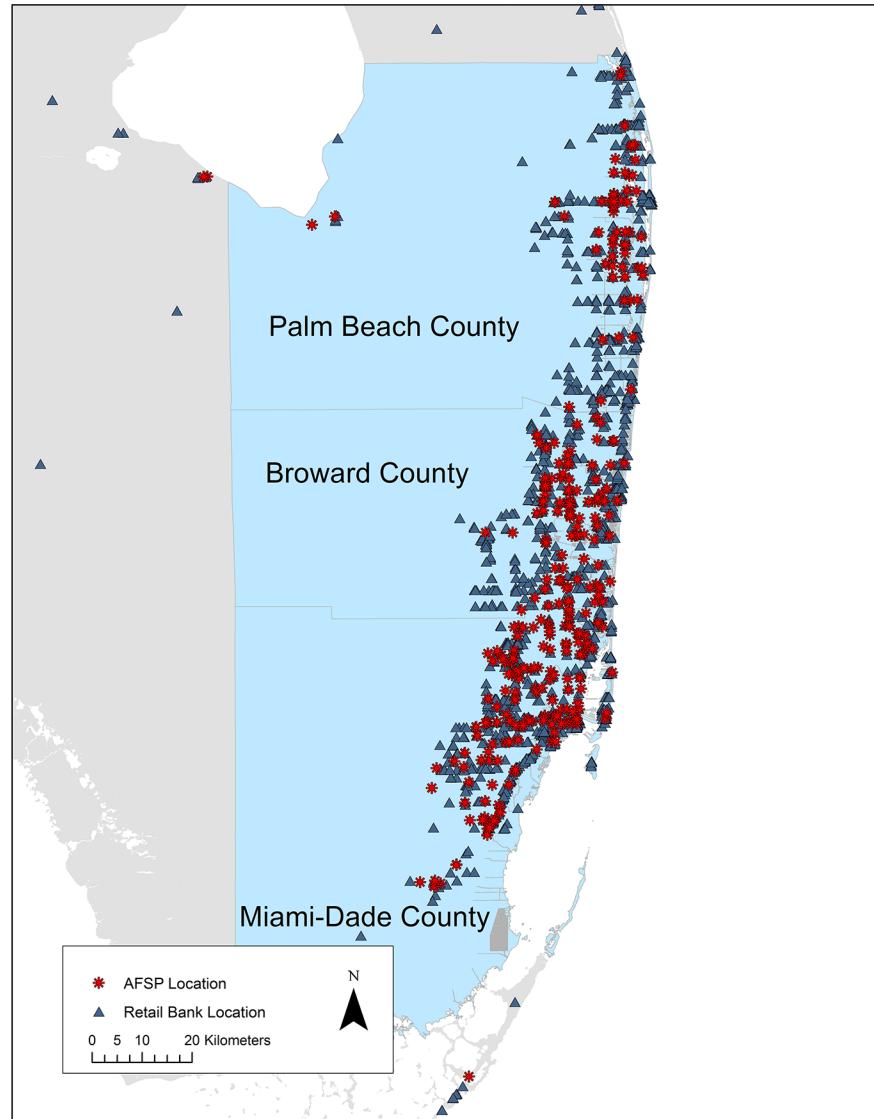


Figure 3.—Miami Study Area AFSP and Bank Locations (Miami-Dade, Broward, and Palm Beach Counties).

loan that is classified as subprime. The variables were converted into a raster grid and a “Zonal Statistics” function was performed in order to aggregate them at the 2010 Census tract level. Table 1 displays the descriptive statistics for Las Vegas, Los Angeles, and Miami, respectively.

