THE IMPACT OF THE SUBPRIME MORTGAGE CRISIS ON COMMUNITY HEALTH

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THE IMPACT OF THE SUBPRIME MORTGAGE CRISIS ON COMMUNITY HEALTH

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SUMMARY

Loans originated to borrowers with lower incomes and/or lower credit scores are classified as subprime. The spatial distribution of subprime loans is alarmingly concentrated in minority-dominated and low-income areas. Beginning in mid 2006 the subprime mortgage market began to see elevated levels of delinquent and defaulted loans. The causes are many but generally traced to the beginning of the reset periods for adjustable rate mortgages and the evaporation of demand for securitized subprime mortgages. As delinquent and default rates in subprime mortgages rise, areas with a concentration of high-risk borrowers are at risk to decline. The decline can be measured across four different groups of factors that indicate the health of a community. The four groups are: physical, institutional, socioeconomic and the residential body. The residential body factor group refers to the citizens of a community and their civic involvement.

The analysis uses binary logistic regression to identify communities that are commonly associated with subprime mortgage defaults. Subprime loans in the ten-county Atlanta Metropolitan Area are the focus of the study. The analysis treats each census tract in the ten counties as an individual community. The sample loans are geocoded to the census tract level allowing defaulted loans to be tied to communities and their characteristics. The data is collected from a variety of sources including the U.S. Census Bureau, the Atlanta Regional Commission and RR Donnelley's Credit Risk Management database. The results indicate that the probability of subprime mortgage defaults are associated with higher vacancy rates, population loss, declining property tax revenues, depreciating property values, and declining owner reinvestment in their properties.

Potential spill over impacts to the community include higher crime rates, decreased school funding and degradation of public infrastructure.

CHAPTER 1

INTRODUCTION

The beginning of the Declaration of the Independence states: “We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.” With these words the Founding Fathers of the United States established the basis for what has become the “American Dream.” The Dream varies from person to person, but generally follows the rags to riches story of overcoming financial misfortune and achieving substantial wealth. The United States has economic and social mobility, which motivates both Americans and immigrants to pursue their dreams of entering the middle or upper class. Homeownership is the primary form of wealth holding for most Americans. Thus, many see the ownership of a home as a means to fulfill part of their American Dream.

The majority of potential homebuyers do not have the large amount of capital necessary to purchase a home with a solitary payment; therefore, over time, the mortgage industry evolved to meet the homebuyers’ demand for capital. A potential borrower interested in purchasing a home applies to a bank for a loan. The bank then assesses certain characteristics of the potential borrower such as income level, employment history and credit history to determine if the borrower is credit worthy. If deemed so, the bank and the borrower enter into a contract. Through the contract, the borrower receives an amount of money from the bank to cover the purchase of the home, and in turn, the bank receives the borrower’s promise to repay the original amount of money plus a specified interest rate over a set period of time. The underlying value of the property is the bank’s

guarantee against loss. The property may be seized and sold if the borrower violates the term and conditions of the contract. In order to repay the mortgage, and avoid the bank seizing the property, the borrower remits a schedule monthly principal and interest payments to the bank.

If the borrower continually misses payments then the bank will take legal action to protect against a loss of the full amount of the loan. The process begins with the bank placing the loan in delinquency. The delinquency period continues until foreclosure begins and the loan enters default. Finally, it ends when the loan enters liquidation. When a loan is in default there may be serious negative consequences for the property and the community. One such impact is the loss in property value resulting from a reduced level of home maintenance. Other factors impacted are: property tax revenues, population demographics, school quality, public infrastructure, housing demand and crime rates

The analysis examines the impacts of the recent spike in defaults among subprime mortgages on the health of communities in the ten county Atlanta Metropolitan Area. For the purposes of the study, census tracts based on 2000 census are treated as communities. Using three primary data sources, variables that measure community health are gathered at the census tract level. Each mortgage is marked as a default or non-default and geocoded to the census tract it is located in. Finally, the analysis uses logistic regression to determine whether a correlation exists between measures of community health and defaulted subprime mortgages. Once the correlations are established, the impacts of the meltdown are examined to determine the consequences. It is expected that defaulted loans lead to a decline in the health of a community.

CHAPTER 2

BACKGROUND INFORMATION

What is a Community?

The city of Jacksonville, Florida established the Jacksonville Community Council (JCCI) in 1985. The council's primary tasks are to engage diverse citizens in open dialogue, research, consensus building and leadership development to improve the quality of life and build a better community. In 2003, the organization issued a report entitled "Neighborhoods at the Tipping Point" that has three main objectives: 1) identifying factors that cause neighborhoods to enter a period of decline, 2) identifying neighborhoods that have a higher risk for decline, and 3) proposing possible plans for improving high risk neighborhoods. The authors conclude that declining neighborhoods are marked by infrastructure and property value degradation, decreasing social involvement among community members, increasing occurrences of crime, declining property tax revenues, a feeling of insecurity among the residents and declining quality of the neighborhood's schools. The aggregation of all these factors leads the neighborhood to become a place that many residents want to leave and consequentially, many residents do. The authors of "Neighborhoods at the Tipping Point" asked citizens of Jacksonville to identify important factors that measure community health. Citizens' responses were organized into ten categories that influence neighborhood health: appearance, civic engagement, commercial activity, environmental factors, housing, infrastructure, organizational capacity, parks, safety and schools.

The report defines a community "by a combination of public service agencies, developers, planning agencies, people and traditions" (JCCI 2003) while stating that

communities are challenging to define because they represent not only a place, but also a group of people. A community can be defined by its streets commercial properties, other buildings, and natural assets or by a group of people who share specific characteristics (e.g. income level, race or age). Counties are considered to be geographic identifier for communities; however, counties can be non-homogeneous across population, housing and other demographic attributes and do not necessarily represent a community in an appropriate manner. Two geographic identifiers that are intended to capture community characteristics on a sub-county level are census tracts and census blocks. Census blocks are separated by distinct geographic boundaries such as roads, creeks, and rivers. Census tracts are designed to be relatively homogeneous with respect to population characteristics, economic status, and living conditions. The population of a census tract varies from 1,500 to 8,000, with the optimum size being around 4,000 people. Because of the way they are constructed, this report uses census tracts as the basic geographic definition of communities. Table 2.1 lists the ten counties in the Atlanta Metropolitan area and the number of census tracts in each county. A map of the ten county area is included in Appendix A. Within the ten counties there are 544 census tracts.

Table 2.1: Counties in the Atlanta Metropolitan Area

County	# of Census Tracts	County	# of Census Tracts
Cherokee	26	**Fayette**	17
Clayton	41	**Fulton**	153
Cobb	84	**Gwinnett**	65
Dekalb	116	**Henry**	16
Douglas	13	**Rockdale**	13
Sub-total	280	**Sub-total**	264
Total Number of Census Tracts			544

The Subprime Market

The mortgage market in the United States is split into three segments: prime, alt-a and subprime. The term "alt-a" stands for alternative documentation which means that a borrower's income documentation is not from traditional employment. Borrowers who receive these loans are considered to be greater risks than are prime borrowers, but less risky than subprime borrowers. The main difference between the three segments is the premiums charged on alt-a loans and subprime loans are above the prevailing market interest rate for prime loans. The interest for alt-a loans tends to be one quarter to a one half a percentage point higher than prime loans, whereas the interest rate for subprime loans is typically two percentage points higher than prime loans (Chomsisengphet, et. Al 2006). Prime mortgages constitute about 80 percent of the market, alt-a loans constitute about 5 percent and subprime loans constitute about 15 percent. In 2006, the U.S. residential mortgage market was $10 trillion and the subprime mortgage market was $1.5 trillion (Agarwal and Ho 2007).

The mid to late 1990s saw strong growth in the subprime market. In 2003, $332 billion originated in subprime loans compared to $65 billion in 1995, which represents a 410% increase in the amount of dollars originated. The fundamental reason for the rapid growth of subprime lending is that it became legal through the Depository Institutions Deregulation and Monetary Control Act. This act allowed thrift institutions to charge higher interest rates and fees to borrowers than they previously had. The Alternative Mortgages Transaction Parity Act permitted use of variable interest rates and balloon payments. The Tax Reform Act of 1986 increased the demand for mortgage debt by prohibiting the deduction of interest on consumer loans, yet allowed interest deduction on

mortgages for a primary residence as well as one additional home (Chomsisengphet, et. Al 2006). Falling interest rates in the early 1990s and in the months after September 11, 2001 greatly increased mortgage demand. Lower interests rates made subprime mortgages an easy route for existing homeowners to refinance their mortgages (Agarwal and Ho 2007). A simultaneously occurring event was the growth in the securtization of subprime mortgages. Securitization of loans occurs when a group of newly originated loans are packaged together and sold as an investment instrument. Investment banks purchase a pool of mortgages (i.e. the investment instrument) from subprime mortgage originator(s), essentially buying the rights to the principal and interest payments for the underlying pool of mortgages. As a result of securitization, originators get a commission and the borrowers get the money to purchase their homes. The securitization rate for subprime mortgages was 28.4% in 1995 and 58.7% in 2003 (Chomsisengphet, et. Al 2006). The securitization of 58.7% in 2003 means that 58.7% of all subprime loans were packaged into a pool of mortgages as sold as an investment instrument. The securitization of these types of mortgages further fueled the growth in the market by making it profitable for firms to originate subprime mortgages.

Geographic Characteristics of Subprime Loans

The main determinant that makes a mortgage subprime is the borrower. Borrowers in the subprime market are dubbed high-risk borrowers, and typically have either lower incomes, tarnished credit histories, high debt to income ratios or unverifiable income. Lenders consider these characteristics when determining the amount of risk a borrower represents. The higher the risk a borrower poses, the higher the interest rate his mortgage carries. The boom in the subprime market meant that people who were

previously unable to qualify for a mortgage could now obtain one. Many of the people who fit the "reduced" qualification standards had characteristics identifying them as high risk. Essentially, the growth in the market represents a growth in lending to riskier borrowers, also known as high risk lending.

A key goal of the Civil Rights agenda in the United States is the elimination of discriminatory practices in home mortgage lending. There are several studies providing evidence of a dual-mortgage market. The "dual" term refers to the two different mortgage markets, the prime and the subprime, serving different neighborhoods based on the racial composition of that neighborhood (Apgar and Calder 2005). Several studies support the finding that neighborhoods where the majority of the population is a racial minority have a high concentration of subprime mortgages (Calem, Hershaff and Wachter 2004; Scheessele 2002; Calem, Giller, and Wachter 2004). Wachter, Russo, and Hershaff (2006) also show that there is a concentration of subprime mortgages in neighborhoods with lower median family incomes. However, Pennington-Cross et al. (2000) provides conflicting evidence. It concludes that the subprime market does not primarily originate mortgages to low-income borrowers, but instead to riskier borrowers. Pennington-Cross (2002) shows that subprime lending is most prevalent in locations with declining housing prices.

Delinquency and Default

The majority of mortgage types in the market are labeled as affordability products and are designed to give the borrower lower principal and interest payments. These products include interest-only mortgages, balloon mortgages, adjustable rate mortgages, or a combination of all three. One key drawback of the affordability products is that the

lower principal and interest payments occur for only a set period of time. Interest-only loans typically have an interest only period wherein just the interest is due and after the period expires both the principal and interest are due. ARM loans have a similar reset period when the interest rate adjusts (typically to a higher rate) and balloon loans amortize slower but at the end of the repayment term the remainder of the principal balance is due. Most borrowers in the market can typically only afford their payment while in the interest only period, before the balloon payment is due or before the rate reset period begins. They expect to refinance at some point before their principal and interest payment increases. If the borrowers are unable to refinance their mortgages before their principal and interest payments are scheduled to increase, then the payment shock may force them into delinquency.

Table 2.2: Affordability Products in the Subprime Market 2004-2007

Product	Loan Count	% of Total Loans	
ARM, Balloon, and Interest Only	4,231	0.32%	Count of Loan in Affordability Products
ARM and Balloon	43,220	3.25%	939,902
ARM and Interest Only	130,698	9.84%	
ARM	646,035	48.64%	% of Loans in Affordability Products
Balloon and Interest Only	1,843	0.14%	**70.77%**
Balloon	94,428	7.11%	
Interest Only	19,447	1.46%	
Fixed Rate	388,193	29.23%	
Total	1,328,095	100.00%	

Information pulled from RR Donnelley's Credit Risk Management Database

Standard mortgage industry terminology labels a loan "current" if the borrower has missed zero payments, "delinquent" if the borrower has missed at least one payment and has yet to repay the bank and "default" if the bank has initiated the foreclosure process. There are many underlying causes that result in delinquent loans. For example, divorce, loss of job and unexpected higher principal and interest payments can all cause a borrower to fail to remit a scheduled payment. Once a loan enters delinquency, the bank

contacts the borrower in attempt to establish a loss mitigation strategy. Strategies typically involve allowing a borrower to remit extra monthly payments or larger monthly payments to make up for the lost payment(s). Loss mitigation is successful about 33% of the time (Biddle 2008). If loss mitigation fails and the borrower continues to accumulate missed payments, then the bank files legal documents to begin the foreclosure process and seize the property. A borrower can also file legal documents to enter bankruptcy to protect his home from foreclosure. If a borrower enters bankruptcy then his debt is restructured in a manner that allows him the opportunity to repay it. Depending on which state the property is located in, the foreclosure process can take as little as three weeks (Texas) or as long as two years (New Jersey) to complete. During foreclosure, the borrower is allowed to continue to inhabit the house, but upon the completion of the process, the borrower is evicted from the home. The home goes to a foreclosure sale, where the home is sold in an auction setting. If the bids are unsatisfactory, then ownership of the property passes to the bank (i.e. it becomes real estate owned or REO). The property is liquidated upon sale of the real estate owned property to a new owner.

