2021

Rural Access to Credit in Vermont: An Examination of Rural Vermont's Access to Credit and Regulated Lenders in the Wake of a Consolidated Banking Industry and the Subprime Crisis

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May 5th, 2021

Abstract

This thesis examines rural Vermont's access to credit in the context of historical bank consolidation and in the wake of the subprime crisis. For the purposes of this study, "rural" is defined using Rural-Urban Commuting Codes, calculated by the United States Department of Agriculture. Access to credit is measured by proximity to lenders regulated by the Community Reinvestment Act or to credit unions, as well as by loan application outcomes, specifically loan origination and denial rates. Proximity to a regulated lender is measured by people per depository institution, a metric created by the author, and is compared over a forty-year span between 1980 and 2020. Loan application outcomes are measured from Home Mortgage Disclosure Act data, using loan origination and denial rates by census tract in 2007 and 2017. These years were chosen in order to compare loan application outcomes immediately before the subprime crisis and in the decade which followed. The metrics calculated are then compared in rural parts of the state to the rest of Vermont. A regression analysis is also included which regresses loan application outcomes against a census tract's status as rural, as well as other factors which could contribute to its loan application outcomes. Ultimately, this study found that rural parts of the state have reduced access to CRA-regulated lending institutions and credit unions, have lower loan origination rates, and have higher loan denial rates. These indicate a relative lack of access to credit in rural Vermont.

Contents

I. Introduction

As a country, the "wealth gap" has been a central focus of national discourse and policy goals for decades. Though these discussions often include a variety of subjects and proposals, access to credit has long been at the forefront of the economic equality conversation. Americans have always experienced unequal access to credit, and these inequalities are often drawn geographically. Decades of research and policy have examined access to credit through the lens of racial discrimination and redlining, as these practices have critically undermined American economic and credit equality. While these sorts of urban geographic credit problems are a major barrier to economic equality, other geographic limitations play important roles in access to credit, too. This paper takes this into account by examining rural access to credit in Vermont compared to non-rural access. While some literature surrounding rural access to credit does exist, it is far from extensive, and no rural-nonrural comparison has been done in the state of Vermont.

Trends in banking consolidation and an economy in the wake of the subprime crisis makes an examination of lending practices in rural places relevant today. For decades, the banking industry has been trending away from small, local banks in favor of larger banks. Today, these larger banks control the vast majority of assets and originate more than half of America's loans, but are mostly headquartered in urban or suburban places. Not only does this mean that most of the lending industry's purchasing power is geographically distant from rural America, literature such as that published by Ergungore (2010) shows that proximity to lending institutions increases access to credit. A lending industry which has experienced a shift away from rural America indicates a potential barrier in rural Americans' credit access. Further, studies such as those published by the Federal Reserve of Minneapolis (2017) and Cole (2020) show that urban

America's successful recovery from the subprime crisis relative to rural America's has widened a gap in loan application outcomes.

In this paper, an analysis of access to credit in rural and non-rural Vermont uses proximity to a regulated lender and loan application outcomes as access to credit metrics. "Rural" is measured using rural-urban commuting area (RUCA) codes published by the United States Department of Agriculture's Economic Research Service. The presence of regulated lenders in Vermont's least- and most-rural counties relative to the counties' population is examined. Mortgage application outcomes by census tract are examined in the years 2007 and 2017, using data obtained via the Home Mortgage Disclosure Act and published by the Consumer Financial Protection Bureau. These outcomes are then compared in rural and non-rural tracts. The years 2007 and 2017 were chosen in order to compare mortgage application outcomes before and after the subprime crisis. Ultimately, the findings of this paper have important implications for economic vitality and equality in Vermont, as well as in other states with large rural populations.

II. Access to Credit And Relevant Legislation

A. A Brief History of Access to Credit

The history of lending in America is tied closely to the history of economic opportunity. Access to credit means the possibility of owning a home, starting a business, or purchasing a car. The modern middle class was built on credit, as cheap loans allowed families to move to the suburbs following World War II (Hyman, 2011). In the mid-20th century Americans were buying everything from homes to clothing on credit, refinancing as needed (Hyman, 2011). The practice bolstered the post-war economy, as American consumerism pushed this country into the forefront of economic growth. But while the benefits of lending built the middle class, credit also

served as a divisive force. Postwar lending was characterized by discrimination, as African Americans and women had substantially reduced access to credit, and a two-tiered lending industry emerged which left poor Americans unable to utilize the same financial tools as wealthier Americans.

The lack of credit access made it very difficult for Black Americans to leave their neighborhoods, as well as for women to gain economic independence (Krippner, 2017). In 1967, seventy percent of low-income consumers could only receive credit from low-income retailers (Hyman, 2011). These retailers generally upcharged their products compared to high-income retailers in wealthier neighborhoods, as the low-income retailers could not receive investment from finance companies and had to borrow directly from the bank. Thus, poorer Americans had to spend more on goods than wealthier Americans and were geographically limited in where they could make credit-driven purchases. In an economy in which credit was a dominant purchasing force, this left low-income Americans at a severe disadvantage.

B. The Introduction of the CRA

The Community Reinvestment Act (CRA) was passed in 1977 with the goal of increasing access to credit for low- and moderate-income (LMI) Americans (Butcher & Muñoz, 2013). It did this by compelling depository institutions to provide credit to LMI communities via the establishment of LMI lending targets. These targets are enforced by an examination and rating system. CRA ratings are considered when depository institutions apply for mergers or for opening a deposit facility (Butcher & Muñoz, 2013). Three specific changes since 1977 have shaped the CRA into its modern version. In 1989, CRA ratings were made public so as to provide more transparency into the regulations. Publicizing CRA ratings put more scrutiny on the CRA analyses, which brought about stricter enforcement. Prior to 1989, only 3% of depository institutions received

low marks; in the years immediately following 1989, 10% received "needs to improve" or "substantial noncompliance" (Macey & Miller, 1993). The 1989 amendments also required the examining agency to write a written evaluation of each lending institution's CRA compliance. In 1995, a more thorough examination was created for large depository institutions which made the CRA examinations more objective. In 2005, another category, "intermediate small institutions," was created, finalizing the current system of three separate CRA evaluations which vary based on the size of the depository institution evaluated (Butcher & Muñoz, 2013).

The actual enforcement of the Community Reinvestment Act is done by a combined force of the Board of Governors of the Federal Reserve System, the Federal Deposit Insurance Corporation (FDIC), and the Office of the Comptroller Currency (OCC). These agencies examine depository institutions' lending practices within their "lending assessment areas," or areas in which the institution has an office, branch or ATM (Congressional Research Service, 2019). Differences in bank size definitions correspond to differences in CRA examinations. "Small" banks are evaluated under the lending test, "intermediate small" depository institutions are evaluated using the lending and investment tests, and "large" depository institutions are subject to all three tests (Congressional Research Service, 2019). Ultimately, most depository institutions pass their CRA examination. There are five possible grades which a depository institution can receive from their examination: "Outstanding," "High Satisfactory," "Low Satisfactory," "Needs to Improve," or "Substantial Noncompliance."

Literature on the CRA's impact on access to credit is rich. One study used data from the Consumer Credit Panel (CCP) between 2004 and 2012 to quantify access to credit for those living in low- or moderate-income census tracts compared to those who don't. CCP data tracks every individual with a credit report's credit history from 1999 to the present (Butcher & Muñoz,

2013). Although CCP data does not contain much information about individuals, it does contain their location, making it possible to track credit outcomes by census tract. The study used the FFIEC's list of low- and moderate- income census tracts for the year 2000, and used census tracts with median family incomes between 75% and 85% of their respective area median family incomes (Butcher & Muñoz, 2013). A census tract with a median family income of 80% of the national average is considered LMI, so this study looks at census tracts which are both slightly above and slightly below the cutoff. Ultimately, the study found that census tracts which had median family incomes just low enough to be considerate low- or moderate-income (thus, just barely CRA eligible) had 9% more trades, or account activity (such as an originated mortgage, student loan, etc.) than tracts with median family incomes just above the LMI threshold (Butcher & Muñoz, 2013). Further, those census tracts which were CRA-eligible in this study had 7% more individuals in the CCP database than census tracts with a median family income just high enough to not be CRA-eligible (Butcher & Muñoz, 2013). This suggests that the "CRA effect" is an increase in access to credit for low- and moderate-income census tracts.

