Digital Redlining and the Fintech Marketplace: Evidence from U.S. Zip Codes

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The rise of digital technologies enables new manifestations of racialization in financial services with marketplace implications. Akin to redlining in the lending market, racialization in the spatial availability of digital technologies—including financial technologies or "fintech"—may raise the costs of banking in Black and Brown communities. This paper investigates associations between communities' racial makeup and rates of fintech by leveraging 2015 Esri Business Analyst Market Potential data from the universe of high-poverty zip codes. Poor Black and Brown communities experience a form of digital redlining by having the lowest fintech rates. Every percentage increase in a community's Black population was associated with an 18% decrease in their rate of high-speed internet access, 1% decrease in smartphone ownership, 12% decrease in online banking, and 3% decrease in mobile banking. Relationships were opposite for communities with increasing white populations where whiteness attracts higher rates of fintech, even amidst high poverty.

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INTRODUCTION

While racial discrimination in financial services such as redlining is not a new phenomenon (Baradaran 2017; Caplovitz 1968; Massey et al. 2016), the rise of digital technologies enables new manifestations with marketplace implications (Benjamin 2019a, 2019b; Noble 2018; Rhue 2019; Turner 2016). For example, computer algorithms target online advertisements for housing, jobs, and credit based on race (Chang 2016; Sweeney 2013), stratifying opportunities for renting a new apartment or applying for low-cost credit. Online reviews of businesses and restaurants that emphasize the surrounding communities' racial demographics may steer potential customers away from Black and Brown communities and influence economic investment (Besbris, Faber, and Sharkey 2019; Dalmage 2019; Zukin, Lindeman, and Hurson 2017). Lenders increasingly incorporate borrowers' social media histories and their communities' racial demographics into their decisions to extend credit (Hanson et al. 2016; Lin and Viswanathan 2016; Lizarazu et al. 2016; Nopper 2019). Considering all the above, digital technologies to a certain degree may replicate and reinforce redlining of Black and Brown communities by enabling racialized differentiation that determines access to critical resources and investments (Cohron 2015; Cottom 2016; Robinson 1983).

To examine how digital technologies affect racialization in the financial services marketplace, this paper investigates overlapping geographies of race, poverty, and financial technologies, or "fintech"—an array of digital technologies that facilitates consumers' marketplace transactions. We leverage novel data on the market potential or permeation of fintech within communities based on the full universe of zip codes in the U.S. and examine communities' rates of high-speed internet access, smartphone ownership, and online and mobile banking with merged sociodemographic data on race and poverty. We hypothesize that significant associations between racial demographics and rates of fintech exemplify added effects of racialization on already-marginalized high-poverty communities. Akin to redlining in the lending market, poor Black and Brown communities may experience a form of digital redlining.

A HISTORY OF REDLINING IN FINANCIAL SERVICES

The term redlining refers to a set of intentionally created and mutually reinforcing policies and practices implemented by banks, lenders, real estate agents, and government (Rothstein 2017; Taylor 2019). These policies excluded Black and Brown borrowers from the mortgage lending market by denying or discouraging their use and purchase of physical property (Rothstein 2017; Taylor 2019). When the Great Depression threw the housing market into tumult, policymakers established the Home Owners Loan Corporation (HOLC) in 1933 through New Deal legislation to provide homeowners with funds for refinancing their homes to avoid foreclosure or for repurchasing their already-foreclosed homes (Fishback, Rose, and Snowden 2013; Rothstein 2017). To disburse funds intended to provide homeowners with short-term relief, HOLC's appraisers developed residential security maps that rated the economic value of communities from most to least desirable: A–green to D–red. "Greenlined" communities were predominantly white while communities "redlined" as hazardous were predominantly Black and Brown (Aaronson, Hartley, and Mazumder 2019; Baradaran 2017; Rothstein 2017). Since banks and lenders would not originate new loans in redlined communities, Black and Brown borrowers were excluded from the mortgage market and from the benefits of accumulating wealth via home equity.

Policymakers' creation of the Federal Housing Administration (FHA) in 1934 further reinforced redlining. The FHA adopted HOLC's maps, including them in the Underwriting Handbook to guide redlining policy implementation in over 200 U.S. cities (Rothstein 2017). Meanwhile, mutually reinforcing policies and practices continued to guarantee the marginalization of Black and Brown communities. The FHA subsidized developers to mass produce “whites-only” subdivisions in city suburbs (Rothstein 2017; Taylor 2019). Exclusionary zoning laws, city ordinances, restrictive covenants, and predatory contract agreements geographically excluded Black and Brown people from using and purchasing certain types of property (Rothstein 2017; Taylor 2019). For example, predatory contract agreements devised by white property owners and lenders mined $3 to $4 billion in wealth out of Black communities in Chicago in the 1950s and 1960s, when up to 95% of homes were sold to Black families on contracts (George et al. 2019).

Legal efforts have been insufficient for ending redlining or reversing its impacts. At the very least, evidence indicates that Black and Brown communities are still disparately impacted (Besbris and Faber 2017; Faber 2017a, 2017b; Massey et al. 2016; Perry 2019; Taylor 2019). While the Fair Housing Act of 1968 ended legally-sanctioned redlining and the Community Reinvestment Act (CRA) of 1977 encouraged banks’ investments in lower-income communities (Rothstein 2017), banks and other lenders continue to extend less credit and lower-quality credit to Black and Brown borrowers (Baradaran 2017; Faber, 2017a, 2017b; Massey et al. 2016; Mitchell and Franco 2018). For example, banks targeted borrowers from Black and Brown communities for subprime mortgages in the years leading up to the Great Recession that began in 2007 (Been et al. 2009; Hwang et al. 2015; Hyra et al. 2013; Massey et al. 2016). During this time frame, borrowers living in communities that had been redlined in the mid-1930s were 69 percent more likely to be denied mortgages and 257 percent more likely to receive subprime loans (Faber 2017b). Moreover, the market’s subsequent collapse wiped out nearly all the wealth that Black and Brown households had accumulated (Dwyer and Lassus 2015; Hall et al. 2015; Rugh and Massey 2010).

