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Residential Foreclosures' Impact on Nearby Single-Family Residential Properties;a New Approach to the Spatial and Temporal Dimensions

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RESIDENTIAL FORECLOSURES' IMPACT ON NEARBY SINGLE-FAMILY RESIDENTIAL PROPERTIES: A NEW APPROACH TO THE SPATIAL AND TEMPORAL DIMENSIONS

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ABSTRACT

This dissertation analyzes the impact that foreclosures have on neighboring property values. It focuses on foreclosures' impact based upon face blocks, not straight-line distances and it also incorporates time and the use of spatial statistics. Findings from this study show that properties in the foreclosure process longer have a greater negative impact on nearby property values than properties with more recent foreclosure filings. The first negative impact is not seen until a year after the filing. Therefore, policy responses need to be as swift as possible in preventing any negative impact on neighboring property values and should not focus on extending the length of time a property is in foreclosure.

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CHAPTER I

INTRODUCTION

As researchers devote more time to studying the current home mortgage crisis, the information available regarding the current situation in the United States begins to provide a more complete understanding of the causes and impacts. The problems can range from its impact on a national scale, to regional implications and all the way down to individual impacts on families affected by foreclosure. Apparent from this recurring research is that foreclosures are not uniformly distributed across the United States. Rates of foreclosure differ from the Northeast to the Western United States and there are also differences from state to state. Even within states, there is variation from region to region, municipality to municipality, and from neighborhood to neighborhood. Despite these variations, the mortgage crisis appears to be impacting all Americans in some way, especially now that it is a full-scale economic recession.

The current situation has drawn many comparisons to the Great Depression of the 1930s. It was during this time period that the federal government first took an active role in creating policy around homeownership. Prior to the Great Depression, the federal government limited its involvement in homeownership to farm housing for the most part.

With the crash of the stock market in 1929 and the economic crisis that followed, many borrowers could not afford to continue to pay for the mortgage or pay the "bullet" or "balloon" payment at the end of the loan terms. The federal government was essentially forced to step in and save homeowners from foreclosure as well as save the thrifts that made the loans. The first piece of legislation was the Federal Home Loan Bank Act of 1932. This placed thrifts under federal supervision for the first time. Quickly following this act were the Home Owners Loan Act of 1933 and the National Housing Act of 1934. The latter act created the Federal Savings and Loan Insurance Corporation (Harriss, 1951; Lea, 1996; Carliner, 1998). Many borrowers were protected from foreclosure and had their loans refinanced. While the main purpose of these programs could be seen as a way to save the financial system at the time, it also expanded homeownership.

Another important part of the 1934 National Housing Act was the creation of the Federal Housing Administration (FHA). Mortgage lending had slowed dramatically due to poor economic conditions. The FHA provided government-backed insurance for mortgages, stimulating lending, home purchasing and home building. With a large portion of unemployment occurring in construction related occupations, insuring mortgages not only spurred homeownership, but it also served as a way to stimulate the building industry. The focus on new construction would have unintended consequences later on in the century.

While FHA is often attributed with the creation of long-term, amortizing loans, loans of that type were used quite frequently prior to the Great Depression. The real innovation was increasing the loan-to-value ratio to 80 percent (Colean, 1975; Lloyd, 1994; Carliner, 1998). That was also the only true liberal feature of FHA program requirements. Appraisals were strict, as were building and construction standards. These stricter measures often excluded existing housing, once again promoted new construction. FHA insured mortgages were also required to be in homogenous neighborhoods. If this is coupled with the focus on new construction, FHA was essentially subsidizing housing for middle and upper class whites in the suburbs. Racial discrimination was a part of FHA until the early 1960s when President Kennedy issued an executive order for equal opportunity in FHA loans. The same became true for conventional loans after the Civil Rights Act of 1968. In order to help with the enforcement of such policies, Congress passed the Home Mortgage Disclosure Act of 1975 and the Community Reinvestment Act of 1977. After this policy change, FHA loan recipients tended to be lower-income borrowers or minority borrowers (Carliner, 1998). Since the 1970s, these loans have also been more likely to result in foreclosure than conventional loans (Immergluck & Smith, 2005).

Another program that originated during the depression was the Federal National Mortgage Association, most commonly known as Fannie Mae. The organization was created in 1938 as a government agency that would support FHA lending by purchasing FHA loans. When Fannie Mae would purchase a FHA loan, FHA would then in turn have more money to lend. Fannie Mae was not initially extremely active in the secondary market, as insurance companies were the largest purchasers of mortgages in the secondary market (Carliner, 1998). In 1968, as part of the Housing and Urban Development Act, Fannie Mae was privatized, becoming a government-sponsored enterprise. Also part of the act was the creation of the Government National Mortgage Association or GNMA. GNMA stepped into the government role left by the now private

Fannie Mae. Two years later, the Emergency Home Finance Act of 1970 authorized Fannie Mae to purchase conventional loans. Just as this provided more money for FHA to lend in the 40s and 50s, it now provides more money for conventional lenders. A "competitor" for Fannie Mae was created as well in the form of the Federal Home Loan Mortgage Company or Freddie Mac. This system of securitizing mortgages in the secondary market fell apart in 2006 and 2007 when too many high-risk loans were being incorporated in the bundle of mortgages purchased. When those loans were defaulted upon, the investments went bad. It should be noted that Fannie Mae and Freddie Mac were not the only secondary market players to have problems once the subprime mortgage market started to fail.

In addition to the programs described above, the federal government has also had other small-scale programs and subsidies, but the impact has been relatively weak and most of the programs are no longer relevant. This applies to programs under the Johnson, Clinton and Bush administrations among others. A non-housing policy that has had a much greater impact on homeownership is the tax code, which is administered by the Treasury and IRS, not a housing agency. While probably not initially intended to support homeownership, the ability to deduct mortgage interest and property taxes from federal income taxes serves as an incentive to own a home. It also encourages the purchase of the most expensive home possible. The more mortgage interest that is paid by the borrower, the greater the deduction. The same can be said for property taxes, which will be greater for a more expensive home. For those with a moderately priced home, the mortgage interest paid may not be large enough to deduct. This is another situation where the "housing policy" is skewed towards newly constructed homes at the urban fringe, as these tend to be the most expensive homes.

Another non-housing program that has had a profound effect on housing development in the United States was the Interstate Highway Act of 1956. Originally passed as a defense measure, the act had the unintended consequence of allowing households to locate further from the central city without increasing transportation times. Areas that would have been considered "remote" became accessible. When that is coupled with FHA policy of insuring new construction, more and more housing was built on the fringe. There were few if any policies devoted to housing in the city core.

When looking at this brief history of homeownership policy in the United States, two trends become apparent. The first is that the federal government only intervenes in the housing industry when absolutely necessary. They have largely left it untouched. When left to the private sector, the housing industry has focused on new construction of detached single-family dwellings simply as a manner of profitability. This is backed up by trends in homeownership rates, which have increased gradually since 1965, with the most notable dips occurring in the early 1980s and the most recent one, starting in 2004 (See Figure 1). Secondly, when the federal government does become involved in the housing market, they tend to focus on single-family residential new construction just like the private sector. FHA, Fannie Mae, the tax code and other policies all provide the greatest incentives for single-family homeownership.

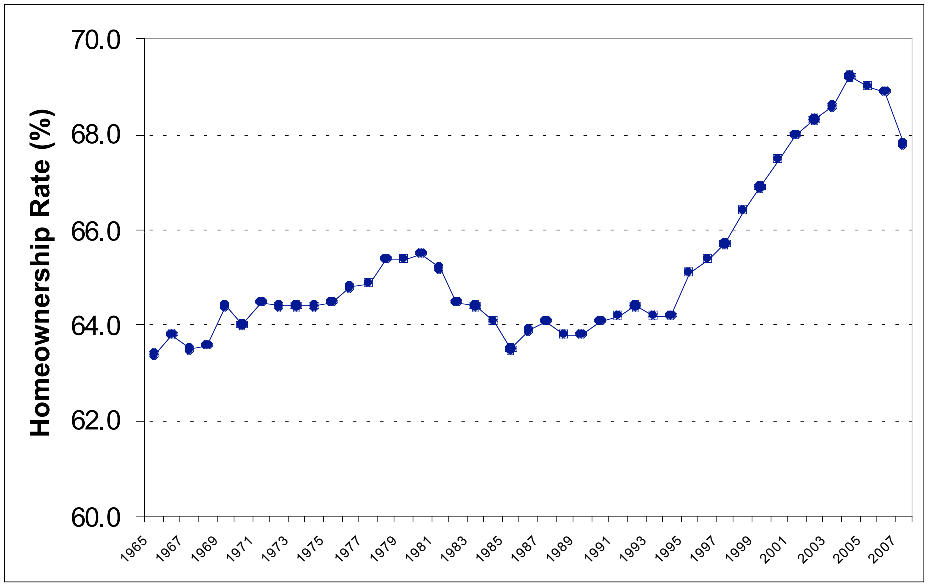

Figure 1. Homeownership Rate in the United States 1965-2007(Q4)

Source: http://www.census.gov/hhes/www/housing/hvs/hvs.html, U.S. Census Bureau

The housing system in place since the 1980s, including the private and public sectors, seemed strong. Homeownership rates were climbing. Unfortunately, some segments of the population were still being left out of what many view as an important part of the American Dream, homeownership. Those most notably lagging behind in homeownership rates were minorities and low-income households. Conventional lenders tended to only make loans to the most creditworthy applicants and government resources were limited in providing loans to those left out of the conventional market. This left a gap in the lending industry.