III. Changes to Vermont In Recent Decades

Changes in the state of Vermont contextualize the findings of this paper. Over the last thirty to fifty years, Vermont's economy has changed dramatically. Although the state lagged behind the rest of the country by many economic measures in the earlier half of the twentieth century, Vermont began closing the gap in the 1950s (Bolduc & Kessel, 2008). One study published in 2008 found that per capita income in Vermont had grown to 95% of the national average. Yet, this growth was not evenly distributed across the state. In 2006, per capita GDP was 62%, 80%, and 83% of the national average in Essex, Orleans, and Caledonia counties, respectively. These same counties were substantially closer to the national per capita income thirty-six years prior, in

1970 (Bolduc & Kessel, 2008). Other metrics also point towards an uneven distribution of economic growth in the state. By 2006, the Burlington labor market was responsible for 37% of Vermont's jobs, while it only accounted for 31% in 1978. This shows that, while Vermont's economy has improved in recent decades, and many parts of the state have caught up with and exceeded national economic standards, its growth has been uneven and parts of the state were left behind.

Another important change in Vermont has been the urbanization of the state and relative decline of rural places. Since the eighties, Vermont has been converting agricultural land to developed land at a relatively rapid rate. Between 1982 and 1997, agricultural land use dropped by 174,000 acres, representing a 16% decrease. During the same period of time, there was a 74,800 acre increase in developed land, 31% of which came from previously agricultural land (Bolduc & Kessel, 2008). Between 1982 and 2003, the proportion of land considered "developed" increased by 60%, but Vermont's population increased by only 19%, suggesting a trend towards higher percentages of Vermonters living in urban places (Bolduc & Kessel, 2008). Census data confirms this, as population density (measured in people per square mile) has steadily increased in recent decades, from 55.5 in 1980 to 67.9 in 2010, with steady increases for every decade in between (United States Census Bureau, 2010.).

IV. The Banking Industry and Rural Access to Credit

A. Banking Industry Consolidation

Changes in banking trends made Vermont's lending industry very different by the end of the 20th century, which changed Vermonters' access to depository institutions and therefore to credit from a mainstream financial institution. Throughout the second half of the nineties, banks were consolidating en masse. Between 1990 and 1998 the number of FDIC-insured banking

institutions in the United States dropped by 26.7%, representing a reduction of 3,288 banks. This decrease was caused by the consolidation of the industry, as smaller banks merged with larger ones. During this time, only 70 banks failed (Heiney, 2011). When the Riegle-Neal Act was passed in 1994, which legalized inter-state mergers starting in 1997, the consolidation trend was exacerbated. Riegle-Neal was intended to accelerate the rate at which banks consolidated. From 1998 to 2003, the number of banks in the United States decreased by 1,004, an 11.5% decrease representing an average of 2.3% per year (Heiney, 2011). Thus, while the rate at which banks consolidated began to slow, the overall trend continued.

Decades of consolidation within the banking industry has changed the landscape of the lending industry for rural borrowers. Between 1990 and 2010, the number of FDIC-insured lenders has dropped by almost 8,000 nationwide, and between 2000 and 2010 the number of these institutions has dropped by 21% (Housing Assistance Council, 2015). Interestingly, 52% of FDIC-insured lenders in 2012 were in small towns or rural places. However, this 52% held only 6% of assets under control by FDIC-insured depository institutions. This is because 85% of rural-based banks are considered "small" by the CRA (Housing Assistance Council, 2015).

The national consolidation trend is mirrored in the experience of Vermont's lending industry, as expressed in Table 1 and visualized in Figure 1. The number of Vermont-chartered banks has steadily declined since 1980, when there were 23 institutions. By 2019 there were only 6, representing a 73.91% decrease in the number of Vermont-chartered FDIC-insured banks during that 49-year timespan (Vermont Department of Financial Regulation, 2019).

B. Rural Banking Industry

A considerable majority (85% in 2012) of banks headquartered in rural places are designated as small under the CRA, making their examinations less thorough or frequent and allowing larger,

non-rural banks to have more reach into rural credit markets. In 2012, the 20 largest depository institutions held more than half of FDIC-insured assets, all of which were headquartered in urban or suburban places (Housing Assistance Council, 2015). The primarily urban location of large lenders means that borrowing in rural places frequently comes from non-rural sources. In fact, despite 52% of depository institutions being rural, only 13% of mortgages came from rural depository institutions in 2012 (Housing Assistance Council, 2015). That year, 70% of rural mortgages from CRA-regulated institutions came from urban-based banks. "Shadow banking" has become a growing source of credit as well. "Shadow banking," defined as the unregulated credit market, grew from 30% to 50% share of the residential housing market between 2007 and 2015 (Buchak, Matvos, Piskorski & Seru, 2017). The shadow banking market, which was worth an estimated $71 trillion globally in 2012, is certainly an important force in the credit market, although its relatively recent boom has made literature surrounding its impact in rural places thin (Buchak, Matvos, Piskorski & Seru, 2017).

The relative size and financial power of larger, urban lenders gives them the opportunity to be the main providers of credit in rural places, which has important implications for credit access. In 2012, one-quarter of mortgages originated by depository institutions in rural census tracts were distributed to people outside the lender's assessment areas (Housing Assistance Council, 2015). This means that banks are not being assessed under the CRA for much of the lending that they do in rural areas. Despite the fact that 42% of rural and small town census tracts were designated as high-credit-need in 2012, 29% of mortgage originations in rural and small towns went to high-credit-need tracts that year. Further data suggests that the same year, about one third of mortgages originated in rural census tracts were from institutions not regulated by

the CRA, and that, prior to the Recession, this number was over 50% (Housing Assistance Council, 2015).

C. Rural Access to Credit

Although the existing literature surrounding access to credit in rural places mostly revolves around the higher costs which rural borrowers incur, there have been multiple studies which examine the ability to obtain credit in rural places. One study published by Ergungore in 2010 used HMDA data to examine how distance between the lender and borrower impacts the availability and terms of credit in low income neighborhoods. The paper studied low- and moderate-income census tracts in Ohio in 2000, and used HMDA data from 2004-2007. Branch locations were established using the FDIC's Summary of Deposits. The study also set 24 control variables, including the share of children in the census tract who live in a two-parent household, the number of home-purchase loan applications per owner-occupied housing units, a binary variable that indicates whether or not the census tract borders other states, etc. (Ergungore, 2010). Not only did this study find that the presence of a bank branch in a neighborhood has a positive impact on loan originations and decreases the price of loans, these correlations become stronger as distance to a bank branch decreases (Ergungore, 2010).

Another study conducted by the Federal Reserve Bank of Minneapolis (2017) looked at loan denial rates in the United States and compared them to denial rates in a collection of six upper-midwest states before and after the subprime crisis. The research was conducted with the goal of finding discrepancies between loan application denial rates from urban and rural applicants. The study found that rates of loan denial were higher in rural places both nationally and in the ninth district. It also found that the differences between urban and rural denial rates were exacerbated in the wake of the subprime crisis (Federal Reserve Bank of Minneapolis,

2017). Interestingly, this study also mapped the geographic extent of differences between urban-rural loan denials. It found that these differences are particularly high in the midwest and northern New England, with Vermont falling in the 3.5-4.5% difference range (Federal Reserve Bank of Minneapolis, 2017).

A different study conducted by Cole (2020) for the U.S. Small Business Administration examined the availability of credit to small businesses in rural versus urban census tracts. The study conducted a series of tests, examining small business loan origination rates in five categories organized by the loan amount, and included multivariate tests to find inconsistencies in both the amount and number of small business loans originated for rural versus urban small businesses. These tests were conducted using data from both before and after the subprime crisis in an attempt to use the crisis as an exogenous shock and examine how outcomes change. The study shows that, while small bank loan originations in all areas of the country dropped dramatically in the wake of the crisis, recovery in rural areas remains much slower than in urban areas. In 2016, average loan originations per capita both nationwide and in urban areas were 35% below their 2007 peak, while rural areas were still 42% below their 2004 peak (Cole, 2020). This points to rural small businesses' continuing difficulty in obtaining credit relative to urban small businesses in the wake of the subprime crisis.

V. Empirical Analysis of Access to Credit

When looked at in conjunction, the existing literature points towards a lack of access to credit for rural Americans, which may be the result of a variety of factors. While the findings of the Federal Reserve Bank of Minneapolis (2017) as well as Cole (2020) point towards differences in loan origination and denial rates, Ergungor (2010) shows that proximity to bank locations is correlated with low- and moderate-income individuals' ability to obtain credit. These findings

have huge implications for states with proportionally large rural populations, like Vermont. The rest of this paper will answer the question: do rural Vermonters have the same access to credit as non-rural Vermonters? By examining the distribution of banks by county as well as loan application outcomes by census tract, my findings show that rural Vermonters have a reduced access to credit when compared to urban Vermonters.