Table 2.3: Possible Mortgage Statuses		
Status	**Description**	**Grouped Status**
Current	As of the end of the month, the next due date is in the future	
Non-reportable	As of the end of the month the current due date is in the past but within the current month	
30 days past due	As of the end of the month, the current due date in the previous calendar month and the loan is note in foreclosure or REO	Delinquent
60 days past due	As of the end of the month, the current due date is at least two months in the past but not greater than three months in the past	Delinquent
90+ days past due	As of the end of the month, the current due date is at least three months in the past	Delinquent
Loss Mitigation	As of end of the month, the loan is not current, in an approved loss mitigation strategy, and not in any other status	Delinquent
Bankruptcy	The mortgages is currently in the bankruptcy process	Delinquent
Foreclosure	The mortgages is currently in the process of foreclosure	Default
Real estated owned (REO)	Mortgages is current real estated owned. The bank has obtained the title and is actively marketing the property for sale	Default
Liquidated	Sale of the property after possession had been taken by the bank.	Default
Prepaid	Voluntary full prepayment of the mortgage (refinance)	

The middle of 2006 saw a rise in the delinquency rates among subprime mortgages, which is a trend that has continued into January 2008. Elevated rates of delinquency, in turn, led to elevated rates of foreclosures, real estate owned properties, and liquidations. The initial cause of the increasing amount of delinquent and defaulted loans is that fact that the loans were originated to borrowers who should not have received them. The initial increase in delinquency and default rates led to a drop in the demand for securitized subprime loans (Biddle 2008). The lack of demand for securitized subprime loans has led to the lack of demand for the originations of subprime loans, which means that borrowers who need to refinance are unable to do so. Borrowers cannot refinance within the prime market since they do not fit the greater qualification standards. The inability to refinance forces subprime borrowers into the position of not being able to pay their higher principal and interest payments when they hit their reset periods or when

their interest-only period expires. The result is a significant increase in the number of delinquent and defaulted loans.

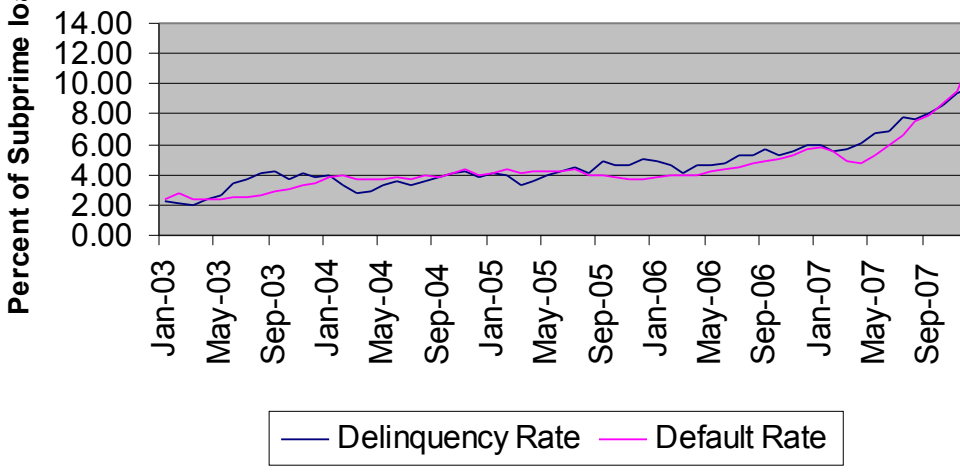

Figure 2.1: Delinquency and Default Rates 2003-2007

Source: RR Donnelley's Credit Risk Management Database

CHAPTER 3

LITERATURE REVIEW

The effects of a foreclosure on the surrounding properties and the neighborhood are known as "spill-over effects." Baxter and Lauria (2000) found that a concentration of foreclosures in a neighborhood is positively correlated with neighborhood vacancy rates. They also found that home ownership and a concentration of foreclosures are negatively correlated. However, foreclosures indirectly affected both measures by its strong affect on the change in the black population. A study of foreclosures in Chicago by Immergluck and Smith (2006) shows that conventional foreclosures have a significant negative effect on property values. Immergluck and Smith (2005) also show that each conventional foreclosure within an eighth of a mile of a particular property results in a 0.9 percent decline in values. In a similar study, Shlay and Whitman (2004) estimate the impact of vacant housing on the sale price of nearby homes. They find that selling a home within 150 feet of an abandoned building will result in a sale price $7,000 less than other comparable properties. Apgar and Duda (2005) note in their report to the Homeownership Preservation Foundation that "the negative impacts of foreclosure extend far beyond the parties to a failed mortgage contract." In particular, local landlords may be forced to charge lower rents, local businesses may see weaker sales and the municipality will see lower property taxes.

CHAPTER 4

DATA AND METHODOLOGY

Using the Jacksonville study as a guide, the ten factors of community health are broken down into four subgroups: physical, institutional, socioeconomic, and residential body.

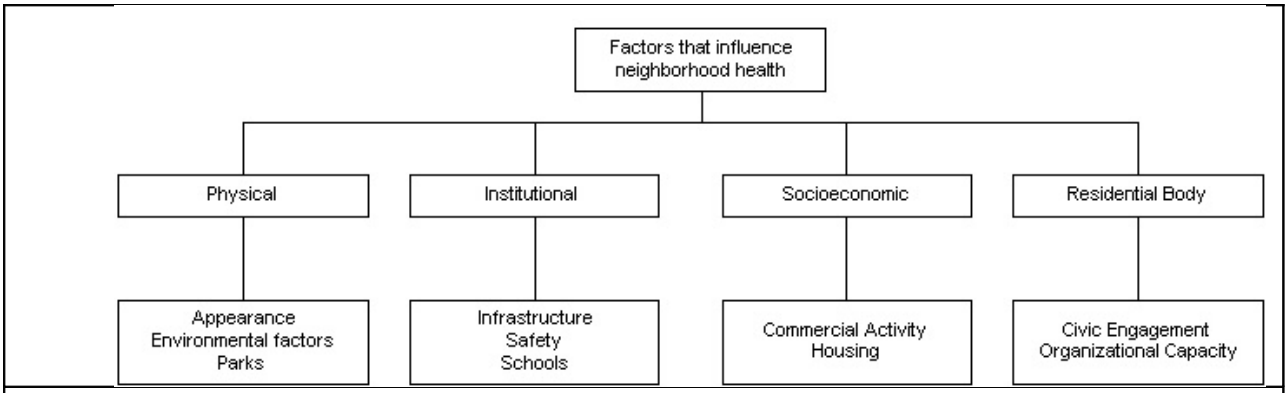

Figure 4.1: Factors of Neighbor Health

Each subgroup contains several factors that indicate community health. "Physical" refers to the physical conditions of the neighborhoods and potential variables measure appreciation in property values, vacant buildings and investment by owners. "Institutional" refers to government services in the communities. Potential variables are access to public transportation, public funds and school quality. "Socioeconomic" refers to variables that measure either social factors in the community, economic factors in the community or both. Potential variables are crime rate, unemployment rate, per capita income and the percentage of homeowners who paid their property taxes. Finally, "residential body" refers to the residents of the neighborhood themselves. Potential variables measure residential factors such as social activity in the community and population change.

Data Sources

Three sources provided data for the analysis: The RR Donnelley Credit Risk Management database, United States 2000 Census, and the Atlanta Regional Commission. RR Donnelley's Global Real Estate Services division supports a Residential Surveillance team specializing in providing services to investors in the subprime market. These clients include Lehman, Normua, Barclays, Credit Suisse First Boston, Hong Kong and Shanghai Banking Corporation and Fannie Mae. Investment banks require securities of loans to be diversified in geographic location in order to avoid a single massive loss caused by a natural disaster. The Credit Risk Management database contains 1.3 million loans from across the continental United States and accurately represents the subprime market as a whole. The database captures originations, servicing, and remittance data. Originations data includes information about the borrower and the loan at the time the loan is originated. Examples of variables captured are original loan balance, original interest rate, product type, original appraisal amount and address. The address of a loan includes the following elements: street, city, county, state and zip code. Servicing data is collected on a monthly basis and captures the most up to date information on the loan. Fields captured in the servicing data include: current balance, current status of loan, and current appraisal amount. The Summary File 3 dataset from the 2000 census captures data concerning population and housing characteristics for geographic areas across the United States. From the dataset over 250 fields are pulled at the census tract level. The 250 fields are then narrowed down and modified into 72 intermediate variables. Finally, the intermediate variables are used to define the final variables that are examined. The Atlanta Regional Commission website (**www.atlantaregional.com)** provides up-to-date

(2006 or 2007) housing data, employment data, population data, and job data on the census tract level.

Table 4.1: Factors of Community Health					
Indicator	**Group**	**Data**	**Indicator**	**Group**	**Data**
Community Policing	Residential Body	No	School Quality	Institutional	No
Neighborhood Organization	Residential Body	No	Political Resources	Institutional	No
Political Participation	Residential Body	No	Rental Property	Socioeconomic	Yes
% Socially Active in community	Residential Body	No	Corporate Investment	Socioeconomic	No
Population change	Residential Body	Yes	Availability of retail and servicers	Socioeconomic	No
% change in racial mix	Residential Body	Yes	Crime Rate	Socioeconomic	No
Infrastructure Improvements	Physical	No	Commercial Activity	Socioeconomic	No
Housing Quality	Physical	No	% of Kids on Meal plans	Socioeconomic	No
Measure(s) of pollution	Physical	No	Unemployment rate	Socioeconomic	Yes
Abandoned Buildings	Physical	No	Job Growth	Socioeconomic	Yes
Parks and green space	Physical	No	% Below Poverty line	Socioeconomic	Yes
Recreational and community facilities	Physical	No	Average income	Socioeconomic	Yes
% Change in Property Values	Physical	Yes	Average tax amount	Socioeconomic	Yes
Vacant Houses	Physical	Yes	Housing demand	Socioeconomic	Yes
New Construction	Physical	Yes	Rental values	Socioeconomic	Yes
Investment by owners	Physical	Yes	% who paid taxes	Socioeconomic	Yes
Access to transportation	Institutional	No			

Variables

The initial number of community health variables is thirty-three; however, eighteen of these are eliminated due to data availability. The elimination of eighteen of the variables means that only three of four community health factor subgroups are represented. Three other variable are eliminated because of endogeneity concerns. These three are the unemployment rate, the percent below the poverty line, and the per capita income. It is unlikely that if a borrower goes into default on his loan that it will cause the unemployment rate to rise. However, if the unemployment rate rises it is more likely that a borrower will default on his loan. Per capita income and percent below the poverty line both measure the wealth of a community. Similar to unemployment, it is unlikely that a defaulted loan caused the per capita income to fall or the percent below the poverty line to rise. Lower per capita income or a higher proportion of residents below the poverty line may indicate that people in the community may have difficult remitting payments

when the payments begin to adjust. The remaining twelve variables are examined to determine the relationship to defaulted loans. Table 5 lists the variables that measure community health.

Table 4.2: Variables Measuring Community Development Factors			
Variable Name	**Attribute**	**Description**	**Source**
Per_Pop_Chg	Population change	% Population Change from 2000 to 2007	ARC Population Dataset**
Per_chg_pv	% Change in Property Values	% change in appraisal value	CRM Database*
Per_Vacant	Vacant Houses	% of Vacant Houses	Census Data--table H006
Per_hunts_chg	New Construction	% change of housing units	ARC Housing Dataset**
Per_Lack_kitchen	Investment by owners	% of homes that lack full kitchen facilities	Census Data--table H050
Per_Job_growth	Job Growth	% change in Job growth from 2005 to 2006	ARC Job Dataset**
Med_Prop_tax	Average tax amount	Median Property Tax for the census tract	Census Data--HCT020001
Per_chg__den	Housing Demand Change	% change in housing demand from 2000 to 2007	ARC Housing Dataset**
Rental_value	Rental values	Median rental value for rental properties in the census tract	Census Data--H056
Per_no_tax	% who paid taxes	% of Owner Occupied Homes that did not pay property taxes	Census Data--HCT019016
Per_chg_comp	Change in Racial Composition	% change in racial composition if % of nonwhite population is above 0.60	ARC Population Dataset**
Per_renter	Rental Property	% of Homes that are renter occupied	CRM Database*
*CRM stands for RR Donnelley's Credit Risk Management database			
**ARC stands for Atlanta Regional Commission			

The residential body subgroup is represented by the variables percent population change (*Per_pop_chg*) and the percent change in racial composition (*per_chg_comp*). The percent change in population measures the extent to which people are moving into or moving out of an area, and it also represents the willingness of people to live in the area. It may be correlated with the new construction variable and/or the percent change in housing density. The percent change in population is defined as the percent change in population from 2000 to 2007. The change in racial composition measures if neighborhoods where the racial minority is the majority are becoming more racially segregated as a result of defaults. It is an interaction term between a binary variable and the percentage change in racial composition. The binary variable is defined as one if in 2000 the percentage of nonwhite residents in the census tract is greater than 60% and

zero otherwise. The percentage of racial composition is the percent change in non-white population from 2000 to 2007. The percent change in composition represents the percent change in the non-white population in census tracts that already had a majority non-white population.

The physical subgroup is represented by the variables percent change in property values (*per_chg_pv*), percent of vacant houses (*per_vacant*), new construction in homes (*per_hunts_chg*), and investment by owners (*per_lack_kitchen*). Percent change in property values measures the curb appeal value of the neighborhood as well as the demand for housing. Calculated by using the Credit Risk Management database, the percent change between the original appraisal amount and the most current appraisal amount is calculated for every loan. It is then averaged by census tract, which creates the variable that measures the percent change in property values in the census tract. New construction in homes is represented by the percent change in houses units between 2000 and 2007. It measures the demand for new housing in the community and it may be correlated with the percent change in population and the percent change in housing density. Investment by owners is measured using the percentage of homes that lack full kitchen facilities as provided by the 2000 census data. A house has full kitchen facilities if it has a sink with piped water, an oven, a stove and a refrigerator. If a house has an icebox instead of a refrigerator or a microwave instead of a stove and oven, then it does not have full kitchen facilities. The variable is measuring owners' reinvestment in their own properties.

The socioeconomic subgroup is represented by the variables percent change in job growth (*Per_job_growth*), median property taxes (*med_prop_tax*), percent change in

housing density (*per_chg_den*), rental values (*rental_value*), percentage of renters (*per_renter*), and percent of owner-occupied homes that did not pay their property taxes (*per_no_tax*). Percent change in job growth is measured as the percent change in the number of jobs from 2005 to 2006; it measures the growth in commercial activity of the community. The housing density is calculated by dividing the number of people in a census tract by the number of housing units. The percent change in density is the percent change in housing densities from 2005 to 2006 and it measures the change in housing demand over the same time period. It may be correlated with the percent change in population and new construction in homes. Rental value represents the median contract rent for renter occupied houses for which the renter pays in cash. It measures the value of rental properties in the community and may be correlated with the percent change in property values. Median property taxes represents the median real estates taxes that owner occupied houses paid. It is measuring the value of the property in regards to tax assessments and may be correlated with rental values or percent change in property values. The percent of homeowners not paying their property taxes represents the percent of owner occupied houses in the census tract that did not pay their property taxes. Percent of renters is the proportion of homes that are renter occupied to the total number of homes.