Subprime lenders filled this void. Subprime loans are made to borrowers with less than "A" credit. These borrowers have some type of blemish on their credit, making them a riskier venture for the lender. Therefore, the lender has to make the terms of the loan reflect this risk. Borrowers in the prime market generally have an interest rate near or at the lowest possible level when the loan in made. Other than that, there are usually few or no other loan terms to account for risk. Prime borrowers are viewed as a very low risk for default and foreclosure. Subprime loans have a higher interest rate than prime loans. A loan with an interest rate three percent above Treasury notes is considered subprime according to HMDA. There are often other features that make the loan cost more for the borrower, which provides more security for the lender. These can come in the form of points, prepayment penalties or other attributes. Despite the greater risk, these loans were securitized in the secondary market with little trouble. Loans considered risky were bundled with a much larger portion of low-risk loans. If a risky loan were to fail, the investment as a whole would still be strong. It appeared that there was a way to increase minority and low-income homeownership, while providing investment opportunities for other Americans with little help from the federal government.

Before continuing, it seems prudent to provide a little more detail about the securitization process. This should make the discussion to follow easier to understand. While mortgage securitization is itself a complex process, a simple outline is sufficient for the purposes of this dissertation. The process starts when a loan is made. This can occur between a borrower and a mortgage broker, borrower and a bank, or a borrower and another loan granting entity. Most banks or other lenders do not hold the loans that they make. While holding the loans and collecting the payments from borrowers would turn a profit, it is a slow process. The loan originator would rather sell the loan to another company, possibly a government sponsored enterprise if the loan meets certain standards, who will then collect payments on the loan. This leaves the loan originator to go out and make another loan to another borrower. The process does not stop here. Companies or groups that purchase loans turn around and offer bundles of loans as investment opportunities. Bundles would generally have a large number of prime loans and a smaller number of subprime loans. By bundling loans in this manner, the risk to the "final" investor is limited. Bundles with a higher number of subprime loans would have a higher risk, but potentially a higher reward as well.

Subprime loans typically do not meet the standards of government sponsored enterprises and are therefore not purchased by those agencies. Private groups that provide mortgage-backed securities for investors fill this gap. Ashcraft and Schuermann (2008) note that until recently, these private companies typically were involved in the origination of mortgages and the issuance of mortgage-backed securities that conformed to the standards of government sponsored enterprises. However, by 2006, these private companies originated $1.48 trillion in mortgage loans, which was forty-five percent greater than loans originated by government sponsored enterprises. In terms of the issuance of mortgage-backed securities, private companies issued over $1 trillion compared to just over $900 billion by government sponsored enterprises. That amounts to a difference of fourteen percent. As these private groups experienced growth, the share of loans for government sponsored enterprises shrank. It appeared that the private sector was more than able to handle the mortgage industry.

Since the system was so successful, it became possible to bundle in more subprime loans with prime loans, while only increasing perceived risk slightly. Most of those borrowers with subprime loans were paying their mortgages. Around the turn of the century, there were some hints that the system was not as perfect as it seemed. Some areas were starting to see increased foreclosure rates, but nothing extreme. House prices were also continuing to climb, which was an important part of the process as loan-to-value ratios rose above 90 percent. Other types of loan products started to become more prevalent. These products can be thought of as exotic loans (Immergluck, 2008). Included in this group could be no money down loans and stated income/stated assets loans. Adjustable rate loans also became more common. The housing industry and lending system continued to accept riskier and riskier products as they continued to be successful. Borrowers were not defaulting and the secondary market was purchasing these loans. Both borrowers and lenders were responsible for supporting such a system. Borrowers might stretch their incomes or misrepresent their ability to pay in order get a bigger, better home. Lenders would often push borrowers into a riskier loan or pressure them to refinance. As long as the loan is made and then sold in the secondary market, the lender is profiting.

Eventually, the risk became too great and some of these loans started to fail and foreclosures rose. Failing loans meant that the investments made in the secondary market were also failing. This in turn had a negative impact on the economy and as workers lost hours or jobs or wages, the process started all over again, creating a cycle of foreclosure, economic downturn and falling house prices. Foreclosures hit certain parts of the country earlier than others. Ohio was a state already having a tough time economically. This was especially true in Northeast Ohio, home to Cuyahoga County and the City of Cleveland. With a weak regional economy and stagnant house prices, Cuyahoga County was one of the first counties in the country to be hit hard by foreclosures.

While unfortunate for many homeowners, this makes Cuyahoga County an excellent place to study the effects of foreclosure, which is what I will do for the remainder of the dissertation. Previous researchers have studied the problem using a straight-line distance to measure proximity between foreclosures and for-sale properties. While this method is efficient and effective, it is not the most accurate way in which the process of foreclosures' impact on property values can be modeled. I utilize the face block to assess proximity. Face blocks are real urban spaces and are a better geography for measuring any impact, as I explain in the literature review and methodology sections. I incorporate time as well. This aspect of the foreclosure problem has been largely unexamined in the literature. I also test for spatial dependence and spatial heterogeneity, which has not been done by previous researchers. The main research question remains the same. What impact do foreclosures have on nearby property values? However, in this dissertation, the impact is measured within a face block, not within a certain distance of the property. In addition to the main research question, there are also two others. What role does time play in the impact of foreclosures on nearby properties? And, Is there still a negative impact when spatial dependence and heterogeneity are controlled for?

In order to answer these questions, I first start with a brief theoretical background using Tiebout (1956), Rosen (1974) and Lancaster (1966). That section is followed by a literature review. The literature review section covers the process of foreclosure and current policies aimed at combating the problem of foreclosure. Policies can be found at the local, state and federal level. The literature review also discusses the effects that foreclosure can have on a neighborhood. These can range from an increase in crime to racial transition. I am interested in examining the impact that foreclosure have on nearby property values due to its effect on a large number of stakeholders: neighbors, school districts and cities to name a few. Therefore, the last part of the literature review focuses on what previous researchers have done. Through this process I identify several areas of the literature on this topic that are under developed. In the methods section, I outline how I am going to address these deficiencies and the data section describes that data that I will use for my analysis. Fittingly, the results section discusses the results from the models that I use to analyze the problem and the discussion section outlines implications from my findings.

CHAPTER II

THEORY

While the process of foreclosure, to be discussed in detail later, truly starts when a household cannot pay their mortgage or the taxes associated with the property, a foreclosure does not occur unless a home purchase takes place first. For many Americans, owning a home is part of the American Dream. In addition to joining or purchasing a piece of the American Dream, households are also purchasing a bundle of attributes that includes goods and services provided by their local municipality as well as the various characteristics of the house and the neighborhood. Tiebout (1956) was the first to outline the concept that households move between communities to the place that offers the goods and services that best align with the needs of the household. Through the process of choosing a community and moving there, households are attempting to maximize their utility. They are also revealing their true preferences. Their willingness to pay is reflected in the price of the home they buy. Prior to Tiebout (1956), scholars viewed the provision of goods and services by the government as a "free rider" problem (Samuelson, 1954). That is, individuals and households hide their true preferences in order to pay less for government-provided goods and services. This is true for the federal government and the services that they provide. However, as Tiebout (1956) explained, this line of thinking is flawed when discussing local governments. At the local level, households have a choice of various municipalities offering different sets of goods and services. When making a location decision, households will choose the municipality that has the service set that most closely matches their preferences. Those in need of high public services will live in a city with a high level of service and likewise, higher taxes. Other households with lower requirements for services will live in communities with lower services and lower taxes.