The Great Recession has been largely blamed on a deregulated banking industry that took on unadvisable risks by widely selling risky mortgages (Mian and Sufi 2014). Policymakers deregulated the banking industry in the 1980s and 1990s as a rebuttal of the Community Reinvestment Act, clawing back regulations and undermining attempts at oversight (Baradaran 2015; Servon 2017). Deregulatory policies allowed banks to grow in size, serve larger geographic regions, and take on additional risks (FDIC 1997), precipitating banks' divestment from local communities in favor of serving more profitable communities (Apgar and Herbert 2006; FDIC 1997). For example, from 1985 to 2013, the number of banks and savings institutions that served higher-income communities increased by 40%, while the number of small banks (i.e., those with less than $100 million in assets) often located in lower-income communities declined by 85% (Peirce, Robinson, and Stratmann 2014).

Similar to redlining in the lending market, policymakers' decisions to deregulate the banking industry discouraged Black and Brown communities' access to financial services by precipitating a decline of "brick-and-mortar" branches (Brown, Cookson, and Heimer 2016; Celerier and Matray 2016). Bank branches were sparsely located in communities of color and lower-income white communities to begin with (Fowler, Cover, and Kleit 2014; Traweek and Wardlaw 2018; Rockoff 2018), and their declines amplified the racialized geography of financial services (Celerier and Matray 2016; Brown, Cookson, and Heimer 2016; Friedline and Despard 2017; Friedline, Dunham, and O'Brien 2019). For example, some communities of color lost half their branches since the Great Recession (Apgar and Herbert 2006; Celerier and Matray 2016; Kashian and Drago 2017; Toussaint-Comeau and Newberger 2017), and 20% of branches are projected to close over the next decade (Ensign, Rexrode, and Jones 2018; JLL 2017).

Payday lenders and check cashers quickly filled the vacuums that were left in communities by bank branch closures and began extending higher-cost, lower-quality credit to Black and Brown borrowers (Apgar and Herbert 2006; Baradaran 2015; Friedline and Kepple 2017). The number of payday lenders, check cashers, and other similar higher-cost alternative financial services has increased substantially since the 1980s and 1990s (Caskey 1994; Apgar and Herbert 2006), and this industry makes an annual profit of $300 billion by charging exorbitant interest rates and fees to lower-income consumers with limited credit histories (FDIC 2009). The growth of higher-cost alternative financial services has been concentrated in Black and Brown communities (Baradaran 2015; Faber 2017a, 2019; Fowler, Cover, and Kleit 2014; Friedline and Despard 2017; Friedline, Dunham, and O'Brien 2019; Friedline and Kepple 2017). At the county level, for instance, increases in the number of payday lenders per capita is associated with increases in a county's Black population (Fowler, Cover, and Kleit 2014). During the Great Recession check cashers in New York City capitalized on the foreclosure crisis and drastically increased their presence in Black and Brown communities between 2006 and 2011 (Faber 2017a).

DIGITAL REDLINING IN THE FINTECH MARKETPLACE

While technological advancements have fostered widespread banking access in developing countries that have fewer brick-and-mortar bank branches (Demirgüç-Kunt and Klapper 2012; Economist Intelligence Unit 2016; Rhyne and Kelly 2018), they may be enabling new, digital forms of redlining in the U.S. (Federal Reserve Bank of St. Louis 2018a, 2018b; Friedline, Naraharisetti, and Weaver 2020). In other words, racialized redlining in physical spaces can be replicated digitally. Financial technologies, also known as "fintech," are a wide array of digital technologies that facilitates marketplace transactions such as through online and mobile banking (Board of Governors of the Federal Reserve System 2016; Davis 2009; nLIFT 2018; Stewart 2018). Banks can leverage fintech to process mortgage applications and to mine consumers' digital information from social media activities and criminal histories to make lending decisions (Bouk 2015; Lauer 2017; Nopper 2019). Consumers can also use digital technologies like high-speed internet connections and smartphone applications to conduct financial activities online including depositing paychecks, paying bills, making transactions, and managing account balances.

As digital technologies play increasingly significant roles in consumers' financial activities (Davis 2009), communities' differential access to digital technologies that is created in coordination with internet service providers and technology companies emulates banks' and lenders' racialized decisions about extending capital and economic investment (Cottom 2016; Gilliard and Culik 2016; Gilliard 2018; Prieger 2002). In other words, policies and practices at the nexus of banking and digital technologies serve to marginalize, exclude, and exploit Black and Brown communities. For example, internet service providers decide where, how, and under what conditions to make high-speed internet available, often choosing to limit their services in Black and Brown communities (Smith 2018).

Differential access does not necessarily mean that digital technologies are entirely absent from communities. As described in the history of redlining, higher-cost, lower-quality financial services like subprime mortgages and payday loans are widely available in Black and Brown communities. Similarly, racialization in the spatial availability of digital technologies may create higher-cost, lower-quality fintech, raising the costs of banking and financial services in Black and Brown communities. Fintech's use is predicated on having an available internet connection, which is far from universal (Mills and Amick 2010; World Bank Group 2016) and least available in communities of color, lower-income white communities, and rural communities (PolicyMap 2018; Prieger and Hu 2008; Smith 2018). High-speed internet connectivity and unlimited data plans also come with additional costs, requiring Black and Brown consumers to spend more of their comparably lower incomes on fintech. Moreover, consumers can lose access to financial services and any money held in their bank accounts when their phone or internet service is disconnected—something that affects 41% of Black households per year and 14% of lower-income households (Gould-Werth and Seefeldt 2012; Heflin, London, and Scott 2011).

Taken together, we propose that digital redlining: (1) occurs at the nexus of banking or finance and digital technologies, (2) manifests from intentional and mutually reinforcing policies and practices across numerous actors, and (3) creates differential, increased costs of banking and financial services for Black and Brown communities. Moreover, while digital redlining can be geographically-based, digital technologies enable the virtual differentiation of individuals' economic value akin to how HOLC ratings and redlining made these determinations of communities. A person may live in a redlined community while individually experiencing digital forms of redlining that compounds their experiences of marginalization or exploitation. Under this framework, digital redlining can occur when banks decide to close branches in Black and Brown communities concurrently with internet service providers' decision to limit high-speed internet access in those same communities. While banks and internet service providers may make these decisions independently, the concomitant results shift costs to consumers and make banking more expensive. Digital redlining can also facilitate wealth extraction, akin to the predatory contract agreements devised by white property owners and lenders. For example, some fintech lenders have decided to charge higher interest rates to individual borrowers who attended Historically Black Colleges and Universities (HBCUs) and Hispanic-Serving Institutions (HSIs) (Student Borrower Protection Center 2020). The substantial amount of money lost to higher interest rates extracts wealth and economic resources from Black and Brown borrowers over time.