Methodology

Several different methodologies are considered for the analysis. Most methodologies are based on multiple linear regression analysis. In order to use multiple linear regression analysis, panel data and/or pooled cross-sectional data is required; however, such data is unavailable. Binary linear regression is used to predict the

probability of a yes/no outcome. The dependent variable is coded at zero for no (non-default) and one for yes (default). Binary linear regression works by first estimating an underlying latent variable equation:

$y^*_i = x'_i \boldsymbol{\beta} + u_i$ using maximum likelihood estimation, and then applying a transformation to relate it to the outcome. There are two transformation functions available: the probit (uses the normal distribution) transformation and the log-odds (logit) transformation. The analysis will use the logit transformation whose conditional probability function is given by:

$$\pi_i = \frac{\exp(x'_i \boldsymbol{\beta})}{1+\exp(x'_i \boldsymbol{\beta})} \qquad (1).$$

β is the vector of estimated parameters and x_i' is a vector corresponding to the independent variables. Given the set up of the model, the probability that y_i equals one is π_i i.e. $P(y_i = 1) = \pi_i$ and the probability that y_i equals zero is $(1-\pi_i)$ i.e. $P(y_i = 0) = 1-\pi_i$. The odds ratio is defined as the probability that $y_i = 1$ divided by the probability that $y_i = 0$ and in the logit case the ratio reduces down to $\pi_i / (1- \pi_i) = \exp(x_i'\beta)$.

$$P(y_i = 1) = \frac{\exp(x'_i \boldsymbol{\beta})}{1+\exp(x'_i \boldsymbol{\beta})};\ P(y_i = 0) = \frac{1}{1+\exp(x'_i \boldsymbol{\beta})} \qquad (2)$$

$$\Omega(x) = \frac{P(y_i = 1)}{P(y_i = 0)} = \frac{\dfrac{\exp(x'_i \boldsymbol{\beta})}{1+\exp(x'_i \boldsymbol{\beta})}}{\dfrac{1}{1+\exp(x'_i \boldsymbol{\beta})}} = \exp(x'_i \boldsymbol{\beta}) \qquad (3)$$

$\Omega(x)$ is known as the odds ratio and represents the odds of choice one (i.e. $P(y_i = 1)$). Taking the natural log of the odds ration completes the logit transformation. If the

coefficient of an independent variable is positive, then an increase in the independent variable will increase the odds of the event occurring, and a decrease in the independent variable will decrease the odds. If the coefficient of an independent variable is negative, then an increase in the independent variable will decrease the odds of that event occurring, and a decrease of the independent variable will increase the odds. If the coefficient of an independent variable is zero, then an increase or a decrease in the independent variable will have not have any impact on the odds.

CHAPTER 5

HYPOTHESIS

The hypothesis of the paper is that subprime mortgage defaults are associated with declining community health. To test the hypothesis it is necessary to establish associations between defaulted loans and several of the variables measuring the factors of community health. It is expected that percent population change, percent change in property values, percent change in housing units, percent change in job growth, median property tax, percent change in housing density, percent of owners who did not pay their property taxes, and rental values will all have negative coefficients. It is also expected that the coefficients of percent vacant, percent that lack full kitchen facilities, number of rental properties, percent change in racial segregation for highly segregated communities will be positive. Delinquent borrowers face a financial crisis and chose the best alternative for themselves and their families. Often the best choice is to continue to provide shelter for the family at the cost of repairs and reinvestment in the home or property taxes. At the completion of the foreclosure process borrowers who defaulted and their families are evicted from their homes and forced to live elsewhere. This leads to a decrease the population, a decrease in housing density and an increase in the number of vacant homes. An increase in the number of vacant house leads to a decrease in property values, rental values, and property taxes. If a property owner wants to sell his home, but would suffer a loss due to declining home prices, then by renting out his home he can avoid the loss. Construction companies and people are unwilling to build new homes in an area of defaulted loans because it is seen as a bad investment as a result of declining housing prices. A decrease in property values should also increase the number of renters

and decrease the construction of new homes. The existence of the dual mortgage market and the growth of subprime lending from 2005 to 2007 ensures that the change of racial composition will increase as subprime mortgage defaults increases. A negative coefficient means that the variable is negatively correlated with the probability of a defaulted loan. If a coefficient is negative then the higher the value, the lower the probability of a defaulting on a loan. A positive coefficient means that the variables are positively correlated with defaulted loans. If a coefficient is positive then the higher the value, the higher the probability of defaulting on a loan Table 6 lists the variables, their names and the hypothesized sign for each.

Table 5.1: Hypothesize Signs of Independent Variables

Variable name	Variable	Hypothesized Sign
Per_chg_pop	Population Change	Negative
Per_chg_hunts	New Construction	Negative
Per_chg_pv	Change in Property Values	Negative
Per_Job_Growth	Job growth	Negative
Med_prop_tax	Median Property Tax	Negative
Per_chg_den	Change in Housing Demand	Negative
Rental_Value	Property Rental Values	Negative
Per_lack_Kitchen	Investment by owners	Positive
Per_no_tax	Property taxes not paid	Negative
Per_vacant	% Vacant Houses	Positive
Per_chg_comp	% Change in Racial Composition	Positive
Per_renter	Rental Property	Positive

CHAPTER 6

SAMPLE

The criteria for the selection of loans are as follows: 1) located in the state of Georgia and 2) located in one of the ten counties of the Atlanta Metropolitan Area. These criteria led to an initial population size of 8,259 loans. Using the address information from the Credit Risk Management Database and the Federal Financial Institutions Examination Council geocoding system (http://www.ffiec.gov/Geocode/default.aspx), the loans are geocoded to the census tract level. Loans that are unable to be geocoded are discarded from the sample, which reduced the population size to 5,706 loans. These 5,706 loans represent the final dataset that the analysis uses. Almost 22 percent of the loans in the sample are in default and another 11.5 percent are delinquent. The loans in default are broken down as follows: 6.64 percent are in foreclosure, 4.64 percent are in real estate owned, and 10.7 percent are in liquidation. Table 6.1 breaks down the loan by status and by status group.

Table 6.1: Final Status Counts in Sample

Status	Count	Percent
Current	1407	24.66
Non-Reportable	652	11.43
30 Days Past Due	259	4.54
60 Days Past Due	103	1.81
90 Days Past Due	103	1.81
Loss Mitigation	77	1.35
Bankruptcy	116	2.03
Prepaid	1735	30.41
Foreclosure	379	6.64
Real Estate Owned	265	4.64
Liquidated	610	10.69
Totals	**5706**	**100**

Grouped Status	Count	Percent
Non-Delinquent	2059	36.08
Delinquent	658	11.53
Default	1254	21.98
Prepaid	1735	30.41
Totals	**5706**	**100**

The average number of subprime loans across census tracts is 10.5 and the standard deviation is 8.74. The minimum number of subprime loans in any of the census tracts is 1, and the maximum is 78. The average number of default loans per census tract is 2.31 with a standard deviation of 2.7. The minimum number of default loans per census tract is 0 and the maximum is 15. Table 6.2 breaks down the statistics of subprime mortgages and default mortgage.

Table 6.2: Census Tract Loan and Default Statistics	
Average number of loans per Census tract	10.5
Standard Deviation of loans per census tract	8.74
Maximum number of loans in a census tract	78
Maximum number of loans in a census tract	1
Average number of defaults per Census tract	2.31
Standard Deviation of defaults per census tract	2.7
Maximum number of defaults in a census tract	0
Maximum number of defaults in a census tract	15

Summary Statistics

Sample statistics for the twelve variables measuring community health are shown in table 6.3.

Table 6.3: Variable Statistics for Census Tracts					
Variable Name	Variable	Mean	Std Dev	Minimum	Maximum
Per_Pop_Chg	Population Change	0.1699	0.3481	-0.3998	4.5061
Per_Hunts_chg	New Construction	0.2337	0.3365	-0.3855	2.9344
Per_Job_Growth	Change in Job Growth	0.0637	0.2207	-0.6250	2.2323
Med_prop_tax	Median Property Tax	1353.4800	1060.9000	0.0000	8505.0000
Per_Chg_Den	Change in Housing Demand	0.1700	0.3494	-0.3993	4.5714
Rental_Value	Property Rental Values	661.1176	222.4943	0.0000	2001.0000
Per_lack_Kitchen	Investment by owners	0.0072	0.0133	0.0000	0.1065
Per_No_tax	Property taxes not paid	0.0027	0.0141	0.0000	0.2353
Per_Vacant	% Vacant Houses	0.0556	0.0467	0.0000	0.5789
Per_chg_pv	Change in Property Values	-0.0076	0.0242	-0.1676	0.1772
Per_chg_comp	% Change in Racial Composition	0.0049	0.0257	-0.1423	0.1674
Per_Renter	Rental Properties	0.3373	0.2356	0.0049	0.8956

The variables *med_prop_tax*, *rental_value*, *per_lack_kitchen*, *per_no_tax*, and *per_vacant* all have minimum values of zero. It is entirely feasible for all owner occupied

homes located within a census tract to all have full kitchen facilities or for all the owner-occupied homes to have paid their property taxes. It is also feasible for there to be no vacant houses in a census tract or no rental properties. Since *med_prop_tax* measures the median property taxes value for owner occupied homes, and if the census tract has no owner occupied homes then that variable will be zero for that census tract.

Table 10 shows the difference in mean values for variables between defaulted loans and non-defaults loans. The averages are calculated out over each loan in the sample. The "change in average" column represents the average of non-defaults loans minus the average of defaulted loans. A positive value means that the non-defaulted loans have a high average and a negative value signals that the defaulted loans have a higher average value.

Table 6.4: Difference in Mean Values between Defaults and Non-Defaults

Variable	Mean when Default = 0	Mean when Default = 1	Change in Mean
Per_Pop_Chg	0.2217	0.1850	0.0367
Per_Hunts_chg	0.2902	0.2436	0.0466
Per_Job_Growth	0.0681	0.0615	0.0066
Med_prop_tax	1265.3900	1006.8000	258.5900
Rental_Value	677.5836	593.6898	83.8938
Per_lack_Kitchen	0.0058	0.0096	-0.0038
Per_chg_pv	-0.0069	-0.0174	0.0106
Per_Renter	0.2653	0.3252	-0.0599
Per_chg_comp	0.0059	0.0068	-0.0009
Per_chg_den	0.2127	0.1817	0.0310
Per_Vacant	0.0487	0.0635	-0.0148
Per_No_tax	0.0023	0.0027	-0.0004

The change in average between non-defaults and defaults in *per_pop_chg*, *per_hunts_chg*, *per_job_growth*, *med_prop_tax*, *per_chg_den*, and *rental_value* is positive, suggestion the higher values are more associated with non-defaulted loans. The change in average for *per_chg_pv* is also positive; however, it indicates that defaulted

loans experience a greater amount of depreciation in property values than non-defaulted loans. The change in average for *per_lack_kitchen*, *per_renter*, *per_chg_comp*, *per_vacant*, and *per_no_tax* is negative indicating that defaulted loans have a higher occurrence among these variables. It is also important to note that some of the differences in the averages are less than 0.001, which may be negligible in the analysis.

Geographic Concentration of Loans in Sample

Figures 6.1, 6.2, 6.3, and 6.4 show the spatial distribution of subprime loans in the ten county Atlanta Metropolitan area. The circles in each figure represent the geographic center of a census tract. Figure 6.1 shows the number of loans per census tracts where the size and color of the circle represents the number of loans. Small, red circles represent a few loans and big, blue circle represent multiple loans. Figure 6.2 shows the per capita income by census tract. Smaller circles represent lower incomes and larger circles represent high incomes. Figure 6.3 shows the racial composition by census tract with smaller circles representing a smaller non-white population. Figure 6.4 show the number of subprime mortgage defaults per census tracts with smaller circles representing a lower number of defaults. Appendices B through K contain a breakdown on the county level.

The figures show that there is a higher number of subprime loans concentrated in low-income communities and in communities where a large proportion of the community is nonwhite. An area of particular interest in the Atlanta area is the interstate 20 corridor, which has census tracts with low income levels, a high proportion of nonwhite, a high number of subprime loans, a high number of subprime defaults. The corridor contains parts of Fulton and Dekalb counties. Another area of interest is communities in Clayton County where there is a trend similar to the I-20 corridor.