A. Data And Methodology

In this section, I examine the availability of loans to credit-seeking customers in rural and urban areas in Vermont. Doing this requires an examination of banking in urban and rural Vermont, as well as a study of lending in the state.

i. *Comparing Rural and Urban Banking in Vermont*

To examine banking, I use a series of resources from the Vermont Department of Financial Regulation, the 1980 Annual Report of the Bank Commissioner of the State of Vermont, and population data from the Census Bureau. Three resources from the Department of Financial Regulation provided me with the current locations of CRA-regulated bank branches in Vermont: the department's lists titled "State and National Financial Institutions with Branches in Vermont," "Vermont Chartered Banks," and "National Financial Institutions Domiciled in Vermont." This final list published by the Department of Financial Regulation did not include Vermont branch locations of the listed institutions, so those locations were found via the institutions' websites.

The current locations of credit unions analyzed in this thesis were also found via the state's Department of Financial Regulation, in their resource titled "Credit Unions in Vermont Ranked by Size." This list also does not include credit union branch locations, and those were obtained via the credit unions' websites as well. The locations of financial institutions in

Vermont in 1980 was taken from the 1980 Annual Report of the Bank Commissioner of the State. This report, provided by the University of Vermont's Howe Library, contains the locations of all financial institutions in 1980 by town, as well as their size. Data regarding population by county was taken from the census bureau's website. From this, I was able to look at the distribution of depository lending institutions in Vermont by county. Using population data from the 2010 and 1980 census I calculated a "people per bank" statistic for each county in both years, which is intended as a measurement of access to a lender's branch location by county.

From this, I was able to measure the percentage change in people per bank over the thirty-year span and compare this to the percentage change in population over the same period. Including population growth is important because it contextualizes changes in the location of banks with changes in the location of people. A decrease in banks which outpaces a decrease in population, or even occurs during population growth, indicates that a community's access to a credit-providing institution is reduced.

ii. *Comparing Rural and Urban Lending in Vermont*

Analyzing Vermont's lending industry involved the use of Home Mortgage Disclosure Act data obtained via the Consumer Financial Protection Bureau, Rural-Urban Commuting Code data obtained via the U.S. Department of Agriculture, and population and demographic data obtained via the Census Bureau. HMDA data organizes loan application outcomes into six categories: loans originated, approved but not accepted, denied, withdrawn, closed for incompleteness, and purchased by institution. For the purposes of this thesis, "loans" are defined as mortgages secured for the purpose of buying a residential property. It therefore excludes auto loans, many business loans, and other forms of credit.

The first part of my analysis involved organizing HMDA data from 2007 (the earliest digitized HMDA data available) and 2017 by census tract and calculating the percentage of loan applications with each outcome. I then used Rural-Urban Commuting codes to separate rural census tracts from non-rural, thereby isolating loan application outcomes in 2007 and 2017 by rural or not. Using this data, I was able to look at the distribution of rural census tracts when Vermont tracts were ranked by percent loans originated and percent loans denied, providing a look into where loan application outcomes stood in rural census tracts compared to the rest of the state. After this, I ran regressions in stata, measuring a census tract's status as rural against other potential indicators of loan outcomes, specifically educational attainment, median household income, and percentage of the tract's population that is non-white. As stated earlier, data for educational attainment and median household income was gathered from the 2010 census. Mortgage origination rates used in these regressions were calculated using 2017 HMDA data.

The years 2007 and 2017 were chosen in order to present a picture of rural access to credit before and after the subprime crisis. Literature discussing the subprime crisis's impact on rural credit is vast. Banks in rural America closed en masse, as the number of FDIC-insured branch locations dropped 6% in rural places nationwide between 2008 and 2016 (National Community Reinvestment Coalition, 2017). Small business lending, which was in steep decline immediately following the recession, has been slow to recover in rural places, especially for loans amounting to less than $250,000 (Cole, 2020). A gap in mortgage application denial rates, which was virtually nonexistent before the subprime crisis, has been growing since 2008 (Federal Reserve Bank of Minneapolis, 2017). This literature indicates the potential impact of the subprime crisis on differences in rural and urban credit access. Analyzing loan outcomes in 2007 and 2017 allows this potential impact to be addressed.

B. Results of Empirical Analysis of Access to Credit

i. *Distribution of CRA-Covered Depository Institutions*

When analyzing access to credit in rural areas, the first issue to tackle is identifying which census tracts are rural. The U.S. Department of Agriculture's Economic Research Service defines Rural-Urban Commuting Area Codes each census year, which code census tracts on a scale of one to ten. These codes, described below, are created using population density, urbanization, and daily commuting. The definitions of these codes for 2010 census tracts are as follows:

Primary RUCA Codes, 2010

Code	Definition
1	Metropolitan area core: primary flow within an urbanized area (UA)
2	Metropolitan area high commuting: primary flow 30% or more to a UA
3	Metropolitan area low commuting: primary flow 10% to 30% to a UA
4	Micropolitan area core: primary flow within an Urban Cluster of 10,000 to 49,999 (large UC)
5	Micropolitan high commuting: primary flow 30% or more to a large UC
6	Micropolitan low commuting: primary flow 10% to 30% to a large UC
7	Small town core: primary flow within an Urban Cluster of 2,500 to 9,999 (small UC)
8	Small town high commuting: primary flow 30% or more to a small UC
9	Small town low commuting: primary flow 10% to 30% to a small UC
10	Rural areas: primary flow to a tract outside a UA or UC
99	Not coded: Census tract has zero population and no rural-urban identifier information

When applied to 2010 census tracts, we can quantify the percentage of each county's tracts coded as "10" for rural. This is a fairly precise measurement of the percentage population living in a rural environment, as each census tract is approximately 4,000 people. The results in order from least to most rural can be found in Table 2 and visualized in Figure 2.

The consolidation of Vermont's lending industry can be quantified by looking at the ratio of population to banks in 1980 versus today by county, as shown in Table 3. Table 4 shows the percentage change in population versus the percentage change in people per bank over the 30-year period. Changes over a 30-year period show that, for many counties, the ratio of people to banks skyrockets between 1980 and 2010, showing that there was a decreasing number of locations from which people in these counties could access credit. In some counties, such as Orleans and Windham, the ratio of people to banks grew by more than 50% over thirty years. However, counties such as Essex, Franklin and Chittenden in the northwest portion of the state experienced a decrease in their ratio.

ii. *Distribution of Credit Unions*

It is important to note that many Vermonters obtain credit from non-CRA regulated depository institutions. Most often, this source is credit unions. Credit unions differ from banks in that their services are only provided to their members and that they are non-profits run jointly by their members (Cassity, 2000). Since 1982, credit unions have also been consolidating into large depository (and lending) institutions, representing a major, less regulated force in the credit market. When the CRA was passed in 1977, it included only depository institutions which were federally insured, thus excluding credit unions. A great debate in the lending industry is whether or not today's credit unions should be regulated under the CRA, as many believe that credit unions' mission to serve their members makes such regulation unnecessary. While the lack of regulation surrounding credit unions means their compliance in providing credit to low- and moderate-income members of their community is less reliable, their importance in the credit market makes them necessary to consider in this study. The same data and calculations done for FDIC-insured depository institutions can be found in Tables 5 and 6.