**Table 1.—Descriptive Statistics: Mean Values for all Study Areas.**

Variable	Las Vegas		Los Angeles		Miami	
	Mean	SD	Mean	SD	Mean	SD
Log of AFSP Distance	2.56	0.92	2.42	0.83	2.69	0.73
Log of Bank Distance	2.39	0.72	2.18	0.63	2.16	0.59
Population Density	2,404	1,536	4,693	4,018	2,578	2,194
Median Household Income	57,467	21,887	64,829	31,283	53,959	26,325
Percent Black	10.18	8.89	7.07	12.41	20.02	25.67
Percent Latino	28.46	19.77	44.07	29.32	38.18	29.84
Percent Asian	8.23	7	14.36	15.51	2.14	2.57
Percent Age 65 Plus	12.61	10.47	11.52	6.55	18.38	15.1
Percent 25 Plus HS Diploma	82.95	13.79	76.46	18.65	83.65	12.13
Pct Mortgage Purchase Denial	22.82	7.32	26.56	10.08	27.01	7.46
Pct Subprime Mortgage Purchase	17.9	9.84	23.98	15.91	25.17	13.53
Number of Tracts (N)	487		2928		1219	

Multivariate spatial regression modeling is utilized to analyze the relationship between the distance to each type of service and Census tract demographics. First, OLS is carried out for each metropolitan area. The basic multivariate OLS model may be represented as:

$$y = \alpha + \sum \beta k x_k + e$$

where  $y$  equals the estimated Census tract-level log Euclidian distance,  $\alpha$  equals the intercept (constant),  $x$  represents each independent variable,  $k$  equals the number of independent variables included in the model, and  $e$  represents the random error term. Results were checked for multicollinearity, outliers, influential observations, and regression assumptions.

SAR modeling is then applied to examine the predictors of payday lender and BCU location. This process accounts for spatial clustering or autocorrelation that violates OLS assumptions of random, independent observation and errors (Chakraborty 2011). Tests were performed to detect spatial autocorrelation using the queen contiguity-based method for defining the spatial weights matrix. The Moran's I statistic, the standard measure of spatial clustering, reveals statistically significant, positive spatial autocorrelation for all of the models. Generally, there are two ways to incorporate spatial autocorrelation into regression models, with spatial error models associating the autocorrelation with the error term and spatial lag models associating it with the dependent variable (Chakraborty 2011). The Robust Lagrange Multiplier statistic was used to determine between spatial error and lag models (Chakraborty 2011), and as this statistic was higher for the spatial lag for all of the OLS regression models, spatial lag models were constructed to address spatial autocorrelation. The spatial lag model may be represented as:

$$y = \alpha + \sum \beta k x_k + \rho W y + u$$

where  $(\rho W)$  is a term for the spatial autoregressive coefficient (lag parameter) applied to the dependent variable ( $y$ ).

## Results

The first sets of results are descriptive in nature. Table 2 summarizes the findings on the number of payday lender and BCU branches in the study areas. The Las Vegas MSA has a total of 302 payday lender locations, and a population of more than 2 million people, which equates to 1.51 locations per resident. With 372 BCU branches, there are 1.86 bank branches for every 10,000 residents. The Los Angeles MSA has a total of 915 payday lender locations and a population of more than 13 million people, which equals 0.7 locations per resident. The Los Angeles MSA includes 2,498 BCU branches, or 1.91 bank branches for every 10,000 residents. The Miami MSA has 347 payday lender locations with a population of nearly 6 million, or 0.6 locations per 10,000 residents. The Miami MSA has 1,655 BCU branches, or 2.87 branches per resident. In summary, Miami has the greatest number of BCU branches per person, while Las Vegas has the greatest number of AFSP branches per person.

Table 2.—Summary of Retail Financial Service Locations in Study Areas.

Variable	Las Vegas (Clark County)	Los Angeles (Los Angeles and Orange Counties)	Miami (Miami-Dade, Broward, and Palm Beach Counties)
Total Population	2,000,759	13,052,921	5,762,717
FDIC-Insured Bank Branches	372	2,498	1,655
Bank Branches per 10,000 people	1.86	1.91	2.87
AFSP Branches	302	915	347
AFSPS per 10,000 people	1.51	0.7	0.6

The OLS models predicting distance to a payday lender and distance to a BCU were all statistically significant. Moving to the spatial lag model improved model fit, although the number of explanatory variables that are statistically significant decreased in all models. The Aikake's Information Criterion is lower and the r-squared is higher for all of the four models, suggesting that the SAR results represent an improvement over the traditional OLS method. The results of the SAR analysis are therefore the primary focus of this study. The results of the OLS model predicting the log Euclidian distance to AFSPs are displayed in Table 3. The results of the OLS model predicting the log Euclidian distance to BCUs are displayed in Table 4.