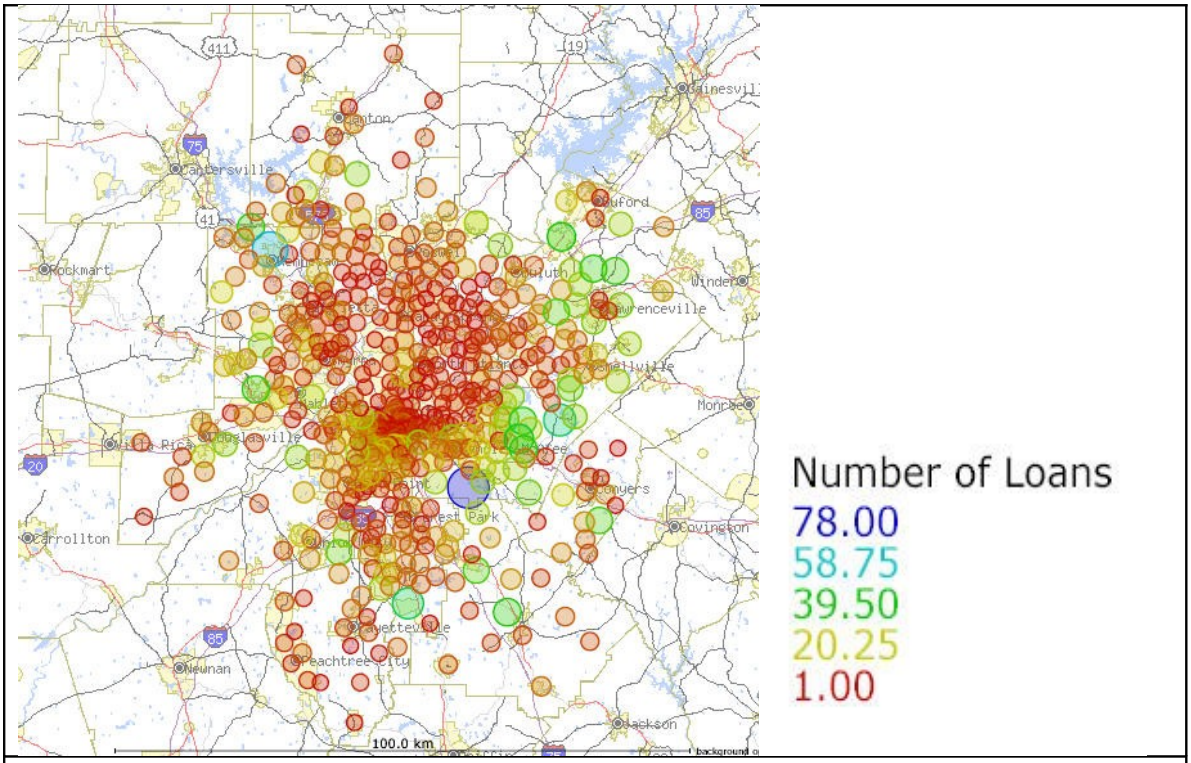

Figure 6.1: Number of Loans by Census Tract

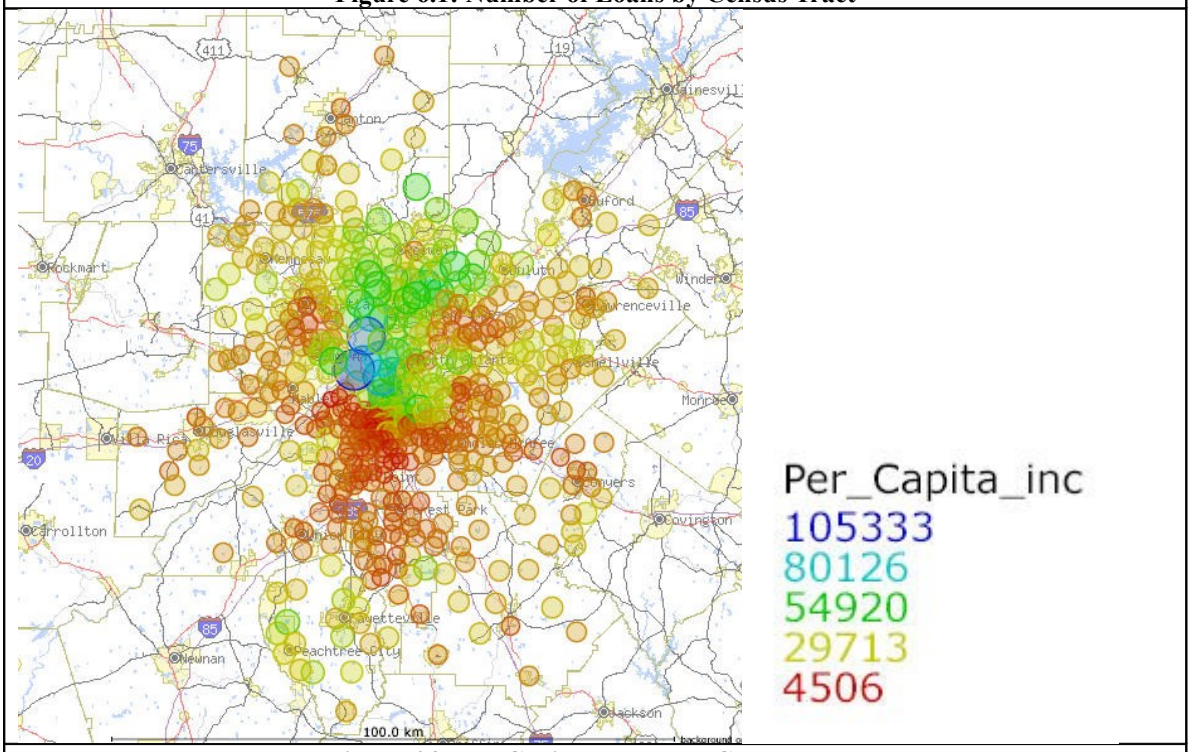

Figure 6.2: Per Capita Income by Census Tract

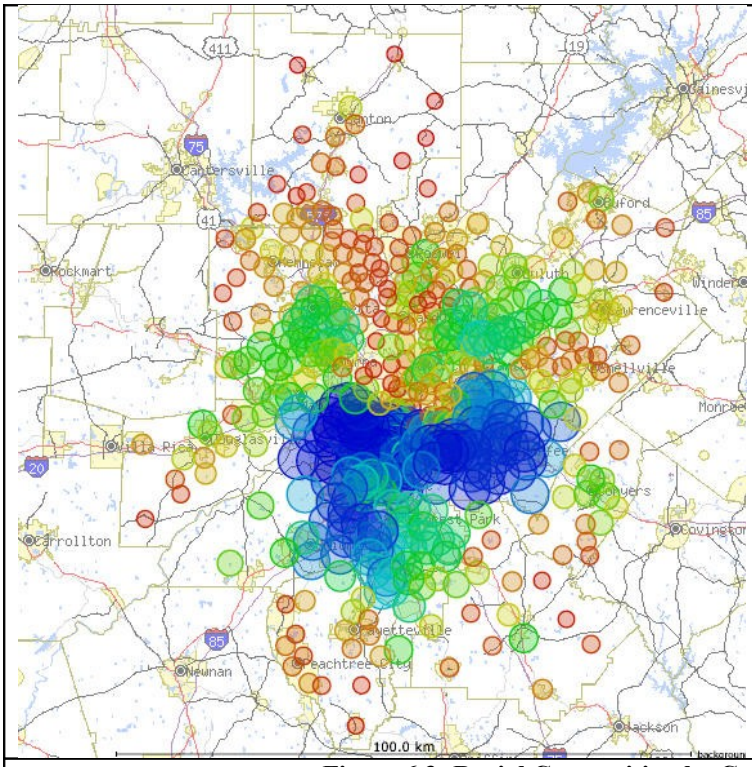

Figure 6.3: Racial Composition by Census Tract

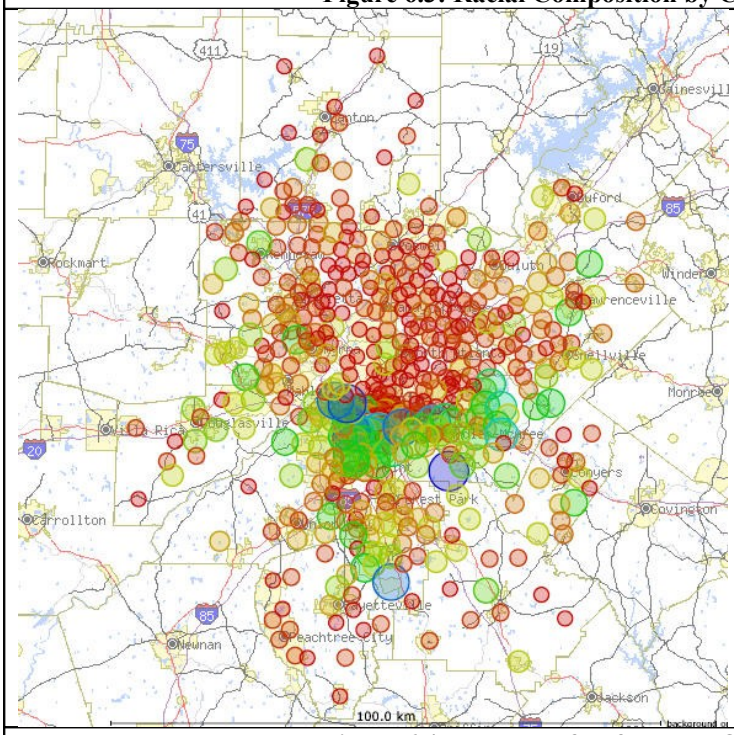

Figure 6.4: Number of Defaults by Census Tract

CHAPTER 7

MODELING

Univariate Modeling

Univariate models are run on each of the twelve variables using the logistic procedure included in base SAS software. A univariate test is conducted by running a binary logistic regression and modeling default against only one of the explanatory variables. Table 11 shows the results of the univariate tests.

Tabe 7.1: Results of Univariate Models

Variable	Estimate	Standard Error	P-Value	Significance Level
Per_pop_chg	-0.4349	0.1165	0.0002	All
Per_chg_pv	-17.5539	1.2769	<.0001	All
Per_job_growth	-0.1685	0.1652	0.3076	None
Per_lack_kitchen	20.6855	2.2838	<.0001	All
Per_no_tax	5.4027	3.5069	0.1234	None
Per_Vacant	8.2266	0.737	<.0001	All
Per_chg_comp	1.5885	1.2911	0.2186	None
Per_renter	1.3986	0.1528	<.0001	All
Per_chg_den	-0.4349	0.1165	0.0002	All
Med_prop_tax	-0.00065	0.000063	<.0001	All
Rental_value	-0.00292	0.000207	<.0001	All
per_hunts_chg	-0.4766	0.1092	<.0001	All
All: significant at the 10%, 5% and 1% level				
None: not significant at the 10%, 5% or 1% level				

The results of the univariate tests all agree with the hypothesis. As expected the signs of *per_pop_chg*, *per_chg_pv*, *per_job_growth*, *per_chg_den*, *per_hunts_chg*, *rental_value*, and *med_prop_tax* are negative. These variables are negatively correlated with defaulted sumbprime loans in the Atlanta area. The signs of *per_lack_kitchen*, *per_no_tax*, *per_vacant*, *per_chg_comp* and *per_renter* are all positive as expected. These variables are positively correlated with defaults subprime loans in the Atlanta metropolitan area. Two of the variables (*per_chg_comp* and *per_job_growth*) are not significant at any of

the standard significance levels. An additional variable, *per_no_tax*, is close to being significant at the 10% significance level. The remaining variables have p-values close to or less than 0.001 signaling that they are very significant.

Correlations

Correlations between the variables are examined to determine collinearity problems. In the sample, the majority of the correlations fall between –0.40 and 0.40. The exceptions are listed in table 7.2.

Table 7.2: Variable with Correlation over 0.40 or Under -0.40

Variable	Variable	Correlation
Per_pop_chg	Per_Hunts_chg	0.9750
Per_pop_chg	Per_chg_den	0.9557
Per_chg_den	Per_hunts_chg	0.9340
Per_renter	Per_vacant	0.5350
Med_prop_tax	Rental_Value	0.4590
Per_lack_kitchen	Per_vacant	0.4418

Three of the variables *per_pop_chg*, *per_hunts_chg*, and *per_chg_den* are highly correlated together with the correlations between any two exceeding 0.90. If more people are living in an area, then the housing stock has increased. The influx of people increases the population and increases the housing density as well. The correlation is too high and the inclusion of more than one of them could lead to a multicollinearity problem, therefore only *per_pop_chg* will be included in the multivariate model.

Both the unemployment rate and per capita income were eliminated from the analysis since they pose a possible endogeneity problem by causing the delinquent events. The correlation between *per_job_growth* and the unemployment rate is tested to determine if those variables measure the same effects. Additionally, the correlations between *med_prop_tax*, *rental_value*, *per_lack_kitchen*, and *per_capita_inc* are also calculated to determine if they measure the same effects.

Table 7.3: Correlations between Included and Excluded Variables			
Variable	**Per_capita_inc**	**Variable**	**Unem_t**
Med_prop_tax	0.88329	Per_Job_Growth	-0.07913
Rental_value	0.59791		
Per_Lack Kitchen	-0.21815		

The correlation between *per_capita_inc* and *med_prop_tax* is 0.88329, which is high suggesting the two variables contain the same information. Additionally, the correlation between *per_capita_inc* and *rental_value* is 0.598. Given the high correlation values, *med_prop_tax* and *rental_value* convey a lot of the same information as per capita income. The exclusion of *per_capita* income, based on potential endogeneity, warrants the exclusion of *med_prop_tax* and *rental_value* as well.

Multivariate Modeling

A multivariate binary logistic regression model is constructed using the eight remaining variables and the logistic procedure from the SAS software. The results are shown in table 7.4.

Table 12: Multivariate Regression Results				
Parameter	**Estimate**	**Standard**	**P-value**	**Significance Level**
Intercept	-1.7763	0.0733	<.0001	All*
Per_Pop_Chg	-0.2432	0.1247	0.0511	10%
Per_chg_pv	-13.2665	1.409	<.0001	All*
Per_Job_Growth	0.0872	0.1579	0.5808	None
Per_lack_Kitchen	6.7285	2.7737	0.0153	5%, 10%*
Per_No_tax	6.17	3.6349	0.0896	10%
Per_Vacant	4.2518	0.9806	<.0001	All*
Per_chg_comp	1.8007	1.2935	0.1639	None
Per_Renter	0.319	0.2067	0.1227	None
All: significant at the 10%, 5% and 1% level				
None: not significant at the 10%, 5% or 1% level				
* Denotes significant at 5% level				

The coefficients in multivariate models are interpreted the same way as in the univariate models except multivariate models all ceteris paribus statements to be made. A negative

estimate indicates that as the variable increases the probability of a default decreases holding all other variables constant and a positive estimate indicates that as the variable increases the probability of a default increases holding all other variable constant. The estimates are given in log-odds form so an increase in any of the independent variables will change the log-odds by the corresponding estimate holding all else constant.

The multivariate modeling results mostly agree with the hypothesis. The main variation is that *per_job_growth* has a positive sign when both the hypothesis and univariate analysis have negative signs. However, *per_job_growth* is not significant at any of the standard significance levels. The other variables have signs that are consistent with both the univariate test and the hypothesis. Consistent with the univariate analysis, there is a mix of variables that are either significant or insignificant. The variables *per_chg_comp* and *per_renter* are not significant at the 10% level with p-values of 0.1639 and 0.1227 respectively. The variables *per_no_tax*, *per_pop_chg*, and *per_lack_kitchen* are significant at the 10% level. Finally, the variables *per_ch_pv* and *per_vacant* have p-values less than or close to 0.01 signifying that they are significant at all standard levels. Even though the variables have differing levels of significance, the results still indicate that defaulted subprime mortgages are correlated with community health indicators. The variables are either correlated with defaults in a positive or negative manner. Regardless of the sign, the correlations represent a decline in the health of a community.

CHAPTER 8

IMPLICATIONS

The analysis establishes that defaults in the subprime mortgages negatively affect community health. Due to the existence of the dual mortgage market, the consequences will not be felt unilaterally across the entire population. Instead, minority and low-income borrowers will feel the brunt of the effects as subprime mortgages are concentrated in minority and low income dominated areas. Communities located along the I-20 corridor in Atlanta and located in Clayton County will feel the most adverse consequences of the crisis due the high concentration of defaults there. The effects of multiple defaults on a community are more severe than a single default leading to amplified consequences in communities with a high concentration of subprime mortgage defaults. The consequences are increased crime rates and drug problems, decreased in property tax revenue, degradation of the physical aspects of communities, increased in segregation, and decreased living desirability of communities.