Public goods and services are not the only attributes in the bundle that a household acquires when they purchase a home. Also in the bundle are individual characteristics of the home that is bought. The sale price is reflective of those characteristics and the public goods and services, with each attribute having an effect on the household's utility. The goal is to maximize utility. Lancaster's (1966) model of consumer theory posits that goods are members of different categories and that goods are purchased in combinations within the constraint of a household's budget. The combination that each household chooses maximizes their utility for their preferences and budget constraint. For example, a household that prefers organic food will allocate more in their budget for food, leaving less for other purchases like clothing and entertainment. Likewise, if name brand or designer clothes are important to a household, they will spend more money on clothes and less on other goods and services. This theory works well for consumer goods, but for a durable good like housing, it is lacking. Rosen's (1974) model is slightly different. Instead of purchasing a combination of goods to maximize utility, households choose from a range of brands or types and the good is consumed discretely. Synthesizing these theories, the hedonic price model can be derived for housing. The price of a house is a function of its individual characteristics, neighborhood characteristics and location characteristics, which includes municipal goods and services. Each household purchases a home that maximizes their utility through different combinations of the attributes that make up the price of the house, all within the constraint of a budget.

It is important to note that in these theories, all players are assumed to have perfect information. However, as many real world applications prove, perfect information is not always present. In the case of purchasing a home, imperfect information can manifest itself as a household misjudges its budget constraint. The household may not include taxes or insurance in their budget, both of which are important aspects of housing costs. They also may not set aside money for any emergencies or unforeseen costs. Besides the possibility of not including certain costs, a household may include extra income. They may be counting on an increase in income due to a raise or change of job that may or may not actually occur. There is also the possibility that fraud occurred at some point during the home buying process. These types of misinformation can be troublesome and potentially lead to a foreclosure.

Regardless of how accurately a household assesses their budget constraint for housing costs, the first step towards foreclosure may be the decision to purchase a home. However, as purchasing a home is generally considered a positive event, it is more accurate to identify the start of the foreclosure process as some type of disruption in the households' lives. There may have a layoff, divorce, or other factor that affects the household's ability to pay their mortgage. Households make the decision to buy a home for various reasons, some more common than others. An ideal prevalent across nearly all home-buying decisions is the prominent place that a single-family home has in the American Dream. Owning ones' home is a sign of success, individuality, freedom and responsibility. Additionally, there are financial incentives for home ownership. Carasso, Bell, Olsen and Steuerle (2005) note that most housing assistance is delivered through the tax code. The tax deduction for home mortgage interest rewards the purchase of the most expensive home with the greatest deduction. Smaller, less expensive homes often do not provide homeowners any tax deduction. With households striving to achieve the American Dream and ample financial incentives to own a home, U.S. Census Bureau data shows that the homeownership rate has gradually been increasing since 1965, reaching a high of 69.7 percent in 2004. This trend can be seen in Figure 1. After 2004, the homeownership rate declines. The drop is slight from 2004 to 2005 and 2005 to 2006. However, from 2006 to 2007, the homeownership rate falls back below 68 percent. This is due in large part to the high number of risky loans that were originated prior to 2006. Those loans then failed, resulting in default and eventually foreclosure. When the loans were made, it was seen as an opportunity to expand access to homeownership to a larger segment of the population and include more people in the American Dream.

In pursuit of the American Dream, a young couple may just have gotten married and decide to buy a house instead of renting. Another household may be growing through birth or adoption and decide that they may need a larger place to live. There is also the possibility that someone in the household has gotten a new job or a promotion and the household can now afford a "better" place to live. Whatever the reason is, the decision is made and the household then begins to search for a house. Different households will value the attributes of a home in a way that will allow them to maximize their utility (Lancaster, 1966; Rosen, 1974; Tiebout, 1956). The young couple mentioned previously may not place much importance on the number of bedrooms or the quality of the school district, but possibly proximity to work and entertainment. A household that is growing will need a certain number of bedrooms and baths. If the children are school age, school quality will be very important. Other households will value attributes and services according to their needs and what will maximize utility. Households interested in city amenities may want a good recreation center as well as a location near parks and open space. The examples are nearly endless, but the point illustrated in the above examples is that each household, after deciding to purchase a home, will look for one that best matches their needs and preferences to maximize utility within a budget.

The budget of a household is a very important factor when purchasing a home and it is ultimately a major factor in the foreclosure process as well. There are two common rules of thumb traditionally used in mortgage lending to limit how much a household can borrow and how much they can spend on housing costs. The first, related to housing costs, is that a household should spend thirty percent of their income or less on housing. The merits of this constraint will not be discussed here, as there are many advantages and disadvantages to the "rule". What is important is that mortgage lenders use this to help determine how much house a household can afford. The other rule of thumb deals with the ratio of debt to income. Mortgage and other types of lenders have traditionally limited this ratio to thirty-nine percent. For example, households may already have other types of debt when they go to buy a home. Many households have car payments and credit card debt. Younger households may have student loans that they are currently repaying. These other debts take up a portion of that thirty-nine percent and the rest can be used to borrow money for a mortgage, which traditionally includes principle, interest, taxes and insurance. Within the constraint of their budget and mortgage lending principles, households attempt to get the most for their money, thereby maximizing utility.

Despite these rules of thumb, there can be substantial leeway in which a household can maneuver to get the best possible combination of attributes in a home. In recent years, more innovative and flexible mortgage products have become available. These products are much different and have the possibility of greater risk than the traditional thirty-year fixed rate mortgage that first appeared after the Great Depression (Gramlich, 2007). Instead of fixed rate mortgages, there are adjustable rate mortgages (ARMs). An ARM allows households to get a lower interest rate initially while taking a gamble that rates will remain low, as the interest rate on the loan will adjust after a certain amount of time. If interest rates have increased between the origination of the loan and the time of adjustment, the household will see their monthly mortgage payment increase due to the higher interest rate. They may or may not be able to afford this rise in housing costs. In an attempt to maximize utility, the household may have been paying thirty percent of their income at the original interest rate and the new rate pushes them above what they have allocated for housing costs and are thus unable to afford the new payment. This may result in a foreclosure if some type of remedy cannot be reached between the lender and the borrower. The borrower may also attempt to sell their home before the bank takes it through foreclosure.

Another example deals with interest only loans. Problems with these types of loans can be especially prevalent in what can at the outset be called “hot” housing markets. A household can get an interest only loan for a house that they could not afford with a more conventional mortgage. The household then makes payments only on the interest while the home appreciates rapidly. When time comes for the mortgage payment to include principle, the household can sell their house for a profit, possibly moving to a bigger home and continuing this cycle all over again. There is also the possibility that the household could refinance. The problem occurs when the "hot" market cools off considerably. The household may not be able to sell and are therefore stuck with a home that they cannot afford after the new payment phase begins. If they can find a buyer, the house may sell for much less than what is remaining on the mortgage, which may lead to the bank rejecting the sale if they cannot recover what was invested in the property when it was first purchased.

There is also the possibility that a member of the household simply lost their job and now the household income can no longer cover the mortgage payment. Numerous other examples and scenarios exist, but they all have one factor in common: households buying a home are looking to maximize their utility. They purchase the home with the best attributes (most square footage, bedrooms, etc) and public services (school district quality, recreation, police and fire, etc) possible. In so doing, the household typically spends every penny in their budget allocated to housing, which is supported by the economic theories discussed previously. This creates a situation where an increase in the mortgage payment or a decrease in household income can lead to foreclosure and ultimately the loss of the home for the household.

The process of foreclosure can be complicated and time consuming, with many negative consequences for the household, bank, neighbors, neighborhood, city and region. Households are forced to uproot their family and move. Their credit is also damaged. Banks lose an investment and may become property owners, which does not suit them. Neighbors lose members of their community and may see the value of their property decline. The neighborhood as a whole may decline through the unraveling of its social fabric. Cities lose tax dollars through lower property values and cannot provide as high of quality of services. Relating this back to Tiebout (1956), households that moved to a community for a particular combination of city services are no longer maximizing utility if services change due to lower tax revenues. The households then might consider moving to a different municipality that can provide the types of city services for which they are looking. If foreclosures are impacting an entire housing market, as has been the case across the United States, city amenities will fall throughout the region, more so in areas with high foreclosure concentrations. The change in services may lead more households to look to relocate, creating a housing market with more supply than demand. This leads to a drop in prices. The process described above builds upon itself, creating a spiral of lower city services and revenues, an oversupplied housing market and falling house prices.