Digital redlining is becoming an increasingly critical issue to the well-being of marginalized communities as banks close their branches and encourage customers to use online and mobile banking.

While evidence of redlining is well established (Aaronson, Hartley, and Mazumder 2019; Baradaran 2017; Faber 2017a, 2017b; Rothstein 2017), few scholarly efforts examine racialized fintech landscapes in communities across the U.S. through the lens of digital redlining (Benjamin 2019b; Cottom 2016; Gilliard and Culik 2016; Gilliard 2018). Communities' differential rates of high-speed internet access, smartphone ownership, and online and mobile banking by race and poverty can shape their residents' access to the financial marketplace. Digital redlining may undermine fintech's potential and reinforce the marginalization experienced by Black, Brown, and lower-income white communities. Along these lines, this paper explores the overlapping geographies of race, poverty, and financial technologies to reveal the differential costs of fintech.

METHODS

Data

This paper used data from several sources to explore the market potential or permeation of financial technologies within communities. These data were retrieved from 2015 Esri Business Analyst Market Potential, 2014 Federal Deposit of Insurance Corporation (FDIC), 2014 National Credit Union Association (NCUA), and 2010-2014 US Census Bureau's American Community Survey (ACS). All data were collected at the zip code level and merged based on US Census Bureau Zip Code Tabulation Areas (ZCTAs). Zip codes were used as a proxy for communities given that the use of geographic space (i.e., activity space) is larger than smaller geographic units such as census blocks (Crawford, Jilcott Pitts, McGuirt, Keyserling, and Ammerman 2014). Since zip codes are a limited proxy for communities given that they are not geographic units and instead are defined by the US Postal Service, their use to descriptively measure fintech likely understates the extent of inequalities between communities.

We chose these data for several reasons, including the opportunity to examine population estimates at the community level. Existing data often overestimate fintech rates by focusing on individuals or households who already have bank accounts, meaning that they are more likely to use online and mobile banking than those without bank accounts. For example, the Board of Governors of the Federal Reserve (2016) reports a mobile banking rate of 53% among 1,762 adults that had both internet access and a bank account. Moreover, the Federal Reserve's (2016) ability to estimate fintech rates by race and poverty was limited given that their survey had an overall response rate of 8% and a response rate of only 3% among Black and Latinx[1] adults. Based on data from 35,217 households that participated in the Current Population Survey's Unbanked / Underbanked Supplement, the FDIC (2018) reports that 39% of households with a bank account used mobile banking in the past year, with a similar rate for Black- and Latinx-headed households. The FDIC also identifies wide gaps in high-speed internet access between households with and without bank accounts: 81% compared to 29%, respectively. The fintech data used in our current study offered an alternative or complementary picture because their estimates across American communities are not limited to individuals or households with bank accounts.

These data also provided the opportunity to examine the extents of connectivity or access at the community level, as opposed to individual or household levels. Fintech rates vary widely when data focus on communities or geographies, reflecting both real spatial variability and inconsistency across data sets. Community data tend to focus on high-speed internet and, while there is some attention to income or poverty, existing reports often fail to explicitly focus on communities' racial demographics (PolicyMap

1. While this paper uses the term Latinx to inclusively acknowledge peoples of Latin American origin who do not ascribe to gender binaries, the authors recognize that the term Latinx emerged in the United States context and can represent a form of linguistic imperialism. The authors also recognize the Latine movement that originated within trans and non-binary communities of Latin America as described by Raquel Reichard (2017).

2018; Prieger 2002; Prieger and Hu 2008; Smith 2018). For example, with data from the Federal Communications Commission, the Rural Opportunity Map visualizes widespread spatial variability across census tracts in access to broadband internet (Center for Rural Innovation 2017). While regarded as a source for accurate and up-to-date high-speed internet rates, the Federal Communications Commission's (FCC) data was recently criticized for vastly underestimating broadband internet rates (Lohr 2018). The FCC data come from internet service providers who may overestimate the availability of their high-speed internet services (PolicyMap 2018). Ninety-two percent of communities have broadband internet according to FCC data, compared to the much lower rates of 73% and 49% reported respectively by Pew Charitable Trusts and Microsoft (Pew Charitable Trusts 2019; Smith 2018). Moreover, while these data report on the spatial variability of high-speed internet access and smartphone ownership at the community level (Center for Rural Innovation 2017; Pew Charitable Trusts 2019; PolicyMap 2018; Smith 2018), they do not provide comparable estimates of online and mobile banking.

Therefore, data from Esri Business Analyst Market Potential presented several opportunities for exploring fintech rates that were unavailable or unreported in existing data. Esri data could be linked with other data for investigating race and poverty and for analyzing a wide set of covariates that correlated with fintech rates. For example, FDIC and NCUA data on bank and credit union branch density could be merged with Esri data for contextualizing online and mobile banking. Data measured at the zip code level enabled the exploration of communities' fintech rates, mirroring redlining at the community level and serving to demonstrate the extents of connectivity or access beyond individual or household levels. Moreover, Esri's fintech rates were estimated for all adults in communities, unlike data from Board of Governors of the Federal Reserve (2016) that preconditioned online or mobile banking rates on bank account ownership.

Fintech

There is lack of agreement on how to operationalize fintech, given the existence of varying and broad definitions (Accion 2017; nLIFT 2018; Pew Charitable Trusts 2018; Sueiro and Hasan 2018; Sy 2019). Recently, the Aspen Institute—a think tank committed to expanding communities' access to financial products and services—defines fintech as "technology innovations used to support or enable banking or financial services" (nLIFT 2018, 20). Under this definition, fintech can include high-speed internet access, smartphone applications, online and mobile banking, electronic payment transactions, peer-to-peer transactions, direct paycheck deposits, blockchain, and cryptocurrencies.

Given digital redlining's definition of using racialized differentiation to determine access to critical resources and investments (Benjamin 2019b; Cottom 2016; Gilliard and Culik 2016; Prieger 2002), we operationalized fintech as the digital tools that consumers use to access financial products and services. In other words, just as redlining prevent(ed) Black and Brown communities' access to financial services, the digital tools to which consumers have access for checking bank account balances, transferring money, or paying bills online may depend on their communities' racial and economic makeup. Therefore, we measured fintech as high-speed internet access, smartphone ownership, and online and mobile banking. This operationalization also incorporates the many ways that consumers use fintech, such as peer-to-peer transactions and direct paycheck deposits through online and mobile banking. Online and mobile banking are primary ways that consumers make transactions with their bank accounts held at brick-and-mortar branches (FDIC 2018), which are enabled by high-speed internet access and smartphone applications (nLIFT 2018).