Increased Crime Rate

The Broken Window Theory created by James Wilson and George Kellog suggests that vacant buildings lead to a sense of community disorganization and will lead to illegal activities in the neighborhood. Illegal activities can include drug trafficking, theft, and prostitution, all of which residents do not want around. Defaults on mortgages also lead to vacant homes. Vacant houses may serve as magnets for illegal activities since they are unoccupied and can shelter such activities from the police. The results indicate that subprime defaults are positively correlated with the percent of vacant homes in a community. As the number of defaults rise, the percent of vacant homes is expected to

rise as well. Immergluck and Smith (2006) show that an increase in the foreclosure rate to about 2.8 foreclosures for every 100 owner-occupied properties in one year corresponds to an increase in neighborhood violent crime of approximately 6.7 percent. Increased crime rates in an area make the residents feel less safe and will help to deter any new residents from moving in. A side effect of increasing crimes and/or drug activities is the higher levels of social services needed to keep the area safe. Two notable services are increased police presence and drug rehabilitation programs. Each of these cost additional monies to the community.

Decreased Property Tax Revenues

According to the Georgia Department of Revenue, property taxes in the state of Georgia are based off of the assessed value of the property and a millage rate. The assessed value of a property is defined as 40% of the current fair market values, and the millage rate is defined as one cent per one thousand dollars in assessed value. The fair market value is the price at which the property would change hands between a willing buyer and a willing seller, neither being under any compulsion to buy or to sell, and both having reasonable knowledge of relevant facts. A good indicator of the current fair market value of a home is the appraisal amount. If the appraisal amount of a home falls, the current assessed value of the home falls as well. Falling assessed values of the homes leads to a decline in property tax revenue. The depreciation of multiple homes in a community or county can lead to a large drop in tax revenue.

The analysis provides evidence that defaulted loans result in lost property taxes. The consequence is seen directly by establishing a positive correlation between the percentage of owner occupied homes that did not pay their property taxes and default

loans. As the number of default loans increase, then the proportion of residents who do not pay their property taxes will increase as well. Indirect evidence is provided by the correlation between percent change in property values, and the lack of owner investment. There exists a negative correlation between the percent change in property values and defaults implying that as the number of defaults increases, then property values will decrease. As noted earlier, both Shlay and Whitman (2004) and Immergluck and Smith (2005) show that vacant houses bring the property values of surrounding homes down. Additionally, the lack of owners' investment in their homes leads to property value depreciation as well. There exists a positive correlation between the variable percent of homeowners lacking full kitchen facilities and loan defaults. Due to lack of investment, the property value may decrease, as proper maintenance is not done on the home. Proper maintenance on a home includes: fixing the roof, cleaning the gutters, and repainting the home. Given the large concentration of subprime loans in certain communities and counties, those geographic areas are at risk to having reduced government spending in the upcoming financial year.

Reduced property tax revenue has a cascading effect on community health. For example, in Cobb Country Georgia, 66% of property taxes go to the Cobb County school system, which represents the majority of school funding. A decline in property taxes results in the school system receiving less funding, which leads to a decline in the quality of an education system. Most people key in on two factors when deciding where to move: 1) location relative to job and 2) the education system. A decline in the quality of a school system could prompt some potential residents to stay away and prompt current residents to leave the area. Another 32% of Cobb county property taxes goes to county funds and

these funds are used to finance infrastructure improvements across the county. Less funding means less infrastructure improvements, which itself can lead to property value deprecation, the exodus of residents, and keep potential residents away.

Increased Segregation

The results indicated that subprime mortgage defaults lead to a greater segregation in communities. The analysis establishes a positive correlation between defaults and the percent change in composition for communities where the minority is the majority. A positive correlation means that a greater concentration of subprime mortgage defaults lead to a greater, positive percent change in the non-white population of the community. The trend may be following a selective migration. When the neighborhood starts to show signs of decline, through appearance, infrastructure or crime rates, the residents who can afford to escape do. The trend has already been seen once in American history in the "white flight" from the inner cities to the suburbs, in then 1950s. Affluent residents are moving out of the area into wealthier areas, and less affluent residents are taking their place. The analysis shows that in some communities the white residents are moving out and non-white residents are moving in suggesting white flight from the area and greater segregation.

Decreased Living Desirability

A concentration of subprime mortgage defaults makes the areas they occupy less desirable to live in. The analysis provides evidence of the statement by showing a positive correlation between defaults and the following: percentage of vacant houses and percentage of rental properties. Additional evidence is provided by the negative correlation between defaults and the percent change in the population. Real estated

owned homes in a community remain vacant until the bank can find a suitable buyer. In areas with a higher percentage of vacant homes, banks have a hard time finding buyers for those houses signifying that people do not want to move to the community. Communities that experience defaults will also experience a loss of population. There is a link between the population loss and the percent of vacant houses since when people are evicted they cannot legally occupy the home. Most evicted residents go to the nearest relative or a neighbor's house, but will most likely not be there the next time the data is collected. Additionally, the loss of population signals that more people are leaving the community than entering it, thus implying that people do not want to live there. An increase in rental properties may also signal that homeowners are moving out of the community or that the homes in the area cannot be sold without taking a loss due to declining property value. Instead, owners rent out their homes to avoid the loss. When renters move into a community, their presence can decrease the desirability since renters do not have the same type of incentives that homeowners do. As noted by the authors of "Neighborhoods at the Tipping Point", most often renters do not establish a relationship to the area they are renting a home in. Homeowners establish an emotional and financial attachment to the community whereas renters do not. With an attachment to the community, homeowners become responsible members of the community, undertaking such actions as maintaining their home and participating in neighborhood programs. Renters do not have the incentive to undertake such actions. An increased number of renters makes a community feel less close-nit and more like a random group of people in residing in the same area with little in common.

It should be noted that some of the consequences are interrelated with one often leading to others. For example, defaulted mortgages lead to a higher percentage of vacant houses. A higher percentage of vacant houses leads to depreciation in property values. Depreciation in property values can be seen as a measure of the desirability of the area. If the areas become undesirable then it can experience a loss in population. Many of the consequences can be linked together to form a chain of events that lead to the decline of the neighborhood. The root cause of each of the chains is defaulted loans.

CHAPTER 9

PREVENTION

The decline in a community's health can be prevented or lessened by the actions of certain groups. Investment banks, different levels of government and community citizens can intervene to prevent, slow down or even stop the decline of a community. Investment bank strategies involve modifying the term and conditions of the mortgage to allow the borrower to continue to inhabit the home and government strategies involve public investment in the community to maintain the community as a desirable place to live. Community citizens can form community associations to prevent their community from entering into decline.

Investment Banks

One concern of investment banks is the return of money on their investments. To avoid the full loss on delinquent loans and to ensure maximum the returns investment banks can employ three strategies: loss mitigation, modifications, and debt forgiveness. Loss mitigation strategies involve allowing borrowers to remit extra payments if they fail to make one on time. Given that a large number of delinquent events are caused by payment shocks, these strategies will not work since the borrower failed to remit payments when it increased. In modification strategies the bank can modify the terms and conditions of the mortgages to allow the borrower to continue to make payments. One possible strategy for loans that went delinquent as the result of a payment shock is to reset the principle and interest payment to the pre-reset level. Another type of modification is to call the loan current if the borrower agrees to start remitting principle and interest payments again. Debt forgiveness is a strategy employed in markets that have experienced high levels of

property value depreciation. If a borrower buys a house for $200,000, the community experiences depreciation and the re-appraised value of the house is $50,000 then all rational borrowers would stop paying the original $200,000 mortgage. Debt forgiveness allows part of a borrower's debt to be erased. In the example, the bank may decide to forgive $120,000 in debt the borrower owes and re-evaluate the mortgage at $80,000 if the borrower agrees to stay in the house and continue to remit principle and interest payments.

The investment bank will lose money as a result of all of these strategies through lost principle and interest; however, such strategies potentially avoid the full loss of the loan. These strategies allow borrowers to continue to inhabit their homes. If people continue to inhabit their homes then there will not be as many vacant homes in the community, which prevents the crime rate from rising and property value depreciation from occurring. An additional effect is greater property tax revenues compared to a community with many vacant homes, as revenue will be collected on homeowners who would otherwise be evicted from their houses. Even though it is in the investment banks' best financial interests to undertake loan modifications they may need incentives to undertake such actions. Two possible incentives are federal and/or state tax credits form modifying loan terms or federal and/state insurance of loans.

Federal, State and Local Governments

Federal, state and local government can help communities with a high concentration of mortgage default by undertaking several actions. All actions center on public investment in the community. The main focus should be keeping the area a desirable place to live by keeping infrastructure in good shape, keeping school quality high and providing job

opportunities. To keep the infrastructure in good shape the government can make sure sidewalks are paved and not cracked, road signs and crosswalks are visibly present, public areas are maintained and vacant and/or abandoned buildings are not used for illegal activities. To keep school quality high the government can continue to invest money in the education system particularly to keep teacher salaries on par with the rest of the state and to give the schools greater resources. If the community is a desirable place to live, then when a homeowner defaults and is evicted from his home other people will immediately want to move into the vacated homes. An inflow of new residents when current residents are evicted will keep the number of vacant home down and the community will not have to feel the effects of the associated consequences. To provide job opportunities the government need to keep current companies from moving out of the community and lure potential companies to the community. This can be achieved by providing financial incentives for companies through tax break and/or low-cost leasing options on land. One primary cause of delinquent events is the borrower's loss of income due to unemployment. If a community is experience high unemployment two things are happening: 1) residents are losing their jobs and 2) unemployed residents cannot find new jobs. The persistence of job opportunities in the community will allow current unemployed residents to find new jobs and will lure new residents to the community. Government actions to keep unemployment low, job opportunities high, and to keep the community a desirable place to live can help prevent a decline in the health of communities.

Citizens of a Community

Citizens of a community can also be involved to prevent their community from declining. Citizens can organize community watch groups, community improvement organizations and other community associations to help deal with the consequences of defaulted loans. A community watch group helps keep the crime in the community down by discouraging residents from undertaking crime and immediately reporting illegal activities to the police. Community improvement organizations improve the communities, often by doing volunteer work that benefits the area. They can pick up trash along the streets, paint over graffiti, maintain public spaces or maintain vacant houses by doing the yard work. People involved in any type of community association are indicating that they have pride in their community. Additionally, the presence of community associations signal to potential residents that the current residents care about their community and that the community is a good place to live.

Actions undertaken by certain group can prevent or slow down the decline in health of communities. Investment banks can alter the term and conditions of the mortgages to allow current residents, who are otherwise facing default, to continue to inhabit their homes by using loan modification strategies. Federal, state, and local government as well as community association can undertake actions to make communities a desirable place to live. Investment banks may need incentive, either financial or required by law, to undertake such actions. If any of these three groups acts then the community will be facing a much brighter future then if none are undertaken.

CHAPTER 10

SHORT COMINGS AND FUTURE CONSIDERATIONS

The analysis has several shortcomings. First is the limited number of variables used in comparison to the original number of indicators hypothesized to measure community health. Several important measures of the health of a community are left out, most noticeably the crime rate and citizen involvement within the community. Additionally, several key variables are not controlled for in the analysis. Perhaps the most important variable not controlled is the change in income levels for each census tract. Communities are defined as a census tract, but these are still relatively large in comparison to some people's definition of a community. One possible improvement is to rerun the same analysis, but on the census block level as well. The analysis also uses the 2000 Census data, which may be out of date in the sense that the community variables measured, have changed either slightly or drastically. The slightest change could result in a significant change in the result. Future analysis on the topic should use either the same methodology or multiple linear regression using panel data. It is important to collect the most up-to-date data, to use a greater scope of variables measuring community health, and to control for all significant factors that differentiate communities. Important variables such as the change in crime rate and change in civic engagement need to be included. Other variables most notably, the change in income, need to be controlled for as well.

CHAPTER 11

CONCLUSION

The results of the analysis indicate that defaults in the subprime market are correlated with declining population, declining property values, increasing lack of owner investment, increasing number of homeowners not paying their property taxes, increasing percent of vacant homes, increasing racial segregation, and increasing percent of renters. In light of the recent subprime mortgage crisis, communities with a high concentration of subprime mortgage defaults are likely to see a decline in their health. Given the high concentration of subprime mortgages in lower income and minority communities, those communities will be the ones hardest hit by the current crisis. Such a high concentration also means that the consequences are likely to be magnified since each community in the analysis sees an average of 2.3 defaults. The consequences include increased segregation, increased crime rates and drug problems, the loss of property tax revenue, and the loss of desirability. Further, the loss of property tax revenue can have spill over effects with consequences in other factors of community health including the education system, parks, and infrastructure. If the crisis continues, the growing number of defaults will continue to harm the health of communities with the affects often feeding off each other. The ongoing subprime mortgage crisis has caused considerable harm to communities across the Atlanta area and it will take many years of reinvestment and redevelopment to revitalize these areas.