CHAPTER III

LITERATURE REVIEW

3.1 Foreclosure Process

An outline on the process of foreclosure itself is presented here to give a more complete picture of the problem. A timeline of the process can be seen in Figure 2. By understanding how a house goes from being occupied and maintained by a household to a post-foreclosure house that may be abandoned, bank-owned or occupied by a new household, it will become more apparent how foreclosures impact neighborhoods. While it could be argued that the foreclosure process starts when a member of the household loses a job or the interest rates adjust upwards, technically, the beginning of the foreclosure process starts when the borrower misses a payment. Following the missed payment, there is a grace period. This is usually fifteen days, but can be slightly shorter or longer, depending upon the lender. During this grace period, there is no penalty for lateness and lenders do not take any action.

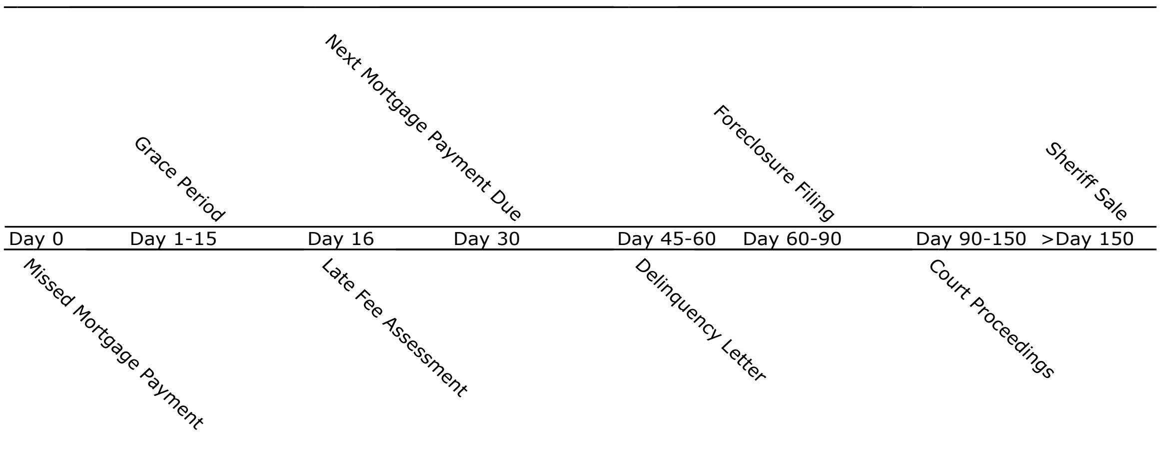

Figure 2. Foreclosure Timeline

Once the grace period has passed, a late fee is assessed and the lender attempts to contact the borrower in an effort to find out the reason for the missed payment. After thirty days, another payment is due and the amount needed to keep the mortgage current can rise rapidly. Between forty-five and sixty days after the first missed payment, a delinquency letter will be sent to the borrower notifying them that they have violated the terms of the mortgage. This letter usually gives the borrower another thirty days to pay the outstanding balance. If after this time the mortgage is still not current, the lender will turn the loan over to its legal department and documents will be prepared to present to a local attorney. Usually between sixty and ninety days after the first missed payment, foreclosure proceedings are initiated in court against the borrower. This is known as the foreclosure filing and is the first time foreclosure information is available publicly. The foreclosure must be advertised, most often in the local paper and the largest circulating daily in the metro area. The legal part of the foreclosure can take as little as two months in some states to well over a year in other states. Once court proceedings have begun, the borrower already owes a substantial amount to the bank, including two or more monthly payments and the late fees and penalties. If the borrower and lender cannot reach a compromise to keep the borrower in the home or otherwise pay what is owed, such as a short sale, the court case closes out with the bank foreclosing on the property.

The foreclosure proceedings end when the property is auctioned publicly. Here, the property can be bid on by anyone. Speculators often come to foreclosure auctions looking to bid low and then sell at a higher price, making a quick turn around. Banks almost always send a representative to the auction to assure that the bank recovers what they have invested in the property. The bank's representative will bid up the price to the amount owed and if no one else is willing to bid above that amount, the bank will end up with the property. This is not ideal, as banks are in the business of money and not property ownership. In many states, borrowers have a right of redemption. This right allows borrowers to pay off the outstanding balance before the gavel falls at the auction and in some states, borrowers can do so even after the auction.

This process of foreclosure raises several questions. For example, what are the causes of foreclosure? What happens that makes a borrower unable to make a payment? It is possible that the borrower recently lost a job. Other economic factors may also come into play. There are also variables surrounding the mortgage itself. Does it have an adjustable rate and when did the rates adjust? Did the rates adjust upwards and how much did that increase the borrower's monthly payment? The mortgage lending industry must also have a part in determining whether or not a foreclosure takes place. Despite a thorough understanding of the foreclosure process, still unknown is the event that triggered the foreclosure process.

3.2 Causes of Foreclosure

There are many reasons or causes for the rise in foreclosures, but three broad, general areas have been consistently linked to the foreclosure crisis. The first is the mortgage lending industry, as there has been an increase in subprime lending and alternative mortgage products. Subprime lending is beneficial because it opens up lines of credit to borrowers who could not otherwise obtain a mortgage, but it is also the victim of abuses that can eventually lead to foreclosures. Apgar and Duda (2005a) note that foreclosures in the City of Chicago have doubled since 1996 even though the rate of foreclosure for prime loans has remained relatively stable. The culprit has been the increasing number of subprime loans. In a separate study of Chicago, Immergluck and Smith (2005) come to a similar conclusion using a multivariate approach. Subprime loans lead to foreclosures at a much higher rate than do prime loans and within high foreclosure neighborhoods, a large share of the foreclosure activity comes from subprime loans. Subprime loans are also problematic because minority and low-income households are much more likely to receive a subprime loan, even if their credit does not warrant such a loan (Immergluck, 2004; National Community Reinvestment Coalition, 2003). Since subprime loans are more likely to result in foreclosure, minority and low-income households are going to be involved in foreclosures at a greater rate than other households. If these households are concentrated in certain neighborhoods, as they tend to be in many metropolitan areas, then foreclosures are also going to be concentrated in those neighborhoods as well.

One aspect of the subprime lending industry that receives an abundance of attention from the media and academicians is predatory lending. It is difficult to define and quantify, but predatory lending is generally characterized by abusive loan terms or practices that target segments of the population based upon race/ethnicity, gender, age, education, or other factors not related to credit risk (Carr & Kolluri, 2001; Engel & McCoy, 2001). The terms of predatory loans are not designed to address concerns about the risk of default, but rather to gouge and harm the borrower for the benefit of the lender and broker. Despite trouble in quantifying predatory loans, the Coalition for Responsible Lending estimates that U.S. borrowers lose $9.1 billion every year as a result of predatory loans. The $9.1 billion in loses comes from losing equity, excessive foreclosures and other factors (Stein, 2001). With evidence from recent studies, the conclusion can be made that subprime lending, along with predatory loans, is one of the causal factors of the recent boom in foreclosures nationwide.

The second factor related to the recent rise in foreclosures is the economy. An economic brief released by the Center for Economic Development at Cleveland State University in July of 2007 found that employment growth in Northeast Ohio, one of the areas hardest hit by the foreclosure boom, was modest at 6.8 percent. Employment growth in Ohio, a state hard hit by foreclosures, was 11.7 percent. To put those two growth rates in perspective, the national employment growth rate was 23.1 percent. From 2005 to 2006, employment growth in the Northeast Ohio region was 0.1 percent. To make matters worse, manufacturing, the largest employment sector in the region with a decent average wage of $50,600, lost jobs at a rate faster than the national average. The other two largest sectors in terms of employment are health care and social assistance and retail trade. Unfortunately, these industries have relatively low average wages at $35,300 and $22,500 respectively (Yamoah, 2007). In terms of foreclosure, the economy in

Northeast Ohio contributes to the problem through stagnant job growth; job loss in key sectors and lower wages in some of the high employment sectors.

Indiana, another state hit hard by foreclosure, has had similar problems related to job loss and wage reductions, particularly in the manufacturing sector (National Association of Realtors, 2004). That same study also notes that the foreclosure rate in San Francisco rose during a period of job cuts and that the foreclosure rate fell in the Los Angeles area while jobs were being created. To bring even more credence to the argument that economic conditions exert some influence on foreclosure rates, two separate studies of New Orleans (Baxter & Lauria, 2000; Lauria & Baxter, 1999) identify loss of employment and income or economic shocks as main factors in the increase of foreclosure rates in the area. Households that experience a decrease in income due to job loss or lowered wages are going to have a difficult time making payments on a mortgage that they were approved for based on a higher income. These households may become delinquent on their payment, which ultimately leads to foreclosure.