Interestingly, this data does not follow the same patterns as FDIC-insured depository institutions. Counties like Addison, Franklin, and Essex, which saw substantial decreases in their people per bank statistics, saw dramatic increases in their people per credit union statistics between 1980 and 2010, with Essex losing its sole credit union during that time. Further, Bennington and Orleans, two counties which saw increases in their people per bank statistic, were the only counties which experienced decreases in people per credit union. This points towards credit unions playing a greater role in rural counties outside the northwest portion of the state between 1980 and 2010, at the same time as FDIC-insured depository institutions were leaving those counties.

iii. *Distribution of Depository Institutions*

Tables 7 and 8 combine the previous two sections to show the concentration of depository institutions compared to population by county in 1980 and 2010, the combined effect of bank and credit union consolidation. The percent changes in people per depository institution by county can also be visualized in Figure 3. It is important to note that, since credit unions are included in this data, not all the institutions examined are regulated by the CRA and are therefore not required by law to serve the needs of the communities they receive deposits from. The second table shows the percent change in people per depository institution as well as population over the thirty-year timespan. Notably, counties like Chittenden, Addison, and Franklin experienced both significant relative increases in population as well as significant relative decreases in people per depository institution. At the same time, counties like Caledonia and Windham experience increases in people per depository institution which are relatively higher than their increases in population. The geographic layout of change in people per depository institution can be visualized in Figure 4.

iv. *Analysis of Loan Application Outcomes*

Table 9 shows the impact of a consolidated banking industry on access to credit in rural places. The figures were established using data from the Home Mortgage Disclosure Act, and represents the outcome of loan applications organized by census tract. The first data table shows the percentage of census tracts in Vermont with a high loan origination rate that are coded as RUCA code "10" for rural. In 2007, the top quartile of census tracts when organized by highest loan origination rate was 17.78% rural, while the bottom quartile was 54.55% rural. The second column of the table shows the same results using 2017 data. In 2017, the top quartile of census tracts by loan origination rate was 10.87% rural, while the bottom quartile was rural 47.83%. Thus, rural census tracts in 2007 dominated the lowest percentages of loan applications originated and were less likely to have a high loan origination rate. This trend was reiterated in 2017. Differences between the statistics for 2007 and 2017 are likely due to credit market changes in the wake of the subprime crisis.

Table 10 goes through the same process for loan denial data. The percentages listed show the percentage of upper and lower quartile of loan denial rates coded as rural. The data shows that rural census tracts dominate the upper quartile of loan denial rates in Vermont, and take up a much smaller portion of the lower quartile.

Tables 11 and 12 show the rates of loan applications originated, approved but not accepted, denied, withdrawn, closed for incompleteness, and purchased by institution in 2007 and 2017. The results reiterate the finding that rates of loan origination are much higher in urban census tracts than rural, and rates of loan denial are much lower in urban tracts than rural.[1]

v. *Regressions*

[1] Note: RUCA code "1" designates "most urban" while RUCA code "10" designates "most rural"

It is clear that other factors besides a census tract's status as rural or urban contribute to whether a bank decides to originate a loan or not. The following regressions attempt to contextualize the impact of a census tract's rural status on its access to credit by including other variables which could contribute to access to credit. The dependent variable in the first two regressions is percent of loan applications originated by census tract in 2017, and the dependent variable in the second two is the percent of loan applications denied. These dependent variables are intended to represent access to credit for each census tract. The four independent variables are median household income, educational attainment, percent of the population that's non-white and RUCA code.

The median household income data is collected from the 2010 Census, and is in 2010 inflation-adjusted dollars. I expect this variable to have a positive coefficient in the first two regressions, as a loan applicant with a high income would most likely be seen by a depository institution as a safer investment. I expect this coefficient to be negative in the second two regressions for the same reasons. Educational attainment is measured by percent of census tract residents who have their high school diploma (or equivalent) or have completed a higher level of education. I expect this variable to have a positive coefficient in the first two regressions and a negative coefficient in the second two, on the assumption that individuals with a higher education level have better employment and therefore have better credit scores. Percent of the population that is non-white is measured as 100 minus the percentage of the population that is white. I expect this variable to be negative in the first two regressions and positive in the second two, as there is a long history of racial discrimination in the credit market. The RUCA code variable is the RUCA code assigned to each census tract. In the regressions in Tables 13 and 15, each census tract has a RUCA code one through ten. This was done to reflect the effects of

increasing RUCA codes on access to credit. In the regressions in Tables 14 and 16, RUCA code is a dummy variable where census tracts coded as "10" for "rural" are assigned a "1" and all other census tracts are assigned a "0." This was done to isolate the effects of being coded as rural on access to credit. Based on my analyses of HMDA data and the Tables listed earlier, I expect both variables to be negative in the first two regressions and positive in the second two, as my previous analysis seemed to show that census tracts with higher RUCA codes had lower loan origination rates and higher denial rates.

The results of the regressions in which origination rate is the dependent variable are consistent with my expectations. In the first two regressions, the coefficient on median household income was positive but very small, at 8.822 in Table 13 and 12.241 in Table 14. This suggests that an increase in a census tract's median household income has a positive impact on its loan origination rates. The p-value for median household income shows that it is statistically significant at the 1% level in both regressions. The coefficient on educational attainment was also positive, at 0.097 in Table 13 and 0.122 in Table 14. This suggests that higher educational attainment among a census tract's residents has a positive impact on loan origination rates. These results were not significant at the 1% level but were significant at the 5% level. The coefficient on percent of the population that's non-white was positive in the first two regressions, at 0.753 in Table 13 and 1.149 in Table 14, suggesting that tracts in Vermont with higher non-white populations have higher loan origination rates. These results were significant at the 1% level. The coefficient on RUCA code was negative in both regressions. In Table 13, the coefficient was -1.002, which suggests that census tracts with a higher RUCA code have lower loan origination rates. The coefficient on RUCA code in Table 14 was -2.803, suggesting that being coded as RUCA code "10" for "rural" has an even greater negative impact on loan origination rates. The

coefficient on RUCA code was significant at the 1% level for both regressions. These results can be seen in full in Tables 13 and 14.

The results for the regressions in which loan denial rates were the dependent variable were also similar to my predictions. In both Tables 15 and 16, the coefficient on median household income was negative, indicating that an increase in a census tract's median household income is correlated with a decrease in its loan denial rate. In Table 15 this coefficient was -8.814 and in Table 16 it was -10.768, with both coefficients significant at the 1% level. The coefficient on educational attainment was also negative in Tables 15 and 16, though less significant than median household income. In Table 15 the coefficient on educational attainment was -0.059 and in Table 16 it was -0.068, with both coefficients being insignificant at the 1% level but significant at 5%. The coefficient on percent of the population that's non-white was negative in Tables 15 and 16, indicating that census tracts with higher non-white populations have lower loan denial rates in Vermont. The coefficient on percent of the population that's non-white was significant at the 1% level in both tables. The coefficients on both RUCA code and the RUCA dummy variable were positive, indicating that a higher RUCA code and being designated as a "rural" census tract is correlated with higher loan denial rates. In Table 15, the coefficient on the RUCA code variable was 0.585, and in Table 16 the coefficient on the binary RUCA variable was 1.772. While the coefficient on RUCA code was significant at the 1% level in Table 15, it was only significant at the 5% level in Table 16. These results can be seen in full in Tables 15 and 16.

VI. Discussion of Empirical Analysis

The results of my analysis of both the banking industry and HMDA data show that rural Vermont has reduced access to credit compared to the rest of the state. "Access" is measured in two ways:

presence of depository institutions, and percentage of loan applications originated or denied. "Rural" is measured using Rural-Urban commuting codes, with code "10" denoting a rural census tract, as indicated by the U.S. Department of Agriculture. The first part of my discussion will involve proximity to a depository institution, while the second portion will involve my analysis of HMDA data.

Interestingly, trends in percent change of people per depository institution seem to mirror trends in counties with the highest percentage of its census tracts coded as "rural." The three counties with the biggest reductions in people per depository institution, Grand Isle, Franklin, and Addison, also fall into the least rural half of Vermont counties, while the three counties with the biggest increases in people per depository institution, Windham, Orleans and Caledonia, fall into the most rural half. In fact, the average change in people per depository institution for the least rural half of Vermont counties is -0.99%, while the average change for the most rural half is 18.84%. Further, Vermont's seven least rural counties had an average 0.39% increase in people per CRA-eligible depository institutions, while Vermont's seven most rural counties had an average 25.94% increase. All of these calculations point towards a general trend of more people per depository institutions in rural counties, which indicates a lack of depository institutions for rural people and greater exposure to "shadow banking." As indicated by Ergungore (2010), this suggests decreased access to credit for rural people as well.

In addition to the availability of lenders decreasing in rural Vermont and increasing in non-rural places, analysis of HMDA data shows that rural applicants for loans are less likely to have their loans originated and more likely to have them denied in the state of Vermont. This was measured in multiple ways and over multiple years. In both 2007 and 2017 HMDA data, rural census tracts were concentrated among census tracts with the lowest origination rates and the

highest denial rates. In 2007, rural census tracts made up more than half of the tracts in the lowest quartile of loan origination rates (meaning the 25% of tracts with the smallest percentage of loan applications originated), while making up just 17.78% of the upper quartile. Ten years later, in 2017, rural tracts made up 47.83% of the lowest quartile of loan origination rates and 10.87% of the highest. These numbers show that, in the ten years following the subprime crisis, rural census tracts were less concentrated in the lowest loan origination rates but also less concentrated in the highest loan origination rates.