APPENDIX A

COUNTIES IN THE ATLANTA METROPOLITAN AREA

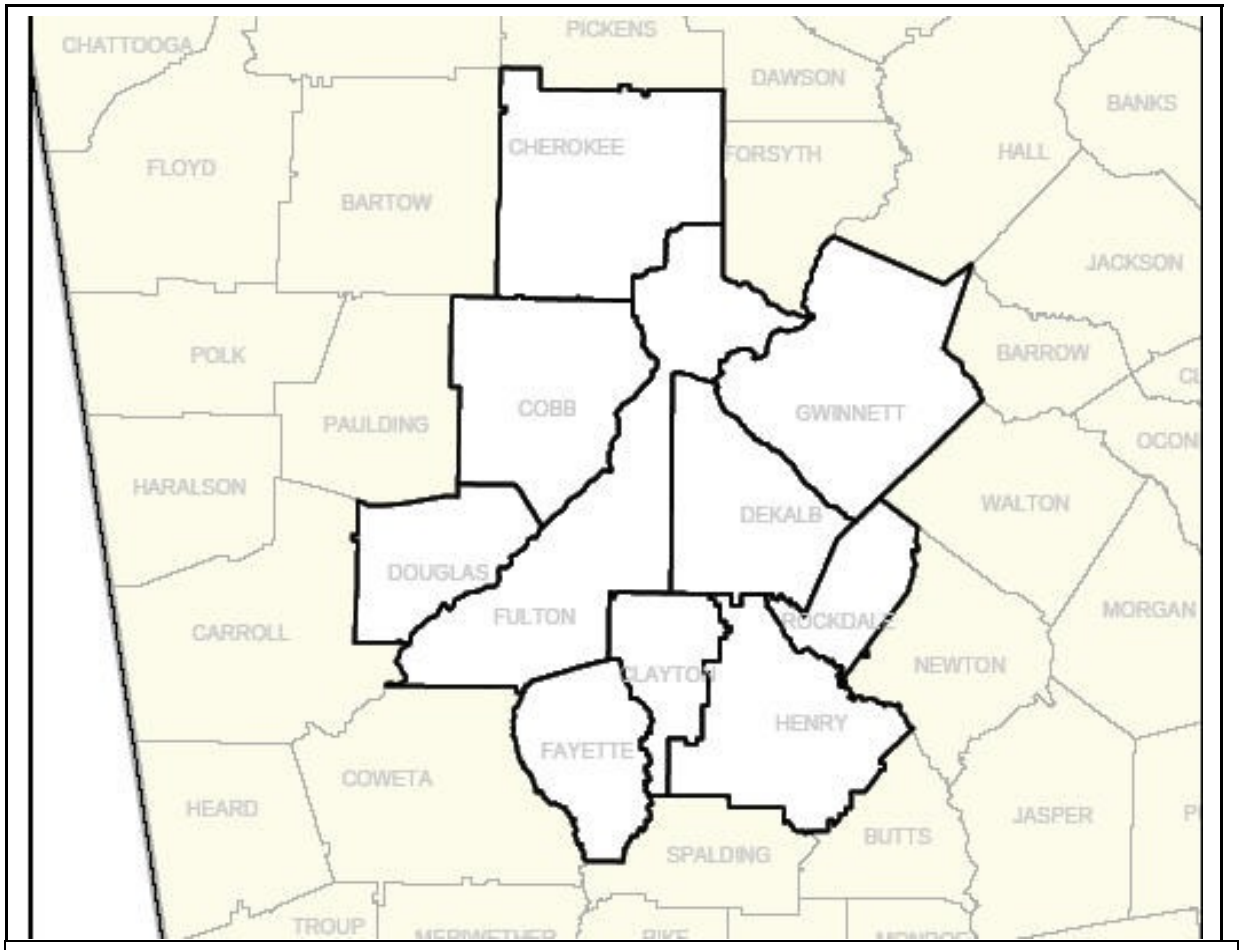

Figure A.1: The Ten Counties in the Atlanta Metropolitan Area

APPENDIX B

CHEROKEE COUNTY SUBPRIME LOANS AND DEMOGRAPHICS

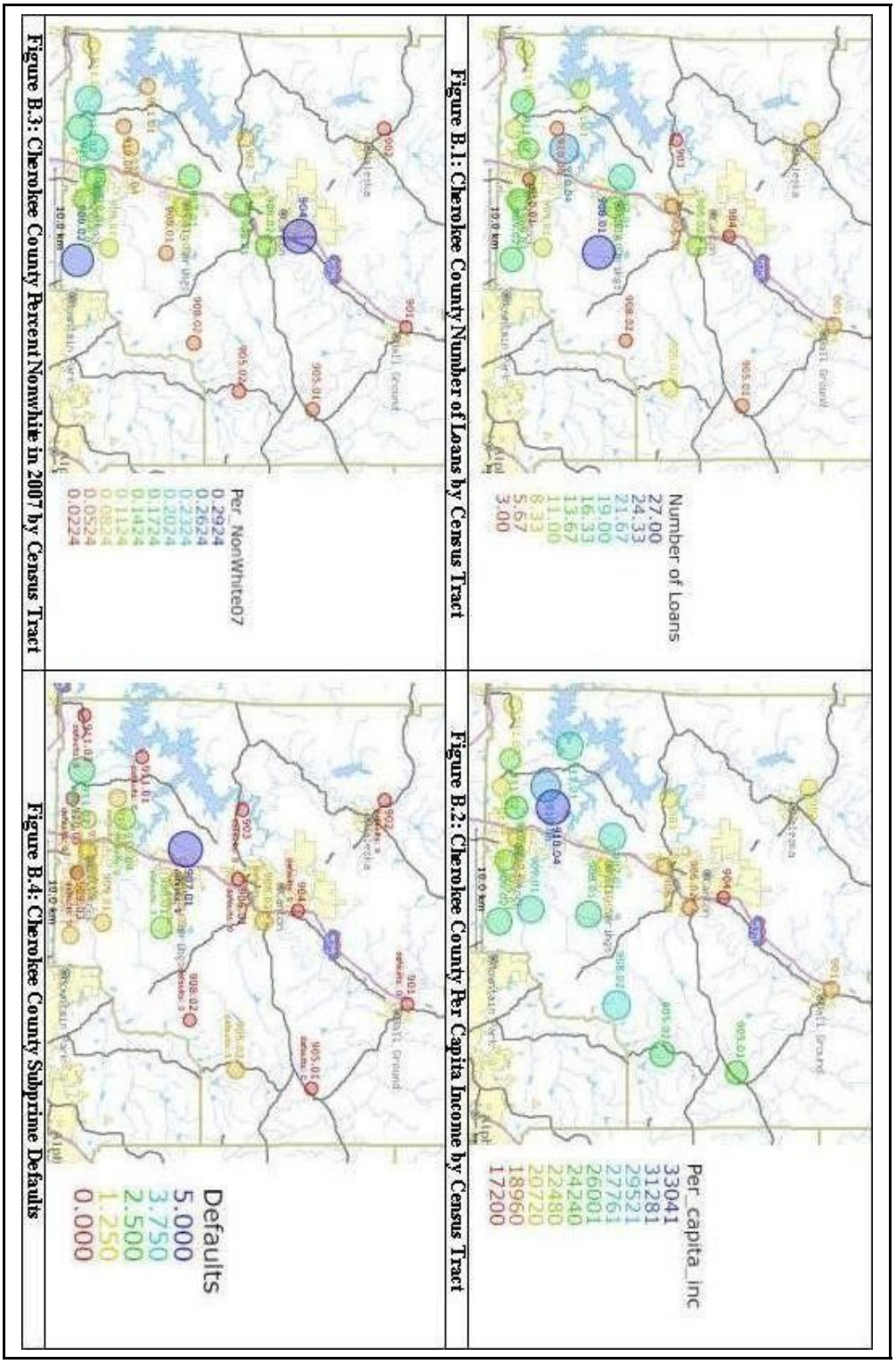

Figure B.1: Cherokee County Number of Loans by Census Tract

Figure B.2: Cherokee County Per Capita Income by Census Tract

Figure B.3: Cherokee County Percent Nonwhite in 2007 by Census Tract

Figure B.4: Cherokee County Subprime Defaults

APPENDIX C

CLAYTON COUNTY SUBPRIME LOANS AND DEMOGRAPHICS

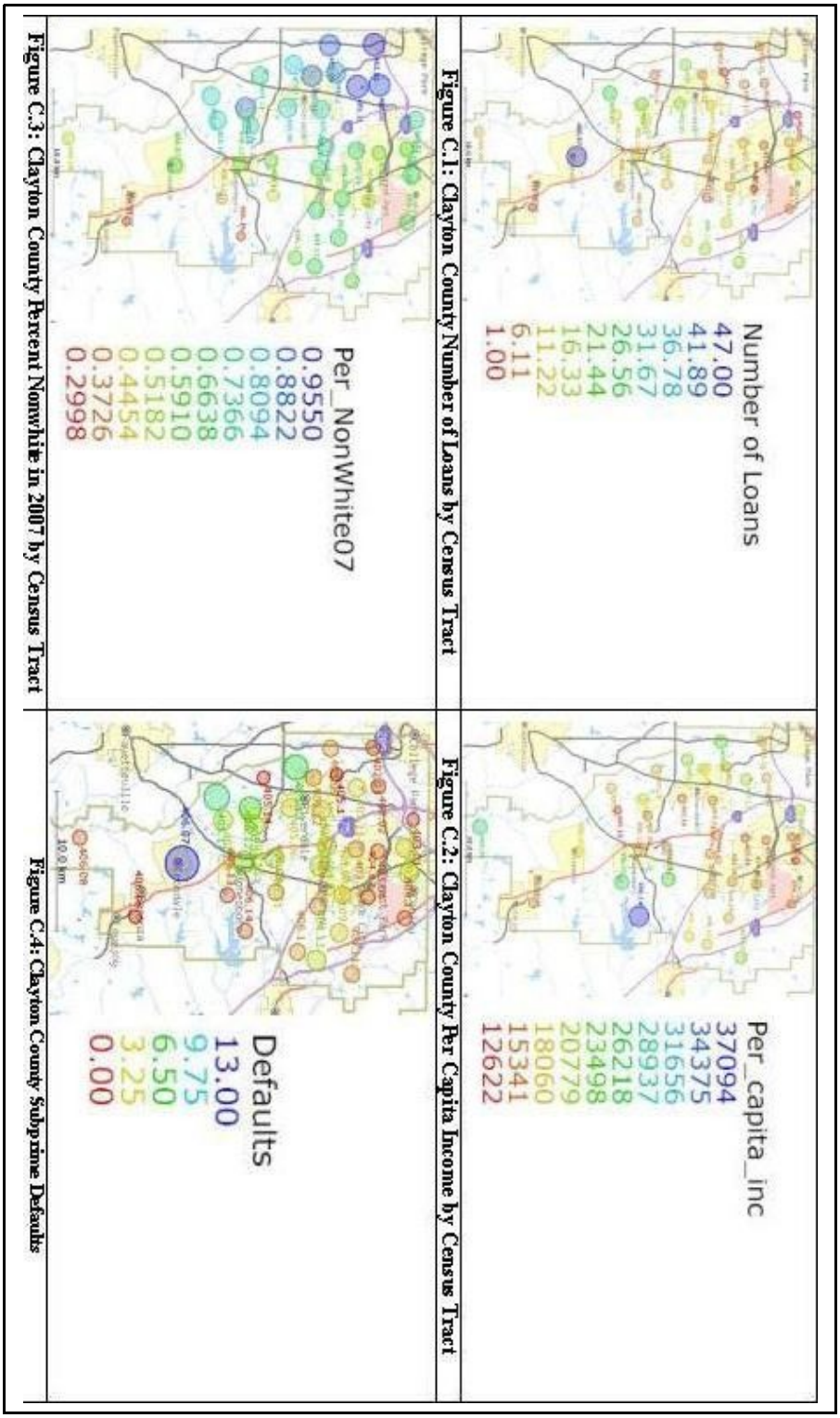

Figure C.1: Clayton County Number of Loans by Census Tract

Figure C.2: Clayton County Per Capita Income by Census Tract

Figure C.3: Clayton County Percent Nonwhite in 2007 by Census Tract

Figure C.4: Clayton County Subprime Defaults

APPENDIX D

COBB COUNTY SUBPRIME LOANS AND DEMOGRAPHICS

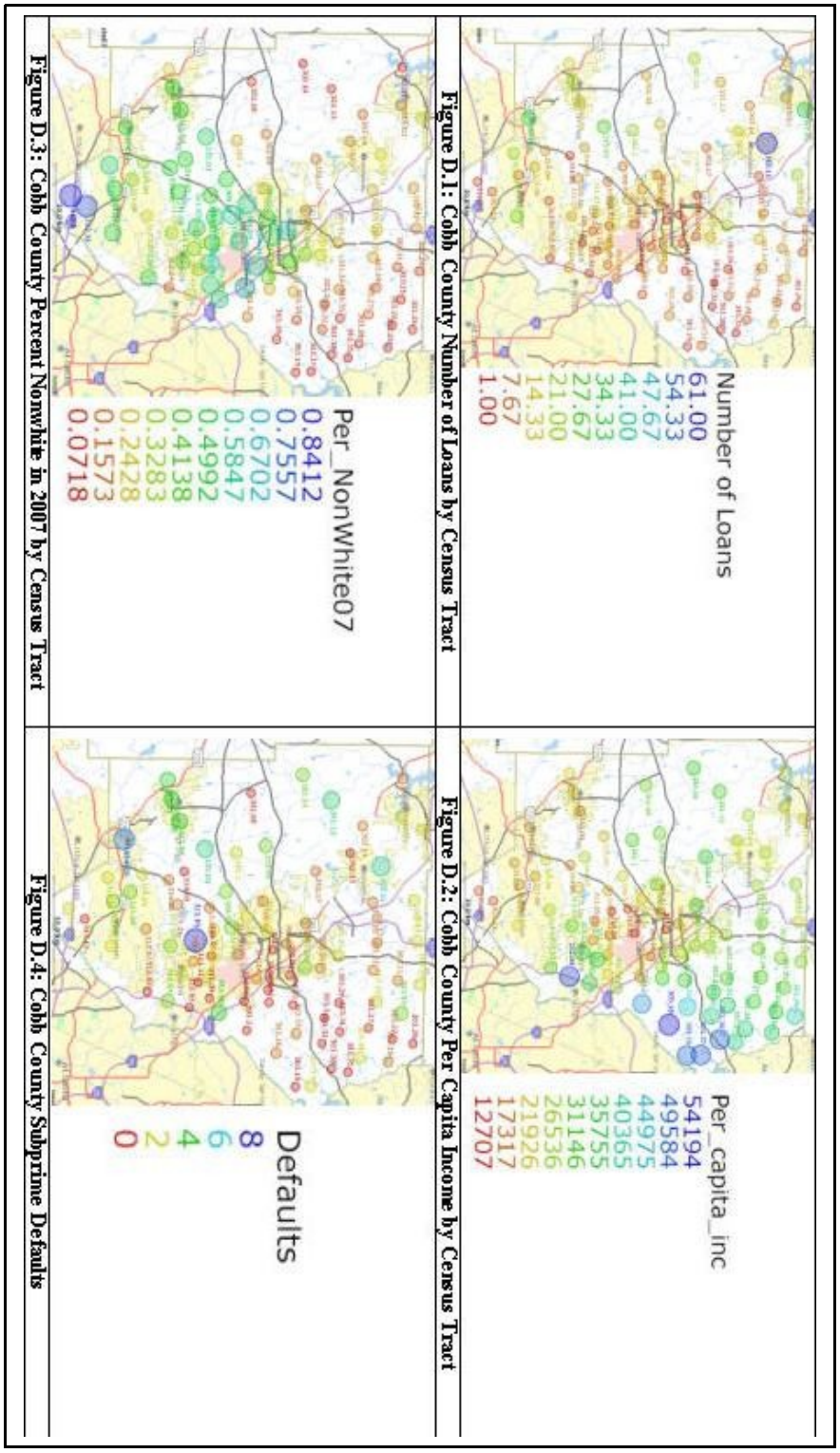

Figure D.1: Cobb County Number of Loans by Census Tract

Figure D.2: Cobb County Per Capita Income by Census Tract

Figure D.3: Cobb County Percent Nonwhite in 2007 by Census Tract

Figure D.4: Cobb County Subprime Defaults

APPENDIX E

DEKALB COUNTY SUBPRIME LOANS AND DEMOGRAPHICS

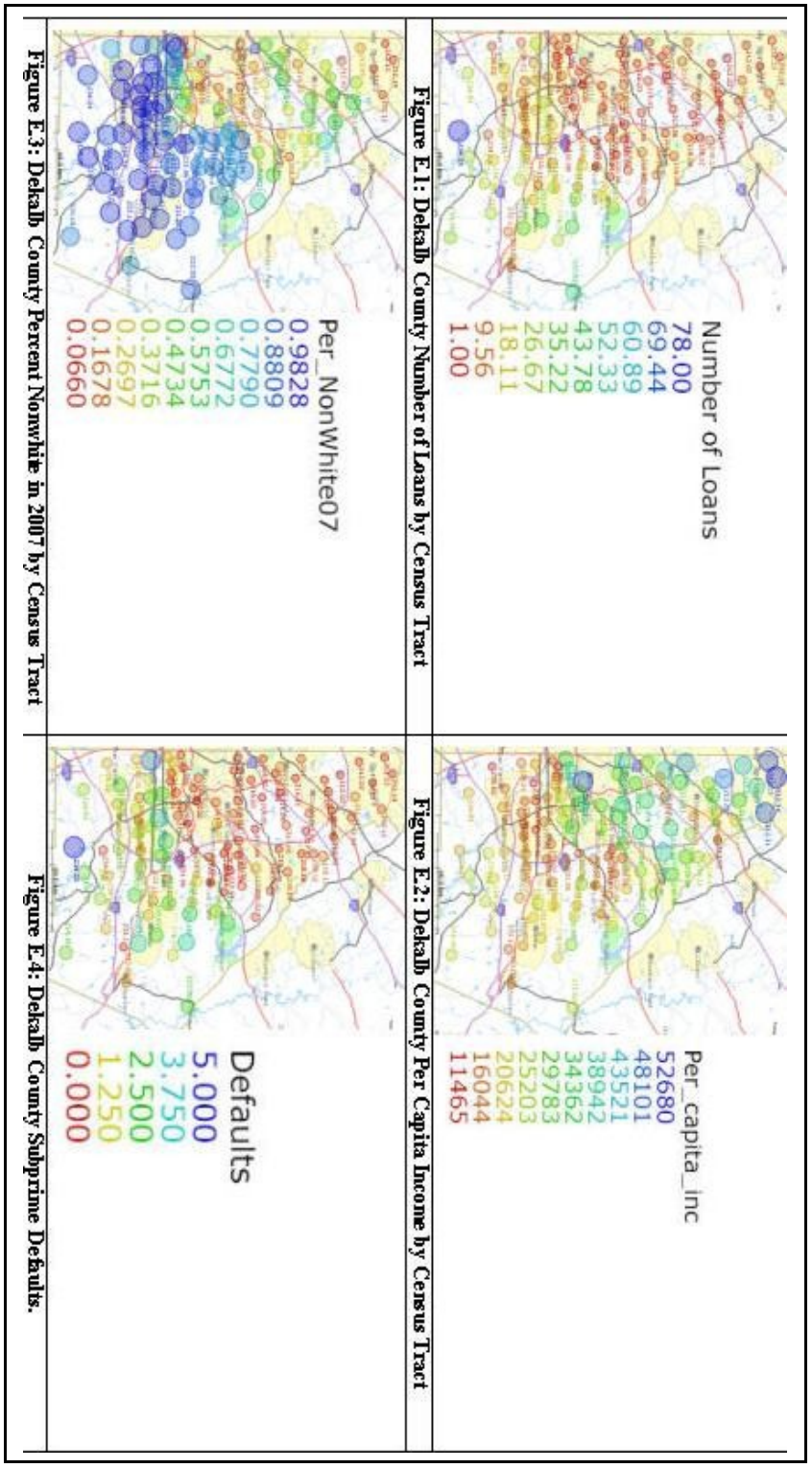

Figure E.1: Dekalb County Number of Loans by Census Tract

Figure E.2: Dekalb County Per Capita Income by Census Tract

Figure E.3: Dekalb County Percent Nonwhite in 2007 by Census Tract

Figure E.4: Dekalb County Subprime Defaults.