Data by zip code on market potential for high-speed internet access, smartphone ownership, and online and mobile banking were collected from 2015 Esri Business Analyst Geographic Information

System (GIS) Market Potential.[2] Market potential data measure consumer demand at the local level, dividing the expected number of adult consumers by the total adult population (Esri 2018). Zip codes' market potential was measured as the expected number of adults who had high-speed internet access in their homes, owned smartphones, or used online and mobile banking any time within the preceding 12 months, divided by the total number of adults. These measures represent percentages among zip codes' entire adult population as opposed to smaller, defined segments of the population that have been the focus of prior research (e.g., mobile banking use among adults that have both smartphones and bank accounts; Board of Governors of the Federal Reserve System 2016).

Race and Poverty

In order to investigate the overlapping geographies of race and poverty, zip codes' race and poverty population demographics were collected from the 2010-2014 ACS. These variables measured the percentages of the populations within zip codes that identified as different racial groups and were living in poverty. For example, racial demographics were measured as the percentages of Black, Latinx, Asian, and American Indian/Alaska Native populations within zip codes, with higher percentages representing the populations' higher racialized concentrations.

The percent of the population living at or below the federal poverty level was also measured, and zip codes from the highest quartile of poverty (≥ 20%) were used to generate a high-poverty subsample for analyses. The tendency to conflate race and income can lead to biased assumptions that poverty drives significant associations. To address this, we focus on the relationships between race and fintech among

2. A description of Esri Market Potential data and methodology can be found here: http://downloads.esri.com/esri_content_doc/dbl/us/J9672_2018_Market_Potential_DB_Methodology_Statement.pdf

the high-poverty sample to examine the potential added or cumulative effects of racialization among already-marginalized and underserved communities.

Financial Services Demographics

Financial services demographics included the bank and credit union branch density of zip codes, as well as the percent of the population that owned a checking account. Bank and credit union branch data were collected through several sources. The FDIC and NCUA provided data for branch locations, including street addresses and zip codes. Bank branch locations were collected through the FDIC's summary of deposits, which provided quarterly information on all bank and bank branch locations. Quarterly information on credit union branch locations were collected through the NCUA call reports, which provided information on all credit union and credit union branch locations. Bank and credit union branch location data were retrieved from the fourth quarter in 2014. Density was calculated within zip codes by aggregating the locations of bank and credit union branches and calculating their total numbers of locations per 1,000 population. Density was capped at the 99th percentile. Zip codes with no matching density measure were considered to have no bank and credit union branches within their communities. Thirty-seven percent of zip codes did not have any bank or credit union branch.

The percent of the population that owned a checking account was collected at the zip code level from 2015 Esri Business Analyst Market Potential data. The percent checking account ownership represented the expected number of adults in a zip code who had a checking account any time within the preceding 12 months, divided by the total number of adults residing within the zip code. Percent checking account ownership was included in some models as controls given its likely correlation with rates of online and mobile banking.

Community Demographics

Community demographic data were collected from the US Census Bureau American Community Survey's (ACS) 2010 to 2014 five-year estimates and 2015 Esri Business Analyst. These data provided aggregate population estimates by zip codes. Variables constructed using data from ACS measure the percent of the population with a bachelor's degree, married, and age 65 and older, as well as the unemployment rate. These variables also indicated the percentage of the zip code that was considered rural, with higher percentages indicating greater rurality. For example, zip codes in large cities like Chicago, Illinois and Philadelphia, Pennsylvania had zero percent of their populations in rural areas, whereas zip codes in smaller cities like Gainesville, Florida and Johnstown, Ohio had respectively 22 and 63 of their populations in rural areas. Fifty percent of zip codes had populations that were in entirely rural areas. Population density was measured per 1,000 square feet and adjusted for zip codes' varying sizes.

From the 2015 Esri Business Analyst, variables measured the median net worth and percent of owner-occupied housing units as proxies for wealth. Median net worth was categorized from its continuous form in order to adjust for skewness, identifying zip codes that had zero and/or negative net worth and quartiles (zero/negative net worth; quartile 1: > $0 to ≤ $58,129; quartile 2: > $58,129 to ≤ $104,399; quartile 3: > $104,399 to ≤ $161,977; quartile 4: > $161,977).

Sample

The data included the full universe of zip codes in the United States (*N* = 31,778). In order to investigate the overlapping geographies of race and income, a separate sample of high-poverty zip codes was created based on having 20% or more of the population living at or below the federal poverty line (*N* = 7,700). As such, the subsample for our analyses represented all high-poverty zip codes within the United States (see Table 1). Among high-poverty zip codes, on average, 59% of the population reported having high-speed internet access in their homes (range from 0 to 97%; *SD* = 12.602) and 37% reported owning a smartphone (range from 0 to 76%; *SD* = 11.765). During the preceding year, 25% used online banking (range from 0 to 55%; *SD* = 8.114) and 7% used mobile banking (range from 0 to 19%; *SD* = 2.886). Zip codes' racial compositions included, on average, 16% Black (range from 0 to 98%; *SD* = 22.896), 14% Latinx (range from 0 to 100%; *SD* = 21.708), 2% Asian (range from 0 to 73%; *SD* = 4.323), and 3% American Indian/Alaska Native (range from 0 to 100%; *SD* = 14.145) populations. Consistent with the high-poverty subsample's identification, on average, zip codes had 30% of their population living at or below the federal poverty level (range from 20 to 100%; *SD* = 10.627). A majority of zip codes residents lived in rural areas (*M* = 60%; range from 0 to 100%; *SD* = 44.608) and the average unemployment rate was 8% (range from 0 to 50%; *SD* = 5.812). Fifty-eight percent of zip codes had net worth that ranged between $0 and $58,129—the lowest quartile for zip codes in the high-poverty subsample that reported net worth.