A similar trend can be seen in loan denial rates. In 2007, the 48.89% of census tracts in the highest quartile of loan denial rates were rural, while just 15.91% of the lowest quartile were rural. Ten years later, in 2017, a smaller percentage of the upper quartile of loan denial rates (41.30%) were rural, as well as a smaller percentage of the lowest quartile (11.90%) were rural. These numbers show that rural census tracts were concentrated among census tracts with the highest loan denial rates in both 2007 and 2017, as well as underrepresented among the lowest loan denial rates.

More analysis further emphasizes this point. When organizing loan application outcomes by RUCA code, the trend of higher rates of loan denials and lower rates of loan originations in rural census tracts continues. In 2007, tracts in Vermont coded as RUCA code "1" or "metropolitan area core" experienced a 53% loan origination rate, while tracts coded as "10" or "rural" experienced a 45% origination rate. At the same time, RUCA code 1 had an 11% denial rate, while RUCA code 10's denial rate was 21%. It even seems that, the more rural a census tract is, the less likely it is to have its loan applications originated and the more likely it is to have them denied. As a tract's RUCA code increases from one to ten, its population as well as the number of people who commute there for work decrease, providing a general measure of a

tract's "rural-ness." Interestingly, RUCA codes one through five have an average 51% loan origination rate, while codes six through ten have a 46.2% average loan origination rate. Codes one through five also had an average 15.4% loan application denial rate, while codes six through ten had an average 21.2% denial rate.

Similar trends can be seen in the 2017 data. RUCA code one has an average 69% loan origination rate, while RUCA code ten has an average 54%. RUCA code one has an average 8% loan denial rate in 2017, while RUCA code ten average 18%. Codes one through five had an average 62% loan origination rate and 11.2% loan denial rate, while codes six through ten had an average 49.6% origination rate and 20.8% denial rate. All of these statistics go to show that, in both 2007 and 2017, not only were there stark differences in outcomes for loan applications in rural versus urban census tracts, but loan application outcomes became generally less favorable as a census tract increased in RUCA code and can therefore be considered "more rural."

Regressions which used loan origination and denial rates as dependent variables and included RUCA data as well as other potential indicators of loan outcome as independent variables show further that a tract's status as rural has a negative impact on its residents' ability to obtain a loan. The regressions used data from the 2010 census as well as 2017 loan origination and denial rates. Two regressions were run with origination rates as a dependent variable and two with denial rates as a dependent variable. For both dependent variables, one regression used RUCA codes one through ten as an independent variable, and another converted the RUCA code to a binary variable in which census tracts which were coded as "10" received a one, and the rest of the tracts received a zero.

In both regressions which used origination rates as a dependent variable, median household income and educational attainment had a positive coefficient, indicating that these

variables are correlated with higher loan origination rates, while percent of the population which is non-white had a negative coefficient. The coefficient on the RUCA code variable when using codes one through ten was -1.002, indicating that increasing RUCA code values have a negative impact on loan origination rates. The coefficient on the binary RUCA code variable was -2.803, which indicates that being designated as a rural census tract has a strong negative impact on the tract's loan origination rate.

In both regressions which used denial rates as a dependent variable, the signs on all coefficients were switched. Median household income and educational attainment both had negative coefficients, while the coefficient on percent of the population that's non-white was positive. The coefficient on the RUCA code variable when using codes one through ten was 0.585, indicating that increasing RUCA values have a positive impact on loan denial rates. The coefficient on the binary RUCA code variable was 1.772, which indicates that being designated as a rural census tract has a strong positive impact on the tract's loan denial rate.

VII. Conclusions

The analysis conducted in this thesis ultimately shows that rural census tracts have a reduced access to credit in Vermont. This was shown through both a decreasing availability of depository institutions in rural places, which has been associated with decreased access to credit, as well as through an analysis of HMDA data from before and after the subprime crisis. The analysis of HMDA data shows that rural census tracts are concentrated among the lowest rates of loan origination, as well as the highest loan denial rates. This indication of rural tracts' relative inability to receive credit is reiterated when examining loan origination and denial rates by RUCA code. Code "10" for "rural" experienced lower loan origination rates and higher loan denial rates than code "1" for "metropolitan area core" in both 2007 and 2017. Further, the

average rate of loan applications originated decreases as a tract's RUCA code increases, and the rate of applications denied increases. This is an indication of reduced access to credit for rural places, because RUCA codes increase as both population and commuters to a census tract for work decrease. Finally, regressions which test RUCA code as well as other contributing factors on loan origination and denial rates confirm that, while there are other contributing factors, being rural has a negative impact on loan application outcomes, suggesting a lack of credit access in these census tracts.

Ultimately, the results of this thesis indicate that credit needs in Vermont are not adequately met in rural census tracts relative to those of urban tracts, and that progress can be made in the field of rural lending in this state. Although this progress could come from a number of sources, the natural place to start would be the Community Reinvestment Act. As a piece of legislation designed to address problems in urban lending, the results of this paper suggest that, in the state of Vermont, the reforms initiated were less inclusive of rural people. This paper leaves the opportunity for further research on the topic of rural access to credit nationally and in other states, as well as for further research into which rural communities are least likely to have their credit needs met, and the factors which contribute to rural credit inequalities.

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Table 1: Vermont-Chartered Bank and Deposit History

Year	Number of Banks in Operation	Total Deposits	Deposits Per Capita
1980	23	2482502	4.81
1985	19	3286557	6.15
1990	21	4654720	8.25
1995	17	4483100	7.69
2000	10	4337247	7.25
2005	9	5371311	8.68
2010	7	2887730	4.64
2019	6	2655971	4.26

Data taken from the Vermont Department of Financial Regulation. "Number of Banks in Operation" refers to the number of Vermont-Chartered Banks, while "Total Deposits" refer to the total deposits in Vermont-chartered banks.

Table 2: Percentage of Census Tracts Rural In Vermont By County

County	Percentage 2010 Tracts Rural
Chittenden	0%
Grand Isle	0%
Franklin	20%
Rutland	20%
Washington	21.05%
Caledonia	30%
Addison	40%
Bennington	41.67%
Windsor	50%
Windham	55.56%
Orleans	70%
Orange	70%
Lamoille	71.43%
Essex	100%

Calculations made using RUCA code and census tract data published by the United States Department of Agriculture's Economic Research Service

Table 3: CRA-Eligible Depository Institutions vs. Population By County

1980	County	Population	Banks	People Per Bank	**2010**	Population	Banks	People Per Bank
	Addison	29406	6	4901		36823	11	3348
	Bennington	33345	14	2382		37078	13	2852
	Caledonia	25808	13	1985		31166	12	2597
	Chittenden	115534	35	3301		156769	52	3015
	Essex	6313	1	6313		6312	2	3156
	Franklin	34788	7	4969		47821	20	2391
	Grand Isle	4613	1	4613		6948	1	6948
	Lamoille	16767	6	2794		24515	7	4903
	Orange	22739	8	2842		28944	11	2894
	Orleans	23440	7	3348		27245	5	5449
	Rutland	58347	17	3432		61586	17	4106
	Washington	52393	19	2758		59570	24	2590
	Windham	36933	21	1759		44502	13	3179
	Windsor	51030	23	2219		56600	27	2021
	Vermont	512456	178	2879		625879	215	2911

1980 bank data taken from the 1980 Annual Report Of The Bank Commissioner Of The State of Vermont For The Year EndedDecember 31st, 1980. 2010 banks taken from The Vermont Department of Financial Regulation, and locations found using the banks' websites. Population data taken from the Census Bureau.

Table 4: Change In Population Vs. Change In People Per Bank By County

County	Change in Population	Change in People Per Bank
Addison	25.22%	-31.69%
Bennington	11.20%	19.73%
Caledonia	20.76%	30.83%
Chittenden	35.69%	-8.66%
Essex	-0.02%	-50.01%
Franklin	37.46%	-51.88%
Grand Isle	50.62%	50.62%
Lamoille	46.21%	75.48%
Orange	27.29%	1.84%
Orleans	16.23%	62.75%
Rutland	5.55%	19.63%
Washington	13.70%	-6.09%
Windham	20.49%	80.71%
Windsor	10.92%	-8.90%
Vermont	22.13%	1.11%

1980 Bank data taken from the 1980 Annual Report Of The Bank Commissioner Of The State of Vermont For The Year EndedDecember 31st, 1980. 2010 banks taken from the Vermont Department of Financial Regulation, and locations obtained from the banks' websites. Population data taken from the Census Bureau.