APPENDIX F

DOUGLAS COUNTY SUBPRIME LOANS AND DEMOGRAPHICS

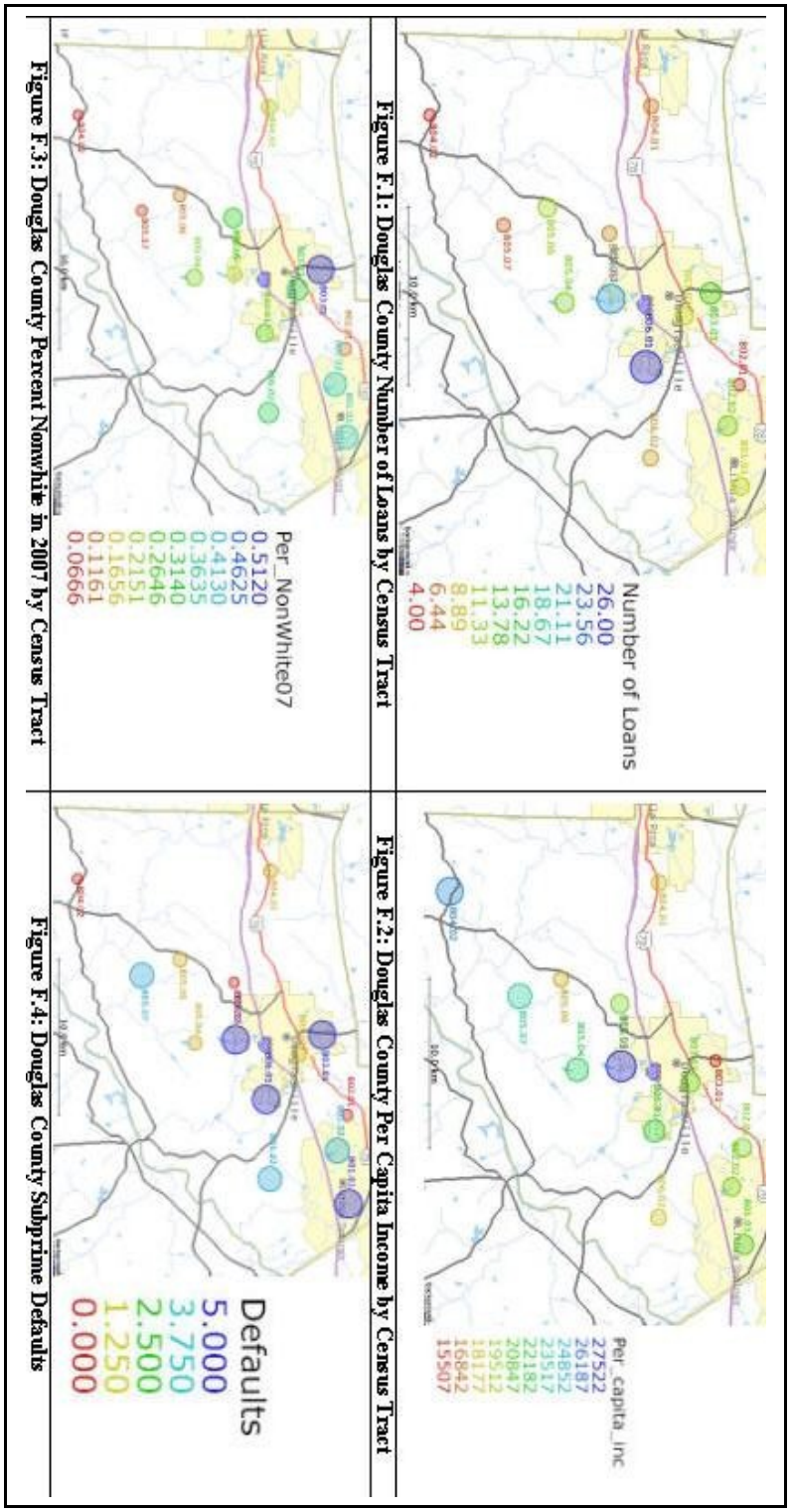

Figure F.1: Douglas County Number of Loans by Census Tract

Figure F.2: Douglas County Per Capita Income by Census Tract

Figure F.3: Douglas County Percent Nonwhite in 2007 by Census Tract

Figure F.4: Douglas County Subprime Defaults

APPENDIX G

FAYETTE COUNTY SUBPRIME LOANS AND DEMOGRAPHICS

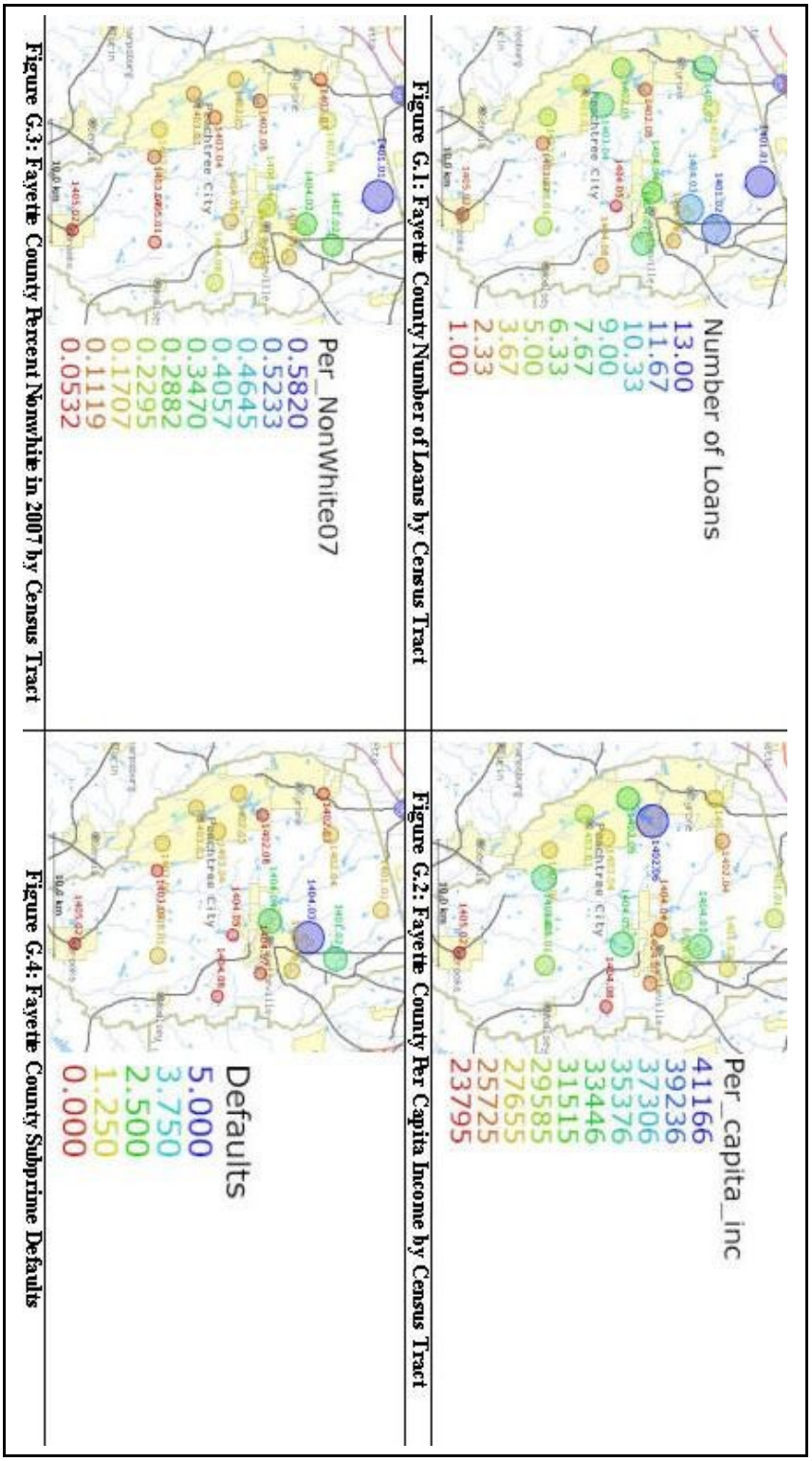

Figure G.1: Fayette County Number of Loans by Census Tract

Figure G.2: Fayette County Per Capita Income by Census Tract

Figure G.3: Fayette County Percent Nonwhite in 2007 by Census Tract

Figure G.4: Fayette County Subprime Defaults

APPENDIX H

FULTON COUNTY SUBPRIME LOANS AND DEMOGRAPHICS

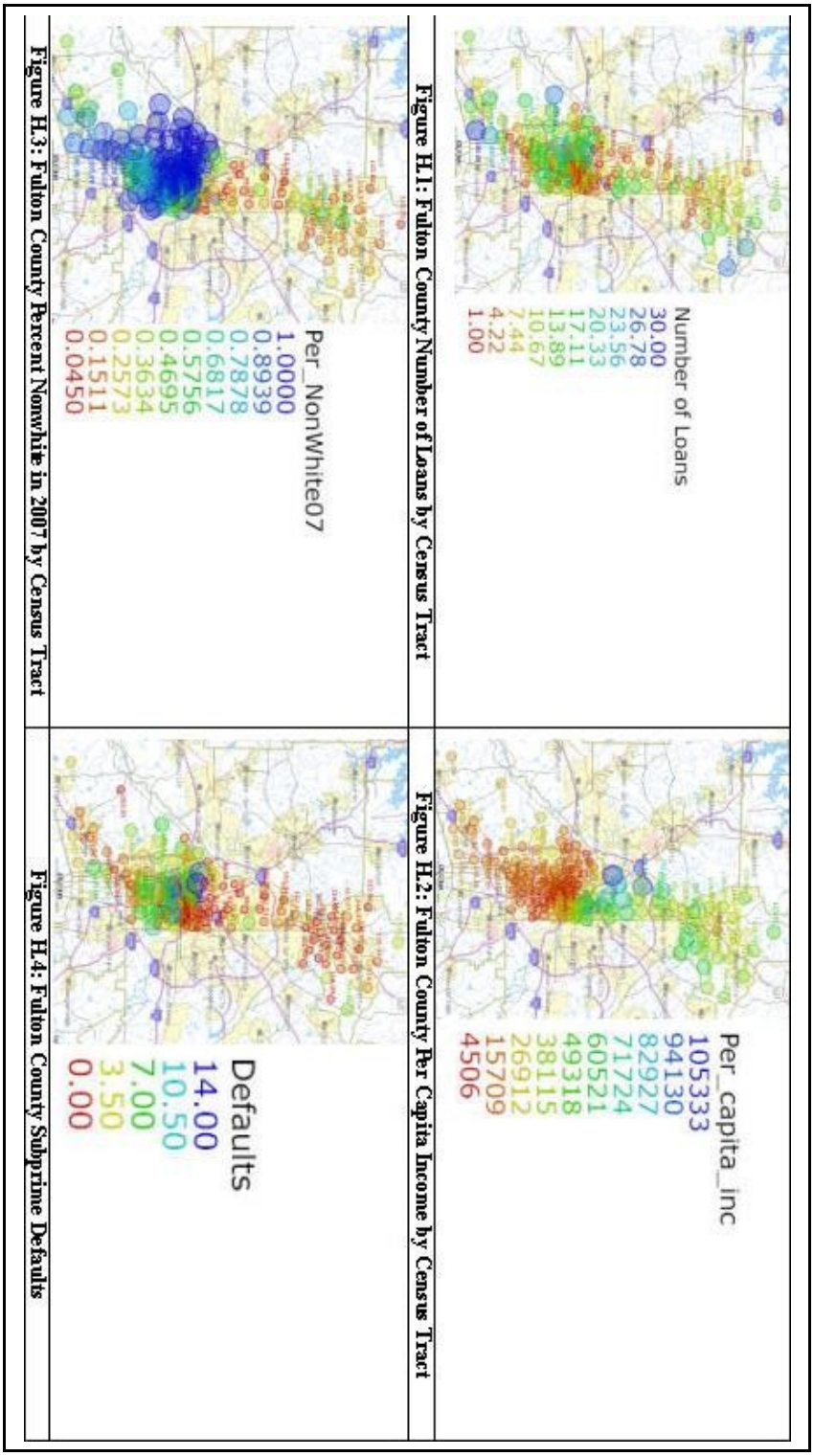

Figure H.1: Fulton County Number of Loans by Census Tract

Figure H.2: Fulton County Per Capita Income by Census Tract

Figure H.3: Fulton County Percent Nonwhite in 2007 by Census Tract

Figure H.4: Fulton County Subprime Defaults

APPENDIX I