The strength of the housing market is the third factor linked causally to the recent rise in foreclosures. Areas affected by dramatic changes in the housing market are in stark contrast to the places that have been negatively impacted by the economy. Metropolitan areas such as Cleveland and Detroit and states like Ohio, Michigan and Indiana have all experienced a rapid increase in the number of foreclosures. These areas also have lost jobs and experienced stagnant wage growth. Opposite of these places are the states of California, Nevada and Florida to name a few that have been prosperous. The economy in such places has been strong and growing and houses have sold quickly with house prices increasing greatly. Households living in these states and the metro areas within the states have been able to avoid foreclosures until very recently. Schloemer, Li, Ernst and Keest (2006) note that these households could use the increased equity in their homes to help pay off any delinquencies. In an extreme case, a household in danger of losing their home could simply sell, as demand in these markets was extremely high. The seller would have more than enough money from the sale to pay off their mortgage as a result of the strong growth in the housing market. However, as the housing market has cooled off, more and more households in places like California and Florida are having trouble selling their home at a price that covers what they owe on their mortgage.

The strength of the housing market and the strength of the economy are often positively correlated with one another. Not only do households move to places like California and Florida for the weather, but those are also states that have had healthy job growth. When households move to these states for the jobs, they then become residents and need housing. This in turn drives up the demand for housing and therefore house prices increase. The opposite is also true. In states that have experienced job losses within a weak regional economy, there has also been population loss. With fewer households in a region, there is less demand for housing. House prices remain stagnant.

Looking at the housing price indices (HPI) since the year 2000 from the Office of Federal Housing Enterprise Oversight, Florida and California rank two and three respectively in the percent change in HPI from the fourth quarter of 2000 to the fourth quarter of 2006. That is, California and Florida have had two of the fastest growing housing markets in the country since the turn of the century. Delaware ranked first. However, when examining the percent change in HPI from the fourth quarter of 2005 to the fourth quarter of 2006, California and Florida rank fiftieth and thirty-seventh out of fifty-one (including Washington DC). In terms of the percent of households experiencing foreclosures in 2007, California and Florida have six each of the top twenty-five metropolitan areas. Of the thriteen remaining metropolitan areas, four are also in high growth, strong economic areas. The Las Vegas area is ranked third overall and the Denver area is ranked ninth by percent of households. The other metropolitan areas that rank in the top twenty-five are characterized by weak housing markets and struggling economies, which was also identified as a causal factor in the recent rise in foreclosure rates. Detroit is number one with nearly five percent of its households experiencing foreclosure and the Cleveland metro area is sixth on the list (RealtyTrac, Inc., 2008). Table 1 outlines the top twenty-five metros by the percent of households in foreclosure along with the state house price index ranks. The increase in subprime lending, weak economies resulting in limited job and wage growth, and strong housing markets cooling off rapidly has led to a quick rise in foreclosure rates across the country.

Table I. Top 25 Metropolitan Areas by Percent of Household in Foreclosure

Metro Area	% HH in Foreclosure 2007	Foreclosure Rank by HH %	State HPI Rank 2000 - 2006 Q4	State HPI Rank 2005 - 2006 Q4
DETROIT/LIVONIA/DEARBORN, MI	4.918	1	51	41
STOCKTON, CA	4.866	2	3	51
LAS VEGAS/PARADISE, NV	4.228	3	30	48
RIVERSIDE/SAN BERNARDINO, CA	3.826	4	3	51
SACRAMENTO, CA	3.189	5	3	51
CLEVELAND/LORAIN/ELYRIA/MENTOR, OH	2.972	6	50	44
BAKERSFIELD, CA	2.960	7	3	51
MIAMI, FL	2.724	8	2	37
DENVER/AURORA, CO	2.641	9	43	34
FORT LAUDERDALE, FL	2.632	10	2	37
ATLANTA/SANDY SPRINGS/MARIETTA, GA	2.531	11	40	14
AKRON, OH	2.326	12	50	44
MEMPHIS, TN	2.141	13	41	12
FRESNO, CA	2.121	14	3	51
DAYTON, OH	2.073	15	50	44
OAKLAND, CA	2.071	16	3	51
WARREN/FARMINGTON HILLS/TROY, MI	2.069	17	51	41
INDIANAPOLIS, IN	2.019	18	27	29
TOLEDO, OH	1.938	19	50	44
ORLANDO, FL	1.932	20	2	37
PALM BEACH, FL	1.924	21	2	37
PHOENIX/MESA, AZ	1.915	22	36	20
TAMPA/ST PETERSBURGH/CLEARWATER, FL	1.908	23	2	37
SARASOTA/BRADENTON/VENICE, FL	1.840	24	2	37
COLUMBUS, OH	1.832	25	50	44

3.3 Policy Responses

Policies to combat and prevent foreclosure are most often undertaken at the local level, as early on in the crisis the role of the federal government had been to simply lower interest rates. Several cities had programs in place that were helping homeowners facing foreclosure before the situation escalated to "crisis". However, these programs were often not large enough to be effective once foreclosures rose rapidly in late 2006 and

2007. In Chicago, the mayor and president of the Federal Reserve Bank of Chicago brought city leaders together to create a program to help prevent foreclosure. From this meeting, the Home Ownership Preservation Initiative (HOPI) was formed. The goals of HOPI were to help 1,500 homeowners in danger of foreclosure keep their homes, reclaim 300 foreclosed properties as neighborhood assets and document lessons learned about what are the best practices in homeownership and property preservation (NeighborWorks America, 2005).

In order to help 1,500 homeowners in Chicago, Neighborhood Housing Services (NHS) worked with local subprime lenders, focusing on loss mitigation, real estate owned (REO) properties and prevention in origination (NeighborWorks America, 2005). Getting homeowners into some type of foreclosure prevention program as quickly as possible minimizes losses associated with foreclosure. NHS worked with lenders to acquire REOs at a discounted price and turn them into neighborhood assets. Prevention in origination helps to create loans that are designed to succeed, not fail.

Financial assistance is provided to troubled Chicago homeowners through the Neighborhood Ownership Recovery Mortgage Assistance Loan (NORMAL) program. Lenders are able to participate in this program for $100,000 a share. The program raised $2.2 million by selling 22 shares to 18 lenders. NHS identifies homeowners in need and works with the person or family in order to help them to qualify for conventional refinancing. Then, NHS works with the lender to hopefully reduce the mortgage amount and refinance the loan. A loan through the NORMAL program is then used to refinance. NORMAL loans can only be used to refinance predatory loans, rehabilitate property or intervene in a foreclosure (NeighborWorks America, 2005).

Through the first 18 months of HOPI in Chicago, nearly 700 foreclosures have been prevented. In addition, NHS has also obtained 111 properties for reintroduction as a productive use. NHS staff has found that loan programs, like NORMAL, need to be done simultaneously with counseling and information services in order to be most effective. Financing needs to be flexible and payments need to be kept low. Any additional funding sources are of great importance (NeighborWorks America, 2005).

NHS in New York runs a slightly different program than in Chicago and focuses mainly on education. There is an early-delinquency intervention, a foreclosure-prevention orientation, a predatory-lending awareness orientation, one-on-one counseling, and a five-week foreclosure-prevention class (NeighborWorks America, 2005). NHS holds forums in neighborhoods identified as at-risk in order to alert homeowners to these services. Staff at NHS in New York identifies early intervention as the key to preventing foreclosure.

A data driven approach could be modeled after the Philadelphia Neighborhood Information System. This information system contains data on numerous attributes of housing in Philadelphia, including housing characteristics, presence of housing code violations and any tax delinquencies. Hillier, Culhane, Smith and Tomlin (2003) use the information system to predict housing abandonment in Philadelphia. A similar system could be used to identify properties or neighborhoods that were at risk for foreclosure and the city could in turn implement their prevention programs in those areas, making service delivery more efficient. Important to the success of such a system would be information about the loans that were used to purchase homes.

While all of the above mentioned programs were in place prior to the most current foreclosure crisis, other areas of the country had little or no programming in place to handle issues related to foreclosure. In Cuyahoga County in Northeast Ohio, the location of the major city Cleveland, officials have taken an educational approach to the foreclosure problem. Mitigation strategies are necessary as Cuyahoga County has the highest foreclosure rate in the state and the Cleveland metro area ranks in the top ten nationally (RealtyTrac, Inc., 2008; Schiller, 2007). After studying the problem over a summer with input from various advocates and experts, the three county commissioners created a program aimed at attacking the root causes of foreclosure. The program offers counseling for those borrowers experiencing financial distress as well as for those who are considering a home loan and those with questions about their credit. By providing education to those populations previously mentioned, it is hoped that borrowers and future borrowers can be steered in directions that will not lead to foreclosure, but appropriate loans and for those in distress, ways to work with lenders to keep their homes.