Table 5: Credit Unions vs. Population By County

County	1980 Population	Credit Unions in 1980	People per Credit Union		2010 Population	Credit Unions Today	People Per Credit Union
Addison	29406	3	9802		36823	3	12274.33
Bennington	33345	2	16672.5		37078	3	12359.33
Caledonia	25808	6	4301.33		31166	3	10388.67
Chittenden	115534	14	8252.43		156769	19	8251
Essex	6313	1	6313		6312	0	No Credit Unions
Franklin	34788	6	5798		47821	3	15940.33
Grand Isle	4613	0	No Credit Unions		6948	1	6948
Lamoille	16767	1	16767		24515	1	24515
Orange	22739	1	22739		28944	1	28944
Orleans	23440	4	5860		27245	5	5449
Rutland	58347	8	7293.38		61586	8	7698.25
Washington	52393	15	3492.87		59570	12	4964.17
Windham	36933	7	5276.14		44502	7	6357.43
Windsor	51030	11	4639.09		56600	11	5145.45
Vermont	512456	79	6486.78		625879	77	8128.30

1980 credit union data taken from the 1980 Annual Report Of The Bank Commissioner Of The State of Vermont For The Year Ended December 31st, 1980. 2010 credit unions taken from The Vermont Department of Financial Regulation, and locations obtained from the credit unions' websites. Population data taken from the Census Bureau.

Table 6: Change In Population Vs. Change In People Per Credit Union By County

County	Change in Population	Change in People Per Credit Union
Addison	25.22%	25.22%
Bennington	11.20%	-25.87%
Caledonia	20.76%	141.52%
Chittenden	35.69%	-0.02%
Essex	-0.02%	N/A
Franklin	37.46%	174.93%
Grand Isle	50.62%	N/A
Lamoille	46.21%	46.21%
Orange	27.29%	27.29%
Orleans	16.23%	-7.01%
Rutland	5.55%	5.55%
Washington	13.70%	42.12%
Windham	20.49%	20.49%
Windsor	10.92%	10.92%
Vermont	22.13%	25.31%

1980 bank data taken from the 1980 Annual Report Of The Bank Commissioner Of The State of Vermont For The Year EndedDecember 31st, 1980. 2010 bank data taken from The Vermont Department of Financial Regulation. Population data taken from the Census Bureau.

Table 7: Depository Institutions vs. Population By County

County	1980 Population	Depository Institutions in 1980	People per Depository Institution		2010 Population	Depository Institutions Today	People Per Depository Institution
Addison	29406	9	3267.33		36823	14	2630.21
Bennington	33345	16	2084.06		37078	16	2317.38
Caledonia	25808	19	1358.32		31166	15	2077.73
Chittenden	115534	49	2357.84		156769	71	2208.01
Essex	6313	2	3156.50		6312	2	3156
Franklin	34788	13	2676		47821	23	2079.17
Grand Isle	4613	1	4613		6948	2	3474
Lamoille	16767	7	2395.29		24515	8	3064.38
Orange	22739	9	2526.56		28944	12	2412
Orleans	23440	11	2130.91		27245	10	2724.50
Rutland	58347	25	2333.88		61586	25	2463.44
Washington	52393	34	1540.97		59570	36	1654.72
Windham	36933	28	1319.04		44502	20	2225.10
Windsor	51030	34	1500.88		56600	38	1489.47
Vermont	512456	257	1993.99		625879	292	2143.42

1980 depository institution data taken from the 1980 Annual Report Of The Bank Commissioner Of The State of Vermont For The Year EndedDecember 31st, 1980. 2010 depository institutions taken from The Vermont Department of Financial Regulation, and locations obtained from the depository institutions' websites. Population data taken from the Census Bureau.

Table 8: Change In Population Vs. Change In People Per Depository Institution By County

County	Change in Population	Change in People Per Depository Institution
Addison	25.22%	-19.50%
Bennington	11.20%	11.20%
Caledonia	20.76%	52.96%
Chittenden	35.69%	-6.35%
Essex	-0.02%	-0.02%
Franklin	37.46%	-22.30%
Grand Isle	50.62%	-24.69%
Lamoille	46.201%	27.93%
Orange	27.29%	-4.53%
Orleans	16.23%	27.86%
Rutland	5.55%	5.55%
Washington	13.70%	7.38%
Windham	20.49%	68.69%
Windsor	10.92%	0.76%
Vermont	22.13%	7.49%

1980 depository institution data taken from the 1980 Annual Report Of The Bank Commissioner Of The State of Vermont For The Year Ended December 31st, 1980. 2010 depository institution data taken from The Vermont Department of Financial Regulation. Population data taken from the Census Bureau.

Table 9: Representation of Rural Census Tracts in The Upper, and Lower Quartile of Loan Origination Rates in Vermont

	2007	2017
Percent of Upper Quartile Coded As Rural *Loan origination rates >51.66% in 2007, >64.88% in 2017*	17.78%	10.87%
Percent of Lower Quartile Coded As Rural *Loan origination rate <42.51 in 2007, <50.96% in 2017*	54.55%	47.83%

Loan application outcome statistics derived using Home Mortgage Disclosure Act Data. RUCA codes obtained from the United States Department of Agriculture's Economic Research Service.

Table 10: Representation of Rural Census Tracts in The Upper and Lower Quartile of Loan Denial Rates in Vermont

	2007	2017
Percent of Upper Quartile Coded As Rural *Loan denial rate >23.06% in 2007, >19.67% in 2017*	48.89%	41.30%
Percent of Lower Quartile Coded As Rural *Loan denial rate <14.12% in 2007, <10.23% in 2017*	15.91%	11.90%

Loan application outcome statistics derived using Home Mortgage Disclosure Act Data. RUCA codes obtained from the United States Department of Agriculture's Economic Research Service.

Table 11: Result of Loan Applications By Rural-Urban Commuting Code in Vermont in 2007

RUCA Code	Loan Applications	Percent Originated	Percent Approved But Not Accepted	Percent Denied	Percent Withdrawn	Percent Closed For Incompleteness	Percent Purchased By Institution
1	9317	53%	06%	11%	08%	02%	19%
2	4147	51%	06%	15%	09%	03%	16%
3	233	55%	05%	13%	12%	03%	13%
4	4014	47%	07%	19%	10%	02%	15%
5	3635	46%	07%	19%	10%	02%	16%
6	190	44%	08%	24%	12%	02%	12%
7	4255	45%	07%	22%	09%	02%	13%
8	2526	45%	08%	23%	11%	03%	12%
9	605	52%	08%	16%	07%	01%	16%
10	14494	45%	08%	21%	10%	02%	14%

Loan application outcome statistics derived using Home Mortgage Disclosure Act Data. RUCA codes obtained from the United States Department of Agriculture's Economic Research Service.

Table 12: Result of Loan Applications By Rural-Urban Commuting Code in Vermont in 2017

RUCA Code	Loan Applications	Percent Originated	Percent Approved But Not Accepted	Percent Denied	Percent Withdrawn	Percent Closed For Incompleteness	Percent Purchased By Institution
1	4444	69%	02%	08%	11%	03%	07%
2	3190	65%	03%	11%	11%	03%	07%
3	224	64%	02%	15%	11%	03%	06%
4	1902	57%	03%	15%	11%	03%	12%
5	1681	55%	03%	16%	12%	04%	09%
6	124	40%	03%	23%	14%	06%	13%
7	2441	54%	03%	17%	12%	04%	10%
8	1476	54%	03%	17%	11%	04%	11%
9	60	46%	04%	29%	04%	04%	13%
10	6739	54%	03%	18%	11%	04%	10%

Loan application outcome statistics derived using Home Mortgage Disclosure Act Data. RUCA codes obtained from the United States Department of Agriculture's Economic Research Service.