GWINNETT COUNTY SUBPRIME LOANS AND DEMOGRAPHICS

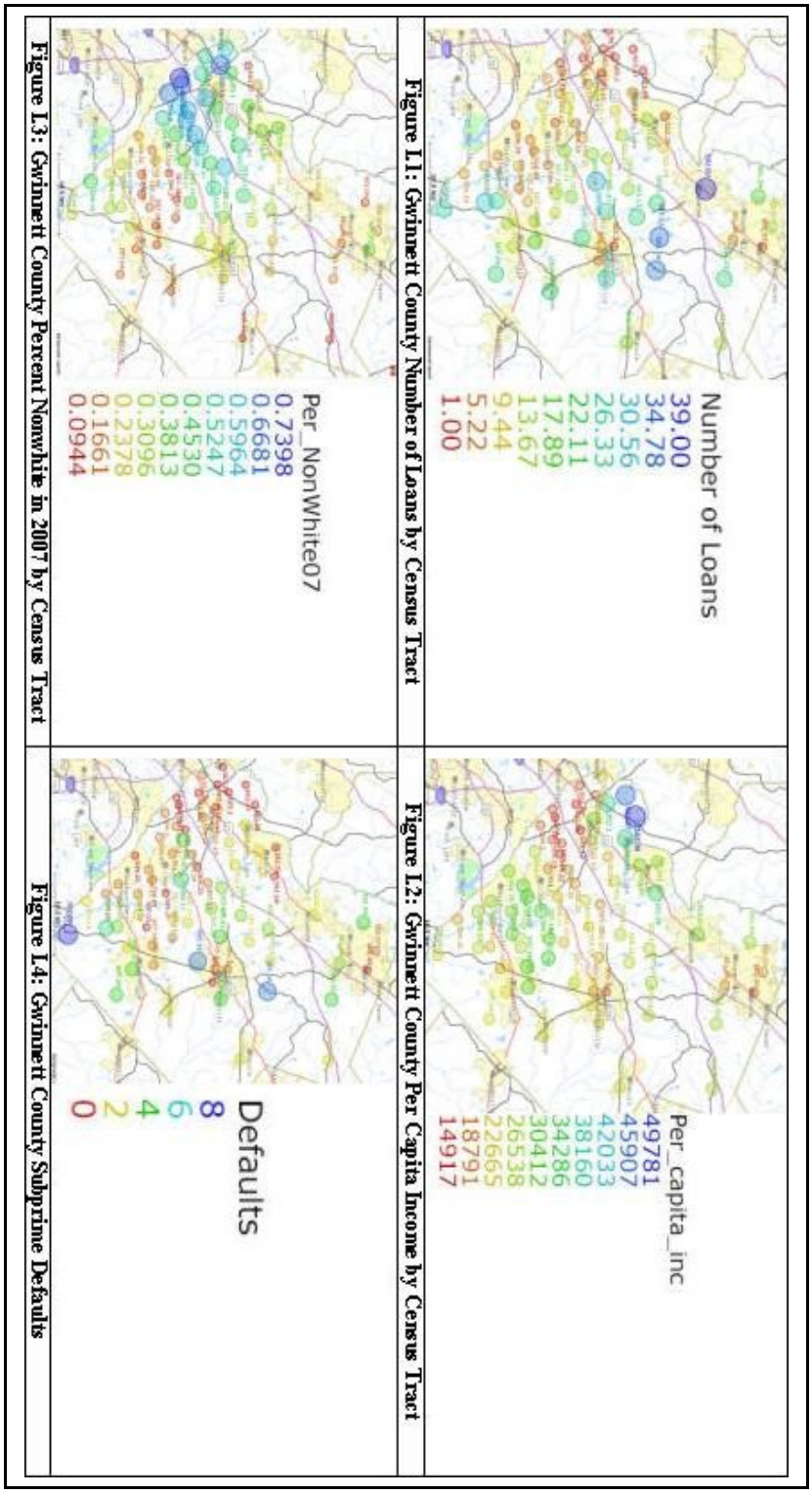

Figure I.1: Gwinnett County Number of Loans by Census Tract

Figure I.2: Gwinnett County Per Capita Income by Census Tract

Figure I.3: Gwinnett County Percent Nonwhite in 2007 by Census Tract

Figure I.4: Gwinnett County Subprime Defaults

APPENDIX J

HENRY COUNTY SUBPRIME LOANS AND DEMOGRAPHICS

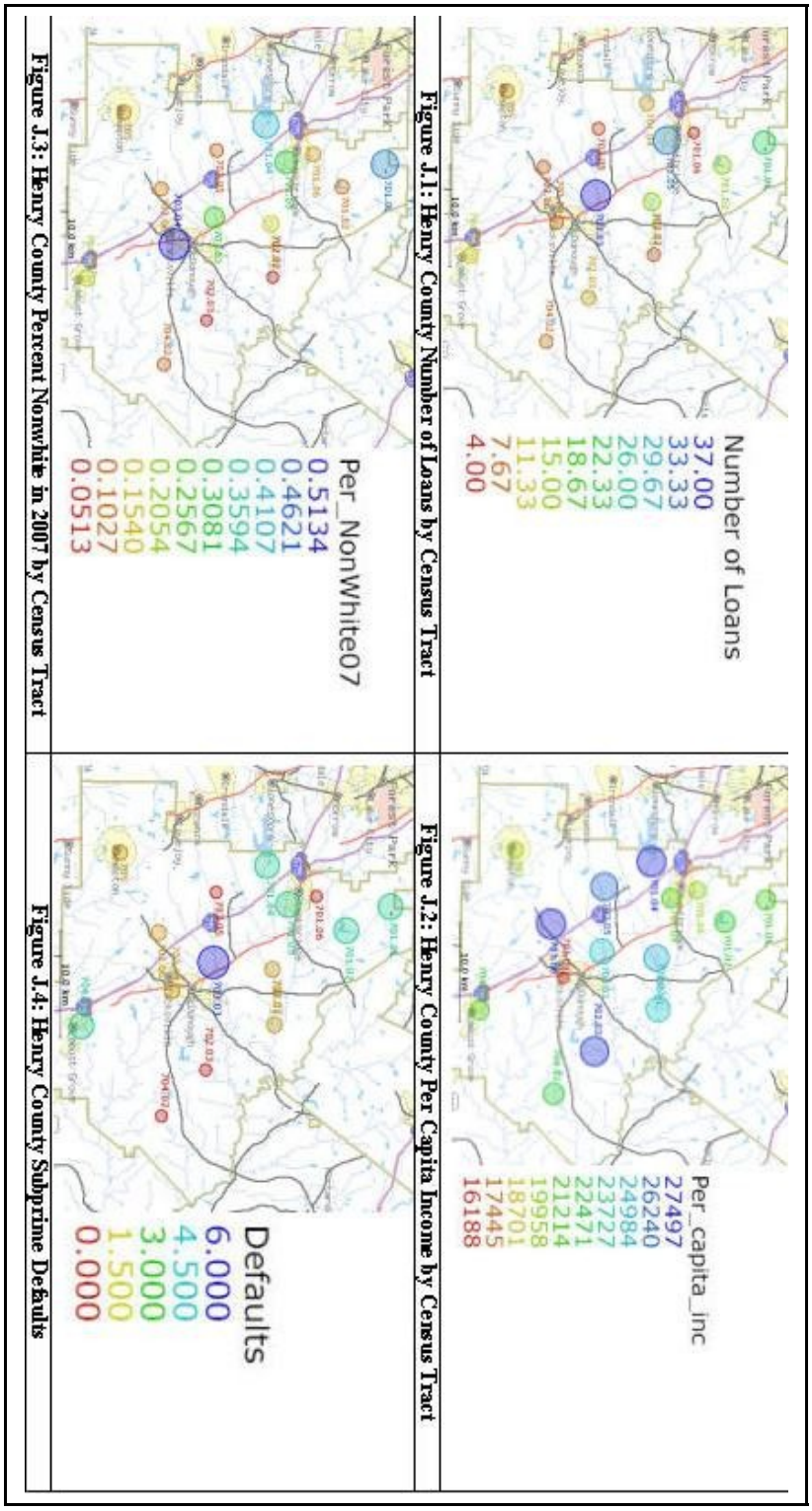

Figure J.1: Henry County Number of Loans by Census Tract

Figure J.2: Henry County Per Capita Income by Census Tract

Figure J.3: Henry County Percent Nonwhite in 2007 by Census Tract

Figure J.4: Henry County Subprime Defaults

APPENDIX K

ROCKDALE COUNTY SUBPRIME LOANS AND DEMOGRAPHICS

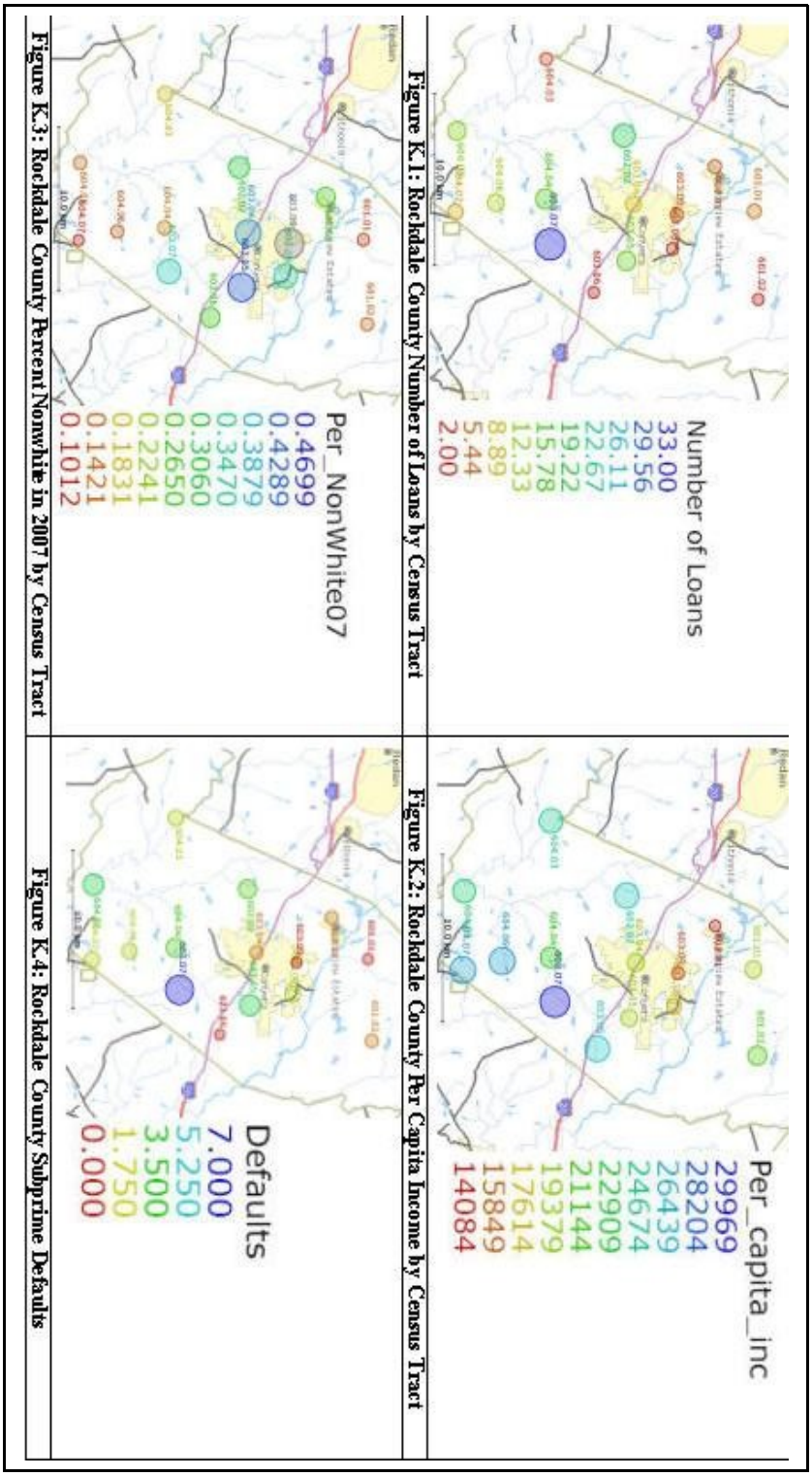

Figure K.1: Rockdale County Number of Loans by Census Tract

Figure K.2: Rockdale County Per Capita Income by Census Tract

Figure K.3: Rockdale County Percent Nonwhite in 2007 by Census Tract

Figure K.4: Rockdale County Subprime Defaults

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