An important part of Cuyahoga County's program is the United Way's First Call For Help Line. Any borrower living in Cuyahoga County, who wants to remain in their home and who has the financial means to maintain a payment plan for their loan is eligible to receive counseling and advice through the Foreclosure Prevention Program. These borrowers are asked to call 2-1-1 and from there they are directed to the proper counseling services. In addition to partnering with the United Way, there are many other partners in the county's program, including lenders, foundations, counseling agencies, government partners and community partners. An extensive partnering network like the one in Cuyahoga County can better provide the right resources and services to those in need. One final piece of the program involves changes made to the court system, which attempt to expedite the process of foreclosure, shortening the time between the filing of the foreclosure complaint and the sheriff sale. In doing this, properties can move from productive to unproductive and back again much more quickly.

In addition to the educational aspects of Cuyahoga County's foreclosure programs, county officials have been working on legislation at the state level to allow the county to set up a land bank. The legislation passed in the Ohio Senate near the end of 2008 and allows the county to buy or accept abandoned and foreclosed homes (Marshall, 2008). Homes deemed to be beyond repair are then demolished. This allows the county to clear out some of its more debilitated and blighted homes. Homes in good condition are held in a trust with the hope of reintroducing them into the housing stock as soon as the market will allow. Since the county has been losing population for some time, there is no real rush to rebuild with plenty of housing present in the county. Ohio senators also made it clear in the legislation that the county was only to clear land and hold it; any rehabilitation will have to be done by the private sector. The county cannot take new properties into the land bank after two years (Marshall, 2008). Despite the restrictions and limited time frame, this will hopefully lessen the negative impacts associated with foreclosure to be discussed later.

In addition to local governments creating policies to prevent foreclosures and combat any negative impacts, local governments have also used the legal system in response to rising foreclosure rates. The City of Cleveland has recently filed a lawsuit against twenty-one of the largest subprime lenders in the country. The lenders are accused of knowingly putting the city into a financial crisis by flooding the housing market with subprime loans that people could never repay. The suit was filed in the Cuyahoga County Common Pleas Court under the state's public nuisance law. The banks targeted in this lawsuit are not those who originally made the loans, but those who purchase the loans, bundle them into securities and divide them into shares to be sold on the stock exchange (Gomez & Ott, 2008).

In a slightly different effort just days before Cleveland filed their lawsuit, the City of Baltimore filed suit against Wells Fargo. Baltimore alleges that Wells Fargo violated fair-housing laws by targeting minority neighborhoods and placing households in loans that they could not afford. This practice is known as reverse redlining. The Cleveland suit does not mention race and twenty-one lenders were mentioned in their suit, not just one. Other than that, the two suits are quite similar. Both note the loses in property taxes from declining property values, the increases in police and fire costs due to increases in crime and arson, and the social costs of trying to keep neighborhoods afloat that are being devastated by foreclosure (Gomez & Ott, 2008).

Since Baltimore and Cleveland filed suit early in 2008, others cities have also taken a legal approach to dealing with foreclosures in their neighborhoods. Buffalo has sued thirty-seven lenders under the city's upkeep code. They are seeking the costs of maintaining and demolishing fifty-seven abandoned homes. St. Paul has sent letters lenders, urging them to fix and sell the homes that they own. The city hopes to avoid any legal action. St. Paul's twin, Minneapolis, has also filed suit. They have won the appointment of a legal caretaker for some abandoned homes and are looking to purchase other homes that have been foreclosed on in an effort to expedite redevelopment

(Leinwand, 2008). Only time will tell if these suits produce any positive results for these cities.

States, like local governments, have been involved in policy making since early in the crisis. There have been several different approaches to combat the problem, and many, if not most states, use multiple policies. One method of fighting foreclosure at the state level has been some type of foreclosure moratorium or a lengthening of the foreclosure timeline. In Massachusetts, there is a program operated by the Division of Banks that can provide borrowers a 30 to 60 day reprieve. When the borrower receives the first notice of foreclosure from the lender, he or she then has to file a complaint with the Division of Banks. A representative from that office then contacts the lender and tries to work out an extension. Lenders are not required to accept the request of the moratorium. This is a voluntary program. If a moratorium is granted, borrowers are provided materials and information about foreclosure prevention in the hope that they will seek help and not find themselves in a similar situation in the future.

Maryland and New York also have passed legislation to lengthen the foreclosure timeline. In Maryland, the process is now a minimum of 150 days as opposed to the previous timeframe of 15 days. Also, lenders must wait 90 days after default to file for foreclosure and there also must be a notification 45 days before the action is filed. In New York, lenders must provide 90 days notice before a foreclosure action is filed. There also has to be information in the notice about local programs aimed at preventing foreclosure.

States have also worked with legal aid offices to provide representation and other services to borrowers facing foreclosure. Legal Aid in North Carolina has a Mortgage

Foreclosure Project. The goals of the project are to preserve credit ratings, prevent foreclosure, and break the cycle of abusive lending practices. There is also a program in New Jersey, run by Legal Services, which specifically works with victims of predatory lending. Both programs also devote some resources to borrower and community education. The legislature of New Jersey is also contemplating a proposal that would charge subprime lenders a $2,000 fee to start a foreclosure action. This serves to provide an incentive for lenders to rework loans as well as establish a foreclosure prevention trust fund.

Because Ohio was one of the first states to experience a high number of foreclosures, its programs are some of the most comprehensive in the country and are often used as a model for other states. In terms of providing legal services to borrowers, Ohio has created the Save the Dream program. This program is the result of collaboration between the state attorney, chief justice and the president of the state's bar association. Together, they made a request to all attorneys to provide legal services to troubled homeowners through a state program. Over 1,000 attorneys have volunteered to assist borrowers with loan restructuring and mediation. These services are free for the borrower. The eligibility cutoff is 250 percent of the area median income.

Another groundbreaking effort by Ohio is a collaborative effort between the state and nine subprime lenders called the Ohio Compact to Preserve Homeownership. This is a non-binding agreement between the state and the lenders. Progress is reported to the Department of Commerce. Lenders are expected to use "good faith" efforts to keep borrowers in their home through loan modification, early communication with at-risk/defaulting borrowers, and incentives for loan restructuring as opposed to foreclosure. This program aims at stemming the tide of subprime loans going into foreclosure.

While late in implementing any policy related to the foreclosure boom compared to local entities, the federal government recently enacted a program to help households facing foreclosure. The program is called Project Lifeline and is headed by Bank of America, Citigroup, Countrywide, J.P. Morgan, Washington Mutual and Wells Fargo. Together, these banks account for over fifty percent of the mortgage servicing industry. As designed, the program gives troubled homeowners some extra time (30 days) to work with their lender to reach an accord in which they can keep their home and become current on their mortgage payments. Some critics believe that a thirty-day reprieve is too short and that the program may simply be delaying foreclosure. Also, lenders are not required to change the terms of the loans. That is, troubled borrowers may not be able to work out an agreement that they can manage. There are also concerns about eligibility requirements. Households who are currently in bankruptcy, who are not more than three months behind on their mortgage payments, and whose foreclosure date is less than thirty days away are not eligible. Also ineligible are those who purchased a vacant home as an investment property.

As the crisis deepened, it became apparent that a more substantive program needed to be enacted by the federal government. In the second half of 2008, two bills were passed. The first was the Housing and Economic Recovery Act (HERA) of 2008. Part of the bill focused on the government sponsored enterprises (GSEs) of Fannie Mae and Freddie Mac. The Federal Housing Finance Agency was created to oversee the GSEs and loan limits for the two entities were increased. Additionally a Housing Trust

Fund was created for the provision of affordable housing along with a first-time homebuyer tax credit. Perhaps the most intriguing part of the bill in terms of foreclosure prevention and recovery is the Neighborhood Stabilization Program (NSP) now administered by HUD. The NSP provides grant money for states and some local communities to combat foreclosure. The funds can be used to purchase foreclosed or abandoned homes and then rehabilitate, resell, or redevelop the properties. Passed a few months after HERA was the Emergency Economic Stabilization Act (EESA) of 2008. A major part of this act is the Troubled Assets Relief Program, commonly referred to as TARP. TARP allows the Treasury Secretary to purchase and insure “troubled assets”. The goal of this is to provide some stability and confidence to the lending market in order to unfreeze credit to borrowers.