Table 13: Regression Results - Loan Origination Rate By Tract Is Dependent Variable[1]

	Coefficient
Median Household Income[2]	8.822*** (2.115)
Educational Attainment[3]	0.097** (0.042)
RUCA Code[4]	-1.002*** (0.197)
Percent Non-White	0.753*** (0.201)
Constant	-43.286* (24.456)
R-Squared	0.4156
Observations	183

Notes:

*Robust Standard Errors in parentheses: *p<0.10, **p<0.05, ***p<0.01.*

1. *Dependent variable is percentage of loan applications originated by census tract, measured using 2017 HMDA data.*
2. *Median Household Income is the natural log of the tract's median household income in 2010. Data taken from the Census Bureau*
3. *Educational attainment data calculated by adding the percentage of the population that completed high school (or equivalent) to those with higher levels of education. This was done using data from the Census Bureau.*
4. *RUCA codes established using data published by the United States Department of Agriculture's Economic Research Service.*
5. *Percent Non-White is calculated as one hundred minus the percentage of the population that's white in 2010. This was done using data from the Census Bureau.*

Table 14: Binary Regression Results - Loan Origination Rate By Tract Is Dependent Variable[1]

	Coefficient
Median Household Income[2]	12.241*** (2.197)
Educational Attainment[3]	0.112** (0.048)
Binary RUCA Code[4]	-2.803** (1.269)
Percent Non-White	1.149*** (0.182)
Constant	-88.598*** (24.375)
R-Squared	0.3334
Observations	183

Notes:

*Robust Standard Errors in parentheses: *p<0.10, **p<0.05, ***p<0.01.*

1. *Dependent variable is percentage of loan applications originated by census tract, measured using 2017 HMDA data.*
2. *Median Household Income is the natural log of the tract's median household income in 2010. Data taken from the Census Bureau*
3. *Educational attainment data calculated by adding the percentage of the population that completed high school (or equivalent) to those with higher levels of education. This was done using data from the Census Bureau.*
4. *Binary RUCA code constructed by assigning a "1" to census tracts coded as rural, and a "0" to all other tracts. This was done using data published by the United States Department of Agriculture's Economic Research Service.*
5. *Percent Non-White is calculated as one hundred minus the percentage of the population that's white in 2010. This was done using data from the Census Bureau.*

Table 15: Regression Results - Loan Denial Rate By Tract Is Dependent Variable[5]

	Coefficient
Median Household Income[6]	-8.814*** (1.816)
Educational Attainment[7]	-0.059** (0.027)
RUCA Code[8]	0.585*** (0.001)
Percent Non-White	-0.480*** (0.002)
Constant	114.087*** (20.526)
R-Squared	0.4083
Observations	183

Notes:

*Robust Standard Errors in parentheses: *p<0.10, *p<0.05, ***p<0.01.*

6. *Dependent variable is the percentage of loan applications denied by census tract, measured using 2017 HMDA data.*
7. *Median Household Income is the natural log of the tract's median household income in 2010. data taken from the Census Bureau.*
6. *Educational attainment data calculated by adding the percentage of the population that completed high school (or equivalent) to those with higher levels of education. This was done using data from the Census Bureau.*
7. *RUCA codes established using data published by the United States Department of Agriculture's Economic Research Service.*
8. *Percent Non-White is calculated as one hundred minus the percentage of the population that's white in 2010. This was done using data from the Census Bureau.*

Table 16: Binary Regression Results - Loan Denial Rate By Tract Is Dependent Variable[5]

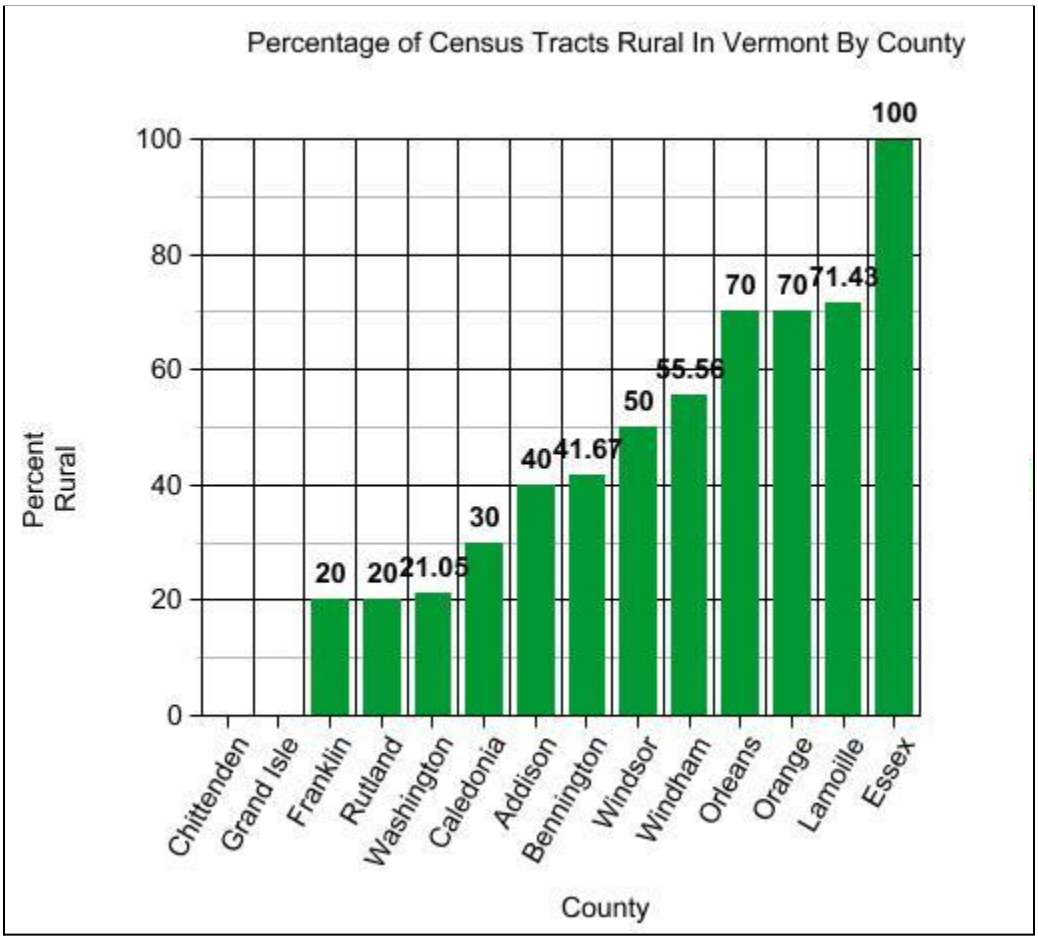
	Coefficient
Median Household Income[6]	-10.768*** (1.909)
Educational Attainment[7]	-0.068** (0.031)
Binary RUCA Code[8]	1.772** (0.842)
Percent Non-White	-0.705*** (0.137)
Constant	140.013*** (21.139)
R-Squared	0.3525
Observations	183

Notes:

*Robust Standard Errors in parentheses: *p<0.10, *p<0.05, ***p<0.01.*

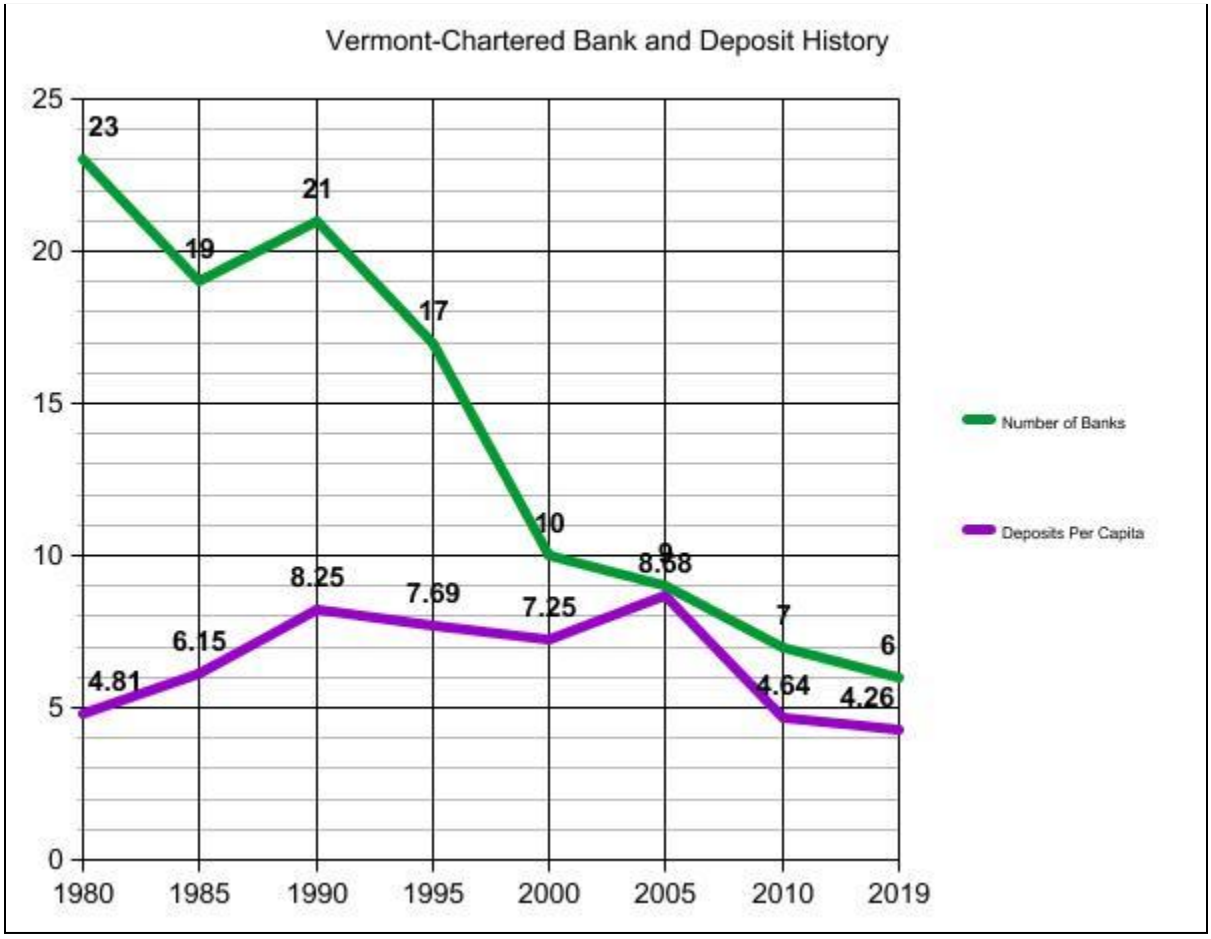
8. *Dependent variable is the percentage of loan applications denied by census tract, measured using 2017 HMDA data.*
9. *Median Household Income is the natural log of the tract's median household income in 2010. data taken from the Census Bureau.*
10. *Educational attainment data calculated by adding the percentage of the population that completed high school (or equivalent) to those with higher levels of education. This was done using data from the Census Bureau.*
11. *Binary RUCA code constructed by assigning a "1" to census tracts coded as rural, and a "0" to all other tracts. This was done using data published by the United States Department of Agriculture's Economic Research Service.*
12. *Percent Non-White is calculated as one hundred minus the percentage of the population that's white in 2010. This was done using data from the Census Bureau.*

Figure 1



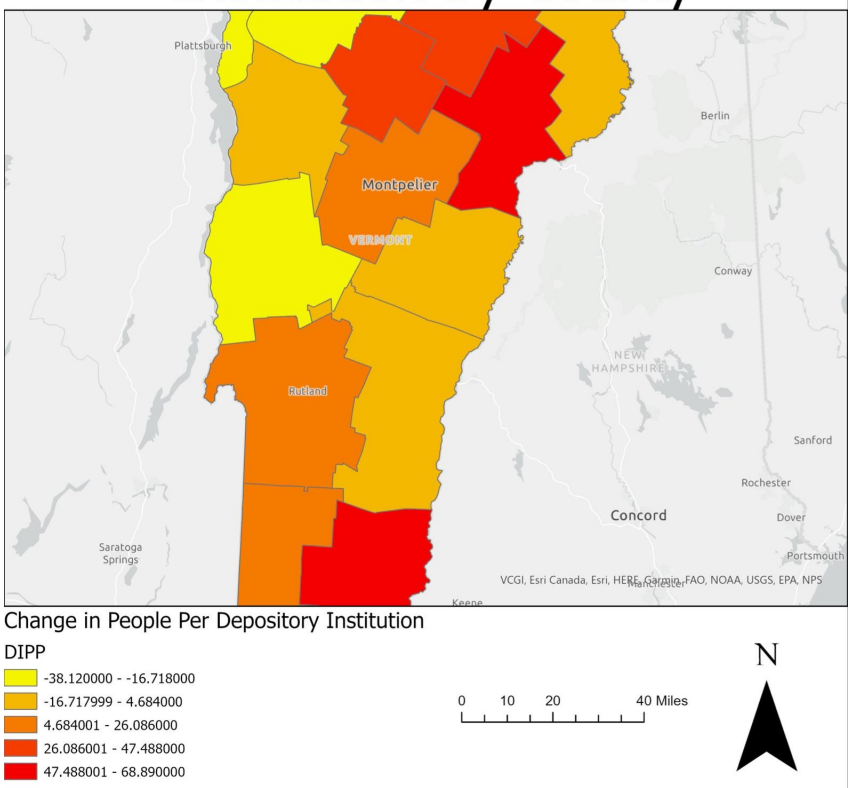
Calculations made using RUCA code and census tract data published by the United States Department of Agriculture's Economic Research Service

Figure 2



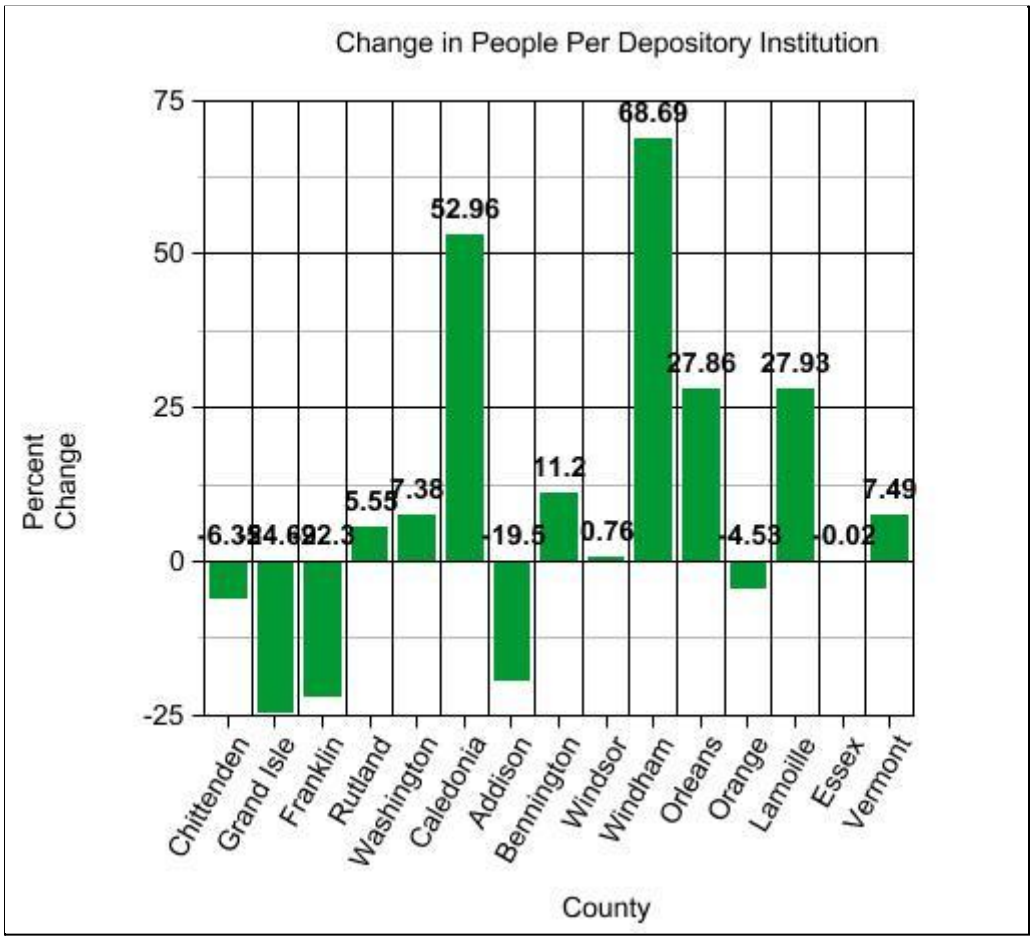
Data taken from the Vermont Department of Financial Regulation. "Number of Banks" refers to the number of Vermont-Chartered Banks, while "Deposits Per Capita" refers to the total deposits in Vermont-chartered banks divided by population.

Figure 3



1980 depository institution data taken from the 1980 Annual Report Of The Bank Commissioner Of The State of Vermont For The Year Ended December 31st, 1980. 2010 depository institution data taken from The Vermont Department of Financial Regulation. Population data taken from the Census Bureau. County boundary shapefile obtained from the Vermont Open Geodata Portal

Figure 4



1980 depository institution data taken from the 1980 Annual Report Of The Bank Commissioner Of The State of Vermont For The Year Ended December 31st, 1980. 2010 depository institution data taken from The Vermont Department of Financial Regulation. Population data taken from the Census Bureau.