Table 3.—Ordinary Least Squares (OLS) Models Predicting Distance to an AFSP.

Variable AFSP Distance	Las Vegas	Los Angeles	Miami
Population Density	-0.314***	-0.323***	-0.304***
Median Household Income	0.17***	0.287***	0.29***
Percent Black	-0.004	-0.107***	-0.053
Percent Latino	-0.275***	-0.342***	-0.09**
Percent Asian	-0.021	-0.051***	0.015
Percent Age 65 Plus	-0.152***	-0.071***	0.017
Percent 25 Plus HS Diploma	-0.191**	-0.137***	-0.034
Percent Mortgage Purchase Denial	-0.23***	-0.01	-0.12***
Percent Subprime Mortgage Purchase	-0.132***	-0.072***	-0.081**
Adjusted r-squared	0.41	0.234	0.379
F	38.46	288.89	82.56
Moran's I (Queen)	20.27	60.333	32.738
Akaike's Information Criterion	527.67	2508.21	1051.32
Lagrange Multiplier (lag)	570.955	3140.296	1218.028
Robust Lagrange Multiplier (lag)	148.338	339.124	205.541
Lagrange Multiplier (error)	424.878	2934.163	1032.779
Robust Lagrange Multiplier (error)	2.26	132.991	20.292

Note: \*\*\*=p<.01, \*\*=p<.05, \*=p<.1

Table 4.—Ordinary Least Squares (OLS) Models Predicting Distance to a BCU.

<b>Variable Bank Distance</b>	<b>Las Vegas</b>	<b>Los Angeles</b>	<b>Miami</b>
Population Density	-0.462***	-0.393***	-0.447***
Median Household Income	0.104*	0.294***	0.216***
Percent Black	-0.022	0.098***	0.094**
Percent Latino	-0.178*	0.061	-0.055
Percent Asian	-0.06	-0.123***	-0.045*
Percent Age 65 Plus	-0.214***	-0.099***	-0.053*
Percent 25 Plus HS Diploma	-0.395***	-0.176***	-0.147***
Percent Mortgage Purchase Denial	-0.15***	0.025	-0.063**
Percent Subprime Mortgage Purchase	-0.085*	0.044**	0.105***
Adjusted r-squared	0.25	0.1	0.28
F	18.92	107.51	52.29
Moran's I (Queen)	23.21	55.26	33.21
Akaike's Information Criterion	508.89	3024.93	955.11
Lagrange Multiplier (lag)	549.67	2069.33	1229
Robust Lagrange Multiplier (lag)	83.38	144.75	201.51
Lagrange Multiplier (error)	497.01	1980.86	1065.31
Robust Lagrange Multiplier (error)	30.72	56.28	37.82

Note: \*\*\*=p<.01, \*\*=p<.05, \*=p<.1

Table 5 displays the results of the SAR analyses examining AFSP location. The dependent variable is distance to a payday lender. Population density is a statistically significant predictor in all three study areas. This indicates that payday lenders are more likely to locate in more-densely populated areas. Median household income is also a statistically significant predictor of distance to a payday lender in all three study areas. Median household income has a positive relationship, which indicates that, as income increases, distance to a payday lender also increases.

In terms of race, the percentage of the population that is Black has a statistically significant negative relationship in Miami. This suggests that the percentage of the population that is Black decreases as distance to a payday lender increases. Percent Latino is statistically significant with negative signs in Los Angeles and Miami, indicating that increasing percentages of Latinos predicts nearness to a payday lender. Percent of the population that

is age twenty-five and greater and hold a high-school diploma is found to be statistically significant across all three study areas, with a negative sign, which suggests that lower education levels are associated with nearness to a payday lender.