[Insert Table 1 about here]

Analysis Plan

The analyses included bivariate correlations and Ordinary Least Squares (OLS) regressions. Bivariate correlations were conducted between zip codes' percentages of high-speed internet access and online banking, and between smartphone ownership and mobile banking. Correlations served as a way to describe the extent to which online and mobile banking were respectively predicated on or correlated with high-speed internet access and smartphone ownership. OLS regression was used to examine relationships between communities' racial makeup and fintech while controlling for community and financial demographics (Kutner, Nachtsheim, Neter, and Li 2004). All data analyses were conducted in Stata 15.0 (StataCorp 2017).

RESULTS

Correlations

Correlations were conducted to test the associations between measures of fintech, and their results are presented here. Specifically, correlations were conducted between high-speed internet access and online banking, and between smartphone ownership and mobile banking. These analyses were undertaken to understand the extent to which a community's rate of online banking could be explained by their rate of high-speed internet access based on the strength of the association. For example, a higher correlation could suggest that high-speed internet access serves as a prerequisite for online banking. In the full sample inclusive of all levels of poverty (N = 31,778), the correlation between the rates of high-speed internet in the home and having banked online in the preceding year was $r = .865$ ($p < .001$). Similarly, the correlation between the rates of smartphone ownership and having used mobile banking in the preceding year was $r = .910$ (p < .001). Correlations between checking account ownership and online and mobile banking were also conducted, presuming that checking accounts were necessary for online and mobile banking. The respective correlations for the rates of checking account ownership with those of online and mobile banking were respectively $r = .688$ ($p < .001$) and $r = .380$ ($p < .001$).

In the high-poverty sample inclusive of zip codes where 20% of the population or greater falls below the federal poverty line (N = 7,700), the correlation between the rates of high-speed internet in the home and having banked online in the preceding year was $r = .870$ (p < .001). Similarly, the correlation between the rates of smartphone ownership and having used mobile banking in the preceding year was r = .794 (p < .001). The respective correlations for the rates of checking account ownership with those of online and mobile banking were respectively $r = .766$ (p < .001) and $r = .397$ (p < .001).

High-Speed Internet Access and Smartphone Ownership

Results from regression models predicting high-speed internet access in the home and smartphone ownership indicated the important roles of race and socioeconomics in high-poverty communities (See Table 2). Specifically, communities' higher percentages of Black and Brown populations were associated with lower rates of high-speed internet and smartphone ownership. Such negative associations were particularly strong for communities with higher percentage of Black (b = -0.18, p <.001) and Latinx populations (b = -0.16, p <.001). For instance, every percentage point increase in a zip code's Black population was associated with an 18% decrease in the rate of high-speed internet access. This associated decrease was 16% for Latinx population. Exceptions were found among communities with higher percentages of Asian and American Indian/Alaska Native populations. Communities' higher percentage of Asian population were associated with higher rates of high-speed internet access and smartphone ownership (b = 0.141, p <.001; b = 0.177, p <.001 respectively). The percentage of American Indian/Alaska Native population showed a complex relationship to the dependent variables: there was a negative association with high-speed internet access (b = -0.028, p <.001) and positive association with smartphone ownership (b = 0.031, p <.001).

Several socioeconomic factors were associated with communities' access to high-speed internet and smartphone ownership. For example, the percentage of college-educated adults was positively associated with high-speed internet in the home and smartphone ownership (b = 0.647, p <.001 and b = 0.341, p <.001 respectively). Results also indicated that median household net worth had sizable, positive associations with both high-speed internet access and smartphone ownership; such associations were strongest at the top net worth quartile (b = 0.631, p <.001 and b = 0.435, p <.001 for high-speed internet and smartphone ownership respectively). For instance, high-poverty zip codes from the top net worth quartile (> $161,977) were associated with a 63% increase in the rate of high-speed internet access and a 44% increase in smartphone ownership, all else being equal. Communities' higher rural percentage was associated with lower rates of high-speed internet access and smartphone ownership (*b* = -0.065, *p* <.001 and *b* = -0.050, *p* <.001 respectively). For every percentage point increase in the zip code's rural population, there were associated decreases of 7% and 5% in the rates of high-speed internet access and smartphone ownership. Bank and credit union density showed negative associations with both dependent variables, indicating that communities with fewer bank and credit union branches had lower rates of high-speed internet access and smartphone ownership (*b* = -0.008, *p* <.001 and *b* = -0.011, *p* <.001 respectively).

[Insert Table 2 about here]

Online and Mobile Banking

Table 3 shows results from regression models predicting rates of online and mobile banking. Model 3 shows that communities' higher percentages of Black and Brown populations were associated with their lower rates of online banking, especially with higher percentages of Black and Latinx populations (*b* = -0.121, *p* <.001 and *b* = -0.061, *p* <.001 respectively). Model 4 shows results of the regression model after adding controls for high-speed internet access and checking account ownership, which were previously found to be strong correlates of online banking. Compared to results shown in Model 3, there were several noticeable changes between communities' racial makeup and online banking. For example, Model 4 indicates that percentages of Latinx and American Indian/Alaska Native populations became positively associated with online banking (*b* = 0.036, *p* <.001 and *b* = 0.013, *p* <.001, respectively), while the sizes of the coefficients for communities' racial demographics decreased between the models. Moreover, both newly added controls showed strong positive associations with the rate of online banking (high-speed internet access: *b* = 0.336, *p* <.001; checking account ownership: *b* = 0.562, *p* <.001). For instance, every percentage point increase in a zip code's checking account ownership was associated with a 56% increase in the rate of online banking. This associated increase was 34% for high-speed internet access.

Socioeconomic profiles of communities showed significant associations with online banking. In Model 4, communities' higher percentage of college-educated adults was positively associated with online banking (b = 0.202, p <.001). Every percentage point increase in a zip code's population of adults with a bachelor's degree was associated with a 20% increase in the rate of online banking. In addition, communities' higher percentage of individuals aged 65 or older was negatively associated with online banking (b = -0.113, p <.001). Communities' percent rural population was also negatively associated with online banking, all else being equal. For every percentage point increase in the zip code's rural population, there was an associated decrease of .5% in online banking (b = -0.006, p <.001). In Model 3, prior to adding controls for checking account ownership and high-speed internet access, this associated decrease was 4%.

All net worth quartile variables were negatively associated online banking access in Model 4, once controls for high-speed internet access and checking account ownership were added. The negative associations were directional changes in their signs as compared to Model 3, where net worth quartiles were positively associated with online banking access. Compared to zip codes where median net worth was equal to or less than \$0, higher quartiles of net worth were negatively associated with rates of online banking. For instance, high-poverty zip codes with the first net worth quartile (between > \$0 to ≤ \$58,129) were associated with an 8% decrease in the rate of online banking, all else being equal.