Despite these steps taken by local entities and state and federal government, foreclosures are still occurring and impacting neighborhoods throughout the country in a negative way. Beyond the causes and policy responses to foreclosure, we are left to wonder about the impacts that foreclosures have on neighborhoods during the foreclosure proceedings as well as after the process has been completed. Are homes properly maintained during this time? What happens to the property if the bank obtains ownership? Do foreclosures create havens for crime? What happens to property values? These are all questions that need to be answered and this dissertation will address the most pressing questions. The study of these impacts is vital to the mediation of problems caused by foreclosure. The impacts can be classified as social, neighborhood and property.

3.4 Impacts of Foreclosure

The most immediate and obvious negative impact of foreclosure happens to the family or household living in the foreclosed house. When the first notice of foreclosure comes, the family has the stress of deciding what to do. They might attempt to get the money together to avoid the foreclosure or they can start to look for another place to live. If they cannot accomplish that and are forced to move, they then have the stresses that come with finding a new place to live. All the while, their credit score will be negatively impacted. This can affect their ability to find a new place to live as well as other facets of their life, such as purchasing a vehicle, possibly to get to work and back, and buying a home in the future when their finances are once again stable. Beyond these very personal impacts that foreclosures have on the household, impacts also extend into the surrounding neighborhood.

Another negative impact of increased foreclosure activity is an increase in crime. Immergluck and Smith (2006a) found that higher foreclosure rates contribute to higher levels of violent crime. Interestingly enough, the impact on property crimes was not statistically significant. Conventional thinking would assume that there would be an increase in property crime with the additional vacant housing units. However, if the units are vacant, there may not be anyone to file a police report. The increase in violent crime tells us that those neighborhoods with higher foreclosure rates also see a decrease in neighborhood quality. Neighborhoods are becoming less safe, making them less attractive to prospective buyers than their current residence and ultimately contributing to the cycle of neighborhood decline.

In a study of New Orleans, Lauria and Baxter (1999) concluded from their analysis that foreclosures aided the process of racial transition. The effect was strongest in neighborhoods that didn't have very low incomes and already had an increasing black population. These are neighborhoods that were probably working class or middle class, with some degree of integration. As households bettered themselves, they moved out of the neighborhood to an area with more expensive housing that they could now afford. The presence of minorities was really no cause for concern. However, as foreclosures increased and residents started to see vacant houses and more houses for sale than was usual, they perceived this as a sign that the neighborhood was declining. The decline was most likely falsely attributed to the recent increase in African American residents. Taking this as a cue to move, white residents would move out of the neighborhood, thereby quickening the process of racial transition and resegregation.

Foreclosures can also negatively impact property values of both the home being foreclosed upon and nearby properties. Foreclosed properties sell at a discount for a number of reasons. The properties may not capture area wide appreciation and sellers are operating under a unique set of incentives that may lead to the acceptance of a lower price (Penninton-Cross, 2004). Several researchers have examined the sale of real estate owned properties (REO's) and foreclosure sales to see if those properties sell for a discount in relation to "standard" sales. Those studies have had a mix of results, data, and methods. Shilling, Benjamin and Sirmans (1990) conducted the first of these studies. The authors used a hedonic model to examine 62 condominium sales from Baton Rouge, some of them were REO's and some were not. The findings concluded that REO's sold at a discount of 24 percent.

Three other studies (Forgey, Rutherford & VanBuskirk, 1994; Hardin & Wolverton, 1996; Carroll, Clauretie & Neill, 1997) use hedonic models as well with some slight differences. Forgey, Rutherford and VanBuskirk (1994) use a larger data set of single-family properties in Arlington, TX and find a similar discount of 23 percent. However, the authors include zip codes in the model as a number, not a dummy variable, which raises questions as to the accuracy of their results. The study by Hardin and Wolverton (1996) uses another small sample of only 90 for-sale apartments in Phoenix, nine of which are foreclosure sales. The results though, are again consistent, with the discount for foreclosure sales at 22 percent. Of the four studies mentioned, the only one to not find a discount associated with REO sales or foreclosure sales was the study conducted by Carroll, Clauretie and Neill (1997). In this study, the authors had a large data set from Las Vegas of single-family properties. To correct the early mistake of including zip codes as numbers, zip codes are entered into this study as dummy variables.

In a change of methodology, Pennington-Cross (2004) chooses to use a repeat sales method as opposed to a hedonic model in examining the discount associated with REO sales or foreclosure sales. The author takes a stratified random sample of REO sales from two large secondary market institutions, ending up with sales in every state and over 12,000 observations. Instead of having housing characteristics to include in the model, the author has variables related to house price appreciation, loan characteristics, and time. The findings show that REO's sell at a substantial discount and that this discount increases in relation to the length of time a property is REO. Properties that are REO for two months or less sell at a sixteen percent discount, but properties that are REO for over a year sell at a 25 percent discount. The Pennington-Cross (2004) article corroborates findings from three of the four studies using hedonic models.

In 2005, Apgar and Duda examine the impact of the mortgage foreclosure boom on municipalities and the costs experienced by a city due to a foreclosure. Using Chicago as their case study city, the authors note that if no vacancy occurs in the foreclosure process, the municipal loss per foreclosure net of fees recovered is just \$27. However, when the property becomes vacant, the costs for a city rise. The basic foreclosure process for a vacant property is termed “vacant and secured” by Apgar and Duda (2005a). This situation results in a cost of \$430 for a municipality. If the property is considered vacant but unsecured, meaning that the building inspector favors conservation over demolition, the municipal cost jumps to \$5,358. Properties that are demolished cost a city \$13,452 and properties that are abandoned before the foreclosure process is complete run the cost up to \$19,227. The largest expense incurred by a city is when an abandoned property is damaged by fire. The cost here is \$34,199 per property. In cities with thousands of foreclosures at the various stages identified by Apgar and Duda (2005a), the municipal costs can be quite high.

Early in 2008, Community Research Partners and ReBuild Ohio released a study on the cost of vacant and abandoned properties in eight Ohio cities. Using a cross-sectional approach, the study found that there are approximately 25,000 vacant or abandoned properties in the eight case study cities. Vacancies affect both small and large cities and cost cities roughly \$15 million annually in service costs. Tax revenues lost are estimated at \$49 million. Cleveland, one of the case study cities, had over 7,000 vacant and abandoned buildings in November of 2007. Community Research Partners and

ReBuild Ohio focused on three Cleveland neighborhoods, Detroit Shoreway, Mount Pleasant, and Slavic Village. Those three neighborhoods accounted for almost thirty percent of vacancies in Cleveland, but only fourteen percent of the cities population. In Detroit Shoreway, houses nearest vacant properties have the lowest change in price or value. Mount Pleasant had no real pattern as the market tended to flatten out over time. Slavic Village showed evidence of a pattern opposite Detroit Shoreway. Properties nearest vacancies have higher changes in value or price. This type of pattern is indicative of property flipping. As a whole, the city spent $1.2 million on the demolition of 153 structures from 2006 to 2007. Grass cutting and trash removal costs were greater than $3 million. Over $300,000 in costs related to fires at vacant and abandoned properties were accrued. The loss in terms of property taxes was $30.7 million for the City of Cleveland.

It is also a possibility that foreclosures can negatively impact the price of a nearby property. The exploration of this topic is relatively young and undeveloped and as such, the remainder of this dissertation will focus on advancing current knowledge on the subject. As a start there will be an inspection of the previous literature, which will identify what is known about the relationship between foreclosure and property values. In addition to revealing what is known, the review of the literature will also illuminate areas where progress can be achieved. These areas where there are gaps in our knowledge, to be identified later, will then serve as the target of the analysis conducted in this dissertation.

3.5 Foreclosures' Impact on Nearby Property Values

Examining the relationship between foreclosure and nearby house prices, Shlay and Whitman (2006) use a hedonic model to answer three questions about abandoned houses and neighboring house prices, related to distance, density, and lack of abandoned properties. For homes within 150 feet of an abandoned house, there is a sale discount of over $7,000. When the distance is extended to 150 to 299 feet, the discount shrinks, but not by much, to a little less than $7,000. Housing within 300 to 449 feet of an abandoned property sell for $3,500 less. Beyond 450 feet, any effect is negligible. In terms of density, one abandoned property on a block was associated with decrease in sales price of around $6,500. When the density increases to five per block, the negative effect grows to over $10,000. The absence of an abandoned property on a block led to a premium of $6,700. This means that on average, blocks with no abandoned properties had properties sell for almost $7,000 more on average than blocks with abandoned properties present. While this article deals with abandonment and not foreclosure, abandonment is seen as one of the possible outcomes for a foreclosed property and this study offers insight into how foreclosures might negatively affect nearby property values.