The results on mortgage lending activity are as follows. The percentage of mortgage applications that were denied is statistically significant with a negative sign in Las Vegas, which suggests that mortgage denial increases as nearness increases. The results are inverse in Los Angeles, suggesting that mortgage denial predicts greater distance. The percentage of mortgages made that were subprime is statistically significant with a negative sign in Los Angeles, suggesting that increased rates of subprime lending are a predictor of nearness to a payday lender.

Table 5.—Simultaneous Autoregressive (SAR) Models Predicting Distance to an AFSP.

<b>Variable</b>	<b>Las Vegas</b>	<b>Los Angeles</b>	<b>Miami</b>
Population Density	-0.00006***	-0.00002***	-0.00004***
Median Household Income	0.000002*	0.000002***	0.000002***
Percent Black	0.001	-0.001	-0.002***
Percent Latino	-0.003	-0.001***	-0.002**
Percent Asian	0.0003	0.0004	-0.006
Percent Age 65 Plus	-0.003	-0.001*	-0.001
Percent 25 Plus HS Diploma	-0.006*	-0.002***	-0.003***
Percent Mortgage Purchase Denial	-0.005*	0.001**	-0.002
Percent Subprime Mortgage Purchase	-0.0009	-0.002***	-0.00003
r-squared	0.835	0.838	0.798
Log Likelihood	-252.84	-1243.1	-514.66
Akaike's Information Criterion	527.67	2508.21	1051.32

Note: \*\*\*=p<.01, \*\*=p<.05, \*=p<.1

Table 6 displays the results of the SAR analyses testing the relationship between BCU distance and socioeconomic indicators and mortgage lending activity. The dependent variable is distance to a BCU. Population density is a statistically significant predictor in all three study areas, indicating that BCUs are more likely to locate in more-densely populated areas. Median

household income is a statistically significant predictor of distance to a BCU in Los Angeles and Miami, but not in Las Vegas. Median household income has a positive relationship in Los Angeles and Miami, indicating that, as income increases, distance to a BCU also increases.

In the Los Angeles Study Area, percent Black and percent Latino are statistically significant predictors of greater distance to a BCU. In Miami, percent Latino is statistically significant, with a negative sign, indicating that greater distance to a BCU is predicted by declining Latino populations. Percent of the population that is Asian is statistically significant in Los Angeles and Miami, with percent Asian predicting nearness to a BCU. Percent of the population that is age sixty-five and above is found to be statistically significant in all three study areas, indicating that greater distance to a BCU is predicted by declining aging populations. Percent of the population that is age twenty-five and greater and that hold a high school diploma is found to be statistically significant and negative across all three study areas, which suggests that lower education levels are associated with nearness to a BCU.

The percentage of mortgage applications that were denied is statistically significant with a positive sign in Los Angeles, suggesting that mortgage denial predicts greater distance from a BCU. The percentage of mortgages made that were subprime is statistically significant with a positive sign in Miami, suggesting that increased rates of subprime lending are a predictor of greater distance to a BCU.

Table 6.—Simultaneous Autoregressive (SAR) Models Predicting Distance to a BCU.

Variable	Las Vegas	Los Angeles	Miami
Population Density	-0.00009***	-0.00002***	-0.00006***
Median Household Income	0.000002	0.000003***	0.000002***
Percent Black	0.00001	0.002***	-0.0007
Percent Latino	-0.002	0.0003*	-0.001**
Percent Asian	0.0001	-0.001***	-0.01**
Percent Age 65 Plus	-0.006***	-0.004***	-0.0001**
Percent 25 Plus HS Diploma	-0.009**	-0.004***	-0.001***
Percent Mortgage Purchase Denial	-0.0006	0.002**	-0.0002
Percent Subprime Mortgage Purchase	-0.0009	-0.0005	0.003***
r-squared	0.698	0.647	0.609
Log Likelihood	-276.57	-1501.46	-651.57
Akaike's Information Criterion	575.14	3024.93	1325.15