Regression results predicting mobile banking showed that a similar set of factors were associated with these rates when compared to results predicting online banking (see Table 3, Models 5 and 6). Communities' higher percentages of Black, Latinx, and American Indian/Alaska Native populations were associated with decreased rates of mobile banking, all else being equal. In Model 6, every percentage point increase in a zip code's Black population was associated with a 1% decrease in the rate of mobile banking (b = -0.011, p <.001). Communities' higher percentages of Latinx and Asian populations were associated with increases in mobile banking rates (b = 0.005, p <.001 and b = 0.041, p <.001, respectively).

Communities' socioeconomic profiles were also significantly associated with mobile banking. The percentage of adults with college education was positively associated with mobile banking (b = 0.082, p <.001). Communities' higher percentage of individuals aged 65 or older was negatively associated with mobile banking (b = -0.113, p <.001). For every percentage point increase in the zip code's rural population, there was an associated decrease of .6% in mobile banking (b = -0.006, p <.001), providing some indication that mobile banking rates differed based on the extent of zip codes' rurality.

[Insert Table 3 about here]

To explicitly measure the relationship between racialized whiteness and fintech, Table 4 shows results from regression models predicting rates of high-speed internet access, smartphone ownership, and online and mobile banking using high-poverty zip codes' percent white population. Confirming the results presented above, communities' higher percentages of white populations were associated with their higher rates of high-speed internet access, online banking, and mobile banking. Communities' increasing white population and, given spatial patterns of segregation, the concurrent decreasing Black and Brown populations, is associated with higher rates of fintech. Every percentage point increase in a zip code's white population was associated with a 12% increase in the rate of high-speed internet access. Every percentage point increase in a zip code's white population was associated with increases of equal magnitude in the rates of online and mobile banking.

[Insert Table 4 about here]

DISCUSSION

Fintech's rise as a mechanism for marketplace transactions coincides with banks' closure of brick-and-mortar branches and their promotion of online and mobile platforms to deliver products and services. These trends have potential to replicate and reinforce redlining by amplifying the existing racialized geography of financial services and exacerbating consumers' marginalization from the financial marketplace (Faber and Friedline 2018; Friedline and Despard 2017; Friedline, Naraharisetti, and Weaver 2020). Banks' branch closures disproportionately occur in communities of color and lower-income white communities (Brown, Cookson, and Heimer 2016; Celerier and Matray 2016; Faber 2017; Fowler, Cover, and Kleit 2014; Kashian and Drago 2017; Toussaint-Comeau and Newberger 2017), and these communities also tend to have lower rates of high-speed internet access (Board of Governors of the Federal Reserve System 2016; Gould-Werth and Seefeldt 2012; Mills and Amick 2010; PolicyMap 2018; Prieger and Hu 2008). As a result, communities of color and lower-income white communities may be at risk for digital redlining. With limited scholarly attention paid to fintch in underserved communities, this paper fills a crucial gap in the current understandings of the overlapping geographies of race, poverty, and financial technologies and helps to illuminate racialization in the day-to-day financial marketplace.

This paper examines high-poverty communities' rates of fintech, including high-speed internet access, smartphone ownership, and online and mobile banking, and focuses on communities' racial makeup. The first key finding is that the average fintech rates among high-poverty communities are generally low, and these fintech measures are strongly correlated. For example, communities' average rate of smartphone ownership is only 37% and that of mobile banking is 7%. The strong correlations between measures of fintech suggest that rates of online and mobile banking are highly determined by rates of high-speed internet access and smartphone ownership. In other words, mobile banking is unlikely to be commonly used in a community where few residents own smartphones. Communities' high-speed internet access and smartphone ownership explained approximately 80% of the respective relationships with their rates of online and mobile banking. Therefore, based on these descriptive findings, online and mobile banking may not be substitutes for accessing basic financial services at brick-and-mortar bank branches in communities with low rates of high-speed internet access and smartphone ownership.

The second key finding that high-poverty communities' racial makeup is associated with rates of fintech, all else being equal provides evidence of a racialized marketplace. Generally, percent increases in high-poverty communities' Black, Latinx, and American Indian/Alaska Native populations are negatively associated with rates of fintech while percent increases in Asian population are positively related. Moreover, high-poverty communities with increasing Black, Latinx, and American Indian/Alaska Native populations experience decreases in their rates of high-speed internet access that are similar in magnitude to the increases in rates that communities experience with increasing Asian population. The relationships are opposite for communities with increasing white populations where—even amidst high poverty—whiteness attracts higher rates of fintech. Aligning with prior research examining access to basic financial services and fintech (Celerier and Matray 2016; FDIC 2018; Gould-Werth and Seefeldt 2012; Jorgensen and Akee 2017; Toussaint-Comeau and Newberger 2017; Mills and Amick 2010; Morduch and Schneider 2017), our findings suggest that the risks for experiencing marginalization from the financial marketplace may be greater among high-poverty Black and Brown communities.

At the same time, some exceptions arise across the models with regard to communities' racial makeup. These exceptions emerge when predicting online and mobile banking and after controlling for high-speed internet access, smartphone ownership, and checking account ownership. Once these controls are added, the regression coefficients' signs change from negative to positive for Latinx (both online and mobile banking) and American Indian/Alaska Native (online banking only) populations. In other words, after accounting for these strong correlates, percent increases in Latinx and American Indian/Alaska Native populations are positively associated with communities' rates of online and mobile banking. It is possible that communities with increasing Latinx and American Indian/Alaska Native populations may be more likely to use online and mobile banking in the presence of fintech and financial service prerequisites.

The third key finding is that bank and credit union branch density is negatively associated with high-poverty communities' rates of fintech, suggesting that online and mobile banking may be used less frequently in the presence of brick-and-mortar branches. For instance, every additional bank or credit union branch per 1,000 population in a zip code is associated with a .02% decrease in the rate of online banking. The coefficient's size does not change even after controlling for high-speed internet access and checking account ownership. While the regression coefficients are fairly small across the models, their significant negative trends indicate that communities may still use branch banking where brick-and-mortar options exist. These findings are far from conclusive; however, they are consistent with past studies indicating lower-income consumers' primary transactions with cash (Matheny, O'Brien, and Wang 2016) and their preferences to make transactions at brick-and-mortar branches (FDIC 2018).

The final key finding confirms the importance of communities' socioeconomic profiles, especially their higher levels of education and median net worth, in determining internet access and use of fintech. For example, every percentage point increase in communities' residents with a bachelor's degree is associated with an increase of 65% in the rate of high-speed internet access. The regression coefficient for the percent with a bachelor's degree remains comparatively high in the model predicting online banking, though the overall rate of online banking is low. The relationships are similar for net worth. High-poverty communities' top net worth quartile (> $161,977) is associated with a 9% increase in the rate of mobile banking, compared to communities' less than or zero net worth and with all else being equal. While noteworthy, these findings are not surprising given that research has consistently documented the importance of socioeconomic factors like education level and net worth for financial outcomes (Board of Governors of the Federal Reserve System 2016; Faber 2017a, 2017b; Fowler, Cover, and Kleit 2014; Friedline and Freeman 2016).

Limitations

The findings presented in this paper are not without limitations. The rates of fintech are estimated based on market segmentation data from Esri Business Analyst Market Potential, and therefore do not necessarily represent the extent of fintech available to a person in a given zip code. Residents may have used online banking in the preceding year because they have high-speed internet access at their work or nearby library—perhaps different locations from the zip code where they live. The possibility of people sharing computers and smartphones could also lead to underestimating the extent of access. Unfortunately, our data do not allow us to investigate nuanced access and availability.

The cross-sectional nature of the data prevented investigating changes over time in communities' rates of fintech and changes in their racial makeup and socioeconomic characteristics; however, this study is one of the first nationwide investigations of fintech in the context of a racialized marketplace. Moreover, the analyses include a range of important controls based on prior theory and research (Board of Governors of the Federal Reserve System 2016; Celerier and Matray 2016; Brown, Cookson, and Heimer 2016; Fowler, Cover, and Kleit 2014; Mills and Amick 2010), lessening endogeneity concerns.

Another limitation has to do with using zip codes as proxies for identifying communities. The availability of zip codes' fintech rates from 2015 Esri Business Analyst Market Potential made it possible to test the geographies of race, poverty, and financial technologies. However, zip codes are not geographic units (Grubesic 2008), and introduce bias into the results because their boundaries cover inconsistent square mileages and are not population-normed. We controlled for population density per square mileage to address this concern. Though, importantly, zip codes' limitations would actually bias the results downward and make the estimates *more* conservative—not overstated. The findings provide support for advancing this line of inquiry using more precise geographic units, such as census tracts.

CONCLUSION

The findings in this paper fill a gap in the existing literature on how the day-to-day financial marketplace is experienced differently across racial groups. The findings show that high-poverty communities' increasing Black, Latinx and American Indian/Alaska Native populations are associated with decreasing fintech rates, even after controlling for a broad range of financial and community demographics. These results are cause for concern because, as banks shutter their branches disproportionately in Black and Brown communities while shifting products and services online, unequal internet access and fintech rates will likely undermine consumers' participation in the financial marketplace. Racialization that raises the costs of banking and financial services in Black and Brown communities introduces a new manifestation of redlining: digital redlining.

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Table 1
Sample Characteristics

	High-Poverty Sample [a]	Full Sample
	Mean (SD) / Percent	**Mean (SD) / Percent**
Percent with High-Speed Internet in the Home	59 (12.602)	67 (13.980)
Percent of Smartphone Ownership	37 (11.765)	40 (11.723)
Percent Online Banking	25 (8.114)	31 (9.427)
Percent Mobile Banking	7 (2.886)	8 (3.309)
Percent Black	16 (22.896)	8 (15.344)
Percent Latinx	14 (21.708)	9 (15.143)
Percent Asian	2 (4.322)	2 (5.282)
Percent American Indian/Alaska Native	3 (14.145)	2 (8.453)
Percent Federal Poverty	30 (10.627)	15 (11.047)
Population Density per 1,000 sq / ft	10.080 (14.634)	9.894 (13.790)
Percent Bachelor's Degree	11 (7.106)	15 (8.417)
Percent Married	39 (11.629)	45 (9.274)
Percent Age ≥ 65	6 (2.864)	6 (2.374)
Percent Rural	60 (44.608)	61 (43.544)
Unemployment Rate	8.244 (5.194)	6.025 (4.028)
Percent Owner-Occupied Housing	25 (10.001)	29 (7.710)
Median Net Worth		
Negative and/or Zero Net Worth	3	1
Quartile 1	58	24
Quartile 2	23	25
Quartile 3	10	25
Quartile 4	5	25
Bank and Credit Union Density	.444 (.842)	.433 (.681)
Percent Checking Account Ownership	25 (5.291)	28 (4.634)
N	7,700	31,778

Note. Data from 2015 Esri Business Analyst Market Potential, 2010-2014 American Community Survey (ACS), 2014 Federal Deposit Insurance Corporation (FDIC) fourth quarter summary of deposits, 2014 National Credit Union Administration (NCUA) fourth quarter call reports. [a] The high-poverty sample included zip codes with poverty rates in the 75th percentile, which corresponded to ≥ 20% of the population above federal poverty level.

Table 2

Regression Models Predicting Population Percentages with High-Speed Internet Access in the Home and Smartphone Ownership among High-Poverty Zip Codes (N = 7,700)

	High-Speed Internet in the Home	**Smartphone Ownership**
	Model 1 β **(SE)**	**Model 2** β **(SE)**
Percent Black	–.180 (.006)***	–.014 (.006)*
Percent Latinx	–.156 (.006)***	–.016 (.005)**
Percent Asian	.141 (.029)***	.177 (.027)***
Percent American Indian/Alaska Native	–.028 (.008)***	.031 (.008)
Percent Federal Poverty	–.001 (.001)***	–.001 (.001)***
Population Density	.001 (.001)***	.001 (.001)***
Percent Bachelor’s Degree	.647 (.026)***	.341 (.025)***
Percent Married	–.119 (.017)***	–.145 (.016)***
Percent Age ≥ 65	–.016 (.062)	–.536 (.059)***
Percent Rural	–.065 (.003)***	–.050 (.003)***
Unemployment Rate	–.001 (.001)**	.001 (.001)*
Percent Owner-Occupied Housing	–.096 (.022)***	–.205 (.020)***
Median Net Worth (Reference: Negative and/or Zero Net Worth)		
Quartile 1	.527 (.039)***	.393 (.036)***
Quartile 2	.557 (.039)***	.402 (.037)***
Quartile 3	.584 (.039)***	.401 (.037)***
Quartile 4	.631 (.039)***	.435 (.037)***
Bank and Credit Union Density	–.008 (.002)***	–.011 (.002)***
Constant	.142 (.038)***	.103 (.037)**
R^2	.495	.499
N	7,700	7,700

Note. Data from 2015 Esri Business Analyst Market Potential, 2010-2014 American Community Survey (ACS), 2014 Federal Deposit Insurance Corporation (FDIC) fourth quarter summary of deposits, 2014 National Credit Union Administration (NCUA) fourth quarter call reports.