Note: \*\*\*=p<.01, \*\*=p<.05, \*=p<.1

## Discussion and Conclusion

This article provides an examination of the geographic relationship between retail financial services locations, neighborhood-level demographic variables, and mortgage lending activity in three U.S. metropolitan study areas. The neighborhood-level predictors of the presence of both payday lenders and BCUs are examined using OLS and SAR statistical models. Median household income is a statistically significant, positive predictor of distance to a payday lender in all three study areas, which indicates that distance increases as income increases. In terms of race, the percentage of the population that is Black is a predictor of payday lender nearness in Miami, while percent Latino predicts nearness to an AFSP in Los Angeles and Miami. Neighborhoods with lower levels of high-school diplomas are predictive of nearness to a payday lender in all three study areas. The mortgage variables are less conclusive, but in Los Angeles, increased rates of subprime lending predict nearness to a payday lender.

In terms of nearness to a BCU, in Los Angeles and Miami, median household income increases as distance to a BCU increases, but not in Las Vegas. Per-

cent Black predicts greater distance to a BCU in Los Angeles only. Percent Latino predicts greater distance to a BCU in Los Angeles and Miami. Percent of the population that is Asian predicts nearness to a BCU in Los Angeles and Miami. Greater distance to a BCU is predicted by a decreasing percent of the population that is age sixty-five and above in all three study areas. An increasing percent of the population that is age twenty-five and greater and that hold a high-school diploma is predictive of nearness to BCUs across all three study areas. In terms of mortgage lending, mortgage denial predicts greater distance from BCUs in Los Angeles only. Increased subprime mortgage lending is predictive of greater distance to BCUs in Miami only.

One limitation to the spatial analysis approach is that, while it is generally accepted that financial exclusion is a form of social exclusion (Carbo, Gardener, and Molyneux 2005; Aalbers 2011), representing the relationship between financial ecologies and individual behavior has proved to be challenging, and therefore assigning causality to particular societal factors is problematic (Clark 2013). Spatial analysis studies have long addressed such limitations. The ecological fallacy warns against drawing inferences about individual behavior based on aggregated data (Waller and Gotway 2004). At the same time, geographic estimates of financial inclusion and exclusion serve as a starting point for understanding and informing future research that may take into account individual-level factors. Temporal mismatch between data sources is also a limitation, but the study is restricted to the availability of data. The question of the significance of distance also remains (e.g., Do people bank where they live?).

Another limitation of note is the issue of zoning and the potential overlap of land-use and sociodemographic variables. This study finds that both AFSPs and BCUs tend to locate in more densely populated areas. The AFSP industry has replied to concerns raised in the academic literature by claiming that location decisions are based on zoning, visibility, and nearness to a sizable customer base, not income or race (Lehman 2006). Unfortunately, controlling for zoning was not practical for this study. However, as is the case in other studies (Cover, Fuhrman, and Garshick 2011), we acknowledge that the inclusion of market-related variables may provide an alternative explanation to location decisions.

Noting the aforementioned limitations, this study is an exploratory attempt to analyze the neighborhood-level predictors of retail financial service location. While the reasons for consumers to remain unbanked and underbanked are likely more complex, convenience, and the presence of AFSPs and ab-

sence of BCUs in LMI neighborhoods, may be contributing factors. Taken in sum, the results of this study suggest that there is a relationship between sociodemographic variables and financial service location, and that there are significant differences present when comparing different metropolitan areas. These findings support the conclusion of the presence of a dual financial service system and serve as the impetus for further research.

## Notes

1 These HMDA data files ([http://www.metrotrends.org/natdata/hmda/hmda\\_download.cfm](http://www.metrotrends.org/natdata/hmda/hmda_download.cfm)) and the procedures for constructing them were initially developed by the Urban Institute to support DataPlace ([www.dataplace.org](http://www.dataplace.org)). The data are licensed under the Open Database License (<http://www.metrotrends.org/natdata/ODbL.cfm>).

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