Table 3

Regression Models Predicting Population Percentages using Online and Mobile Banking among High-Poverty Zip Codes (N = 7,700)

	Online Banking		Mobile Banking	
	Model 3 **β (SE)**	**Model 4** **β (SE)**	**Model 5** **β (SE)**	**Model 6** **β (SE)**
Percent Black	–.121 (.004)***	–.013 (.002)***	–.027 (.001)***	–.011 (.001)***
Percent Latinx	–.061 (.004)***	.036 (.002)***	–.011 (.001)***	.005 (.001)***
Percent Asian	.002 (.018)	.007 (.010)	.045 (.005)***	.041 (.005)***
Percent American Indian/Alaska Native	–.004 (.005)	.013 (.003)***	–.007 (.001)***	–.008 (.001)***
Percent Federal Poverty	–.001 (.001)***	–.001 (.001)***	–.001 (.001)***	–.001 (.001)***
Population Density	.001 (.001)***	.001 (.001)**	.001 (.001)***	–.001 (.001)
Percent Bachelor's Degree	.491 (.017)***	.202 (.010)***	.140 (.004)***	.082 (.004)***
Percent Married	–.056 (.011)***	–.020 (.006)**	–.046 (.003)***	–.031 (.003)***
Percent Age ≥ 65	–.113 (.040)**	–.104 (.021)***	–.172 (.014)***	–.113 (.010)***
Percent Rural	–.043 (.002)***	–.005 (.001)**	–.016 (.001)***	–.006 (.001)***
Unemployment Rate	–.001 (.001)***	–.001 (.001)	.001 (.001)	.001 (.001)
Percent Owner-Occupied Housing	–.051 (.014)***	–.011 (.007)	–.045 (.005)***	–.020 (.004)***
Median Net Worth (Reference: ≤ Zero Net Worth)				
Quartile 1	.208 (.025)***	–.076 (.013)***	.076 (.009)***	.002 (.006)
Quartile 2	.236 (.025)***	–.069 (.013)***	.082 (.009)***	.003 (.006)
Quartile 3	.258 (.025)***	–.065 (.013)***	.081 (.009)***	–.001 (.006)
Quartile 4	.288 (.025)***	–.055 (.013)***	.087 (.009)***	.001 (.006)
Bank and Credit Union Density	–.002 (.001)*	–.002 (.001)***	–.001 (.001)**	–.001 (.002)**
Percent Checking Account Ownership	--	.562 (.012)***	--	.168 (.004)***
Percent High-Speed Internet in the Home	--	.336 (.005)***	--	--
Percent Smartphone Ownership	--	--	--	.109 (.002)***
Constant	.084 (.025)**	–.019 (.014)	.033 (.009)***	.005 (.006)
R^2	.522	.854	.541	.747
N	7,700	7,700	7,700	7,700

Note. Data from 2015 Esri Business Analyst Market Potential, 2010-2014 American Community Survey (ACS), 2014 Federal Deposit Insurance Corporation (FDIC) fourth quarter summary of deposits, 2014 National Credit Union Administration (NCUA) fourth quarter call reports.

Table 4

Regression Models Predicting Fintech with Percent White Population among High-Poverty Zip Codes (N = 7,700)

	High-Speed Internet Access β (SE)	**Smartphone Ownership β (SE)**	**Online Banking β (SE)**	**Mobile Banking β (SE)**
Percent White	.123 (.004)***	.001 (.005)	.010 (.004)***	.010 (.001)***
Percent Federal Poverty	–.001 (.001)***	–.001 (.001)***	–.001 (.001)***	–.001 (.001)***
Population Density	.001 (.001)***	.001 (.001)***	.001 (.001)***	.001 (.001)
Percent Bachelor's Degree	.784 (.018)***	.388 (.016)***	.186 (.004)***	.086 (.003)***
Percent Married	–.142 (.017)***	–.146 (.016)***	–.003 (.003)***	–.024 (.003)***
Percent Age ≥ 65	–.144 (.062)*	–.580 (.056)***	–.142 (.014)***	–.118 (.010)***
Percent Rural	–.039 (.004)***	–.044 (.004)***	–.005 (.001)**	–.006 (.001)***
Unemployment Rate	–.001 (.001)	–.001 (.001)**	–.001 (.001)	.001 (.001)
Percent Owner-Occupied Housing	–.069 (.014)***	–.221 (.019)***	–.063 (.007)***	–.038 (.003)***
Median Net Worth (Reference: ≤ Zero Net Worth)				
Quartile 1	.500 (.039)***	–.384 (.036)***	.062 (.014)***	.003 (.006)
Quartile 2	.532 (.039)***	–.394 (.036)***	.054 (.014)***	.003 (.006)
Quartile 3	.560 (.039)***	–.393 (.036)***	.050 (.014)***	–.001 (.006)
Quartile 4	.605 (.039)***	–.426 (.036)***	.039 (.014)**	.001 (.006)
Bank and Credit Union Density	–.007 (.002)***	–.011 (.002)***	–.004 (.001)***	–.001 (.001)***
Percent Checking Account Ownership	--	--	.538 (.012)***	.160 (.004)***
Percent High-Speed Internet in the Home	--	--	.334 (.006)***	--
Percent Smartphone Ownership	--	--	--	.113 (.002)***
Constant	.014 (.041)	.109 (.037)***	–.020 (.014)	–.001 (.006)
R^2	.426	.493	.844	.739
N	7,700	7,700	7,700	7,700

Note. Data from 2015 Esri Business Analyst Market Potential, 2010-2014 American Community Survey (ACS), 2014 Federal Deposit Insurance Corporation (FDIC) fourth quarter summary of deposits, 2014 National Credit Union Administration (NCUA) fourth quarter call reports.

Digital Redlining and the Fintech Marketplace: Evidence from U.S. Zip Codes

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