The most recent study in terms of examining the relationship between foreclosures and property values was done by Immergluck and Smith (2006b). The authors analyzed this phenomenon through use of a hedonic model and created a database with foreclosures for the years 1997 and 1998 with data on neighborhood characteristics and over 9,600 single-family property transactions in Chicago in 1999. Foreclosure filings were used as a proxy for foreclosure, but it is important to note that not all foreclosure filings lead to a foreclosure. After controlling for property and neighborhood characteristics, foreclosures of conventional single-family loans had a significant impact on nearby property values. For each foreclosure within an eighth of a mile of a home, that property decreased in value by 0.9 percent. An impact was also found within a quarter of a mile. Making an estimate based on the number of foreclosures in Chicago from 1997 to 1998, property values in Chicago were lowered by more than $598 million or $159,000 per foreclosure. Looking at this result from a city's point of view, foreclosures are costing them revenue by reducing property taxes. School districts should also be interested in such a finding, as many states fund public schools largely through property taxes.

3.6 Limitations in Current Research

After reviewing this research, several deficiencies presented themselves despite important contributions by various researchers. All of the deficiencies can be attributed to a disconnect between the methods used by the researchers and the actual process of foreclosure and how it may impact nearby property values. This is not uncommon, as nearly all researchers must simplify the phenomenon that is of interest in order to study it and create a model to describe it. Despite the need to simplify complex processes, all researchers should aim to have their models as closely as possible represent the subject under study. Three deficiencies have been identified in areas that will be improved by this dissertation.

The first deficiency is related to time. The studies by both Shlay and Whitman (2006) and Immergluck and Smith (2006b) were cross-sectional, which means that only one point in time was examined. The properties that were considered abandoned or foreclosed (an unproductive use) were not so for a uniform period of time. One property may be unproductive for eight months and another property may be unproductive for two years. Previous analyses treated all properties equally in their impact on property values. This is probably not appropriate because, thinking about the problem theoretically, a property that is unproductive for two years will negatively influence property values more strongly than a property that is unproductive for only five months.

When thinking about property deterioration, one of the most prominent theories explaining the process is the theory of filtering. According to the theory, new properties enter at the top of the property chain. These homes are the most expensive and purchased by households with high incomes. As the property ages, its quality also deteriorates. High-income households vacate the home, moving to another new or nearly new home. A lower-income household then occupies the home. This process continues gradually until the home is not longer fit to be occupied, even by extremely low-income households. This can be seen as a largely linear process. While filtering occurs over many years, property deterioration associated with foreclosure takes place over a manner of months, possibly extending to over a year. However, the process should also be linear in nature, just as it is in housing stock filtration. This relationship between deterioration and time in foreclosure has yet to be modeled.

A way to remedy this problem would be to create a systematic way for determining the length of time a property is unproductive and incorporate that into the hedonic model. For example, the start of unproductive use could be approximated by the foreclosure filing date and the end of unproductive use could be approximated by the first sale of the property that is not a sheriff sale. The above example would more closely represent the process of foreclosure and its impact on neighboring properties, but would require a rather complex data set covering a number of years. A less intensive way to account for time would simply involve including a variable of change from one year to the next of foreclosure filings. While this may not align as appropriately with the process as the first example, it is an improvement in that it would take into account time whereas the previous studies ignored it altogether. There are also other ways to approximate the time of unproductive use and the above were just two examples.

The other two deficiencies deal with the spatial nature of the problem. Previous research takes a straight-line distance approach in determining the number of foreclosures that are considered close to the property of interest. However, urban space does not lend itself to straight-line distances. An eighth of a mile up and down the street that the property of interest is located on may be appropriate, but measuring an eighth of a mile perpendicular to the street may not make sense, as much of the impact of foreclosure is visual. Additionally, not all streets are straight. Many curve or bend. Foreclosures might only affect one single block. It is possible that the most appropriate way to measure foreclosure proximity is to count all the foreclosures in the same census block as the sale property and use that as the variable of interest. Possibly census blocks are too small and the number of foreclosures in the same census block group should be the variable entered into the hedonic model. Even the above variations are simply that, variations. They do not truly offer an improvement in measurement and in fact, introduce problems of their own.

Foreclosures may negatively impact nearby property values because city officials, neighbors, prospective buyers and real estate agents can see them. As the property goes through the foreclosure process, it is theoretically expected that there will be neglect. A homeowner is not going to take care of a home that they are likely going to lose and if they do not have the money to afford the mortgage and any late fees, then they also will not have money for maintenance. The visual nature of the problem makes the face block an appropriate geography for exploring the relationship between foreclosures and neighboring property values. The main problem with this part of the spatial deficiency is that the geographic relationships used thus far to model the phenomenon do not match the process that is actually taking place.

The other aspect of the spatial deficiency is that previous research has failed to account for spatial dependence in both the dependent and independent variables under study. Researchers analyzing other types of externalities have started to control for spatial relationships and research on foreclosure as a negative externality should be no different. The inclusion of methods that control for spatial dependence need to be used in future hedonic models assessing foreclosure’s impact on house prices when appropriate. At the very least, researchers should be testing for troublesome spatial relationships. This allows for the measurement of a neighborhood effect. It is possible that foreclosures are simply concentrated in neighborhoods with low property values.

All of the deficiencies related to the study of the relationship between foreclosures and property values identified in the literature review will be addressed in this dissertation. Because research on the topic of foreclosure as a negative externality on house prices is still emerging, the basic question needs to be answered through an improvement in methods and that is what is proposed here. The question of interest is, "What impact do foreclosures have on nearby residential property values?"

It is important for scholars to be able to identify the causal factors that have led to the large increase in foreclosures in the United States. Current forecasts indicate that the problem will only worsen in the coming years. We currently have a large number of foreclosures and are beginning to see some of the negative impacts that occur because of this problem. The study of these impacts is vital to the mediation of problems caused by foreclosure. Also, through the recognition of the conditions that have led to the foreclosure crisis, policies can be formed at all levels of government to help alleviate the problem and hopefully prevent it in the future. This is of importance to homeowners not in foreclosure because they are worried about their investment depreciating in value or appreciating at a slower rate than it would without the presence of foreclosure. Municipalities and school districts are concerned over this matter because lower property values translate into lower tax revenues and citizens are then in turn concerned about the level of services in their city. Municipalities are also worried about foreclosures because of the cost that they incur as explained by Apgar and Duda (2005a). While so many parties are being impacted by the foreclosure crisis, the problem now becomes how to appropriately find an answer to the question of how foreclosures impact property values.

CHAPTER IV

METHODOLOGY

4.1 Improvements on Current Literature

Shlay and Whitman (2006) and Immergluck and Smith (2006b) used a hedonic model in their study of the impact of foreclosures on residential property values. The authors chose to use a hedonic model as it most appropriately measures price variation for a product with multiple attributes. In this case, the product is housing and the multiple attributes can be categorized as structure, location and neighborhood. The inclusion of an externality, such as nearby foreclosures, is easily integrated as a neighborhood attribute. Since this dissertation focuses on a particular neighborhood impact, it is appropriate to once again use a hedonic model to answer that same question, but with improvements on the methods. The improvements undertaken in this dissertation will create models that better represent the process that is occurring in cities throughout the United States as homeowners are becoming delinquent on mortgages and the subsequent foreclosure that may follow. Cuyahoga County in Northeast Ohio and home to the City of Cleveland is used as a case study.

The necessary improvements for this research to advance current knowledge about the relationship between foreclosure and property values are three fold in this dissertation. The first is the inclusion of time in the model. While it may be easiest to create a rate of change variable from one year to the next (2006 to 2007), that variable does not best represent the process under examination, despite it being an improvement over not including time at all. Ideally, as previously mentioned, each foreclosure would have some type of temporal weight or category associated with it, as theory would indicate properties that have been in the foreclosure process longer will have a greater impact on neighboring property values. This type of variable will require data from multiple sources as well as multiple years. In Cuyahoga County, where this study is based, foreclosure data with geographic information is available for enough years to create such a database. Also included in the database are real estate transactions (single-family residential units) from the Cuyahoga County Auditor. Important variables from the Auditor include the type of deed involved in the transaction as well as sales price and property characteristics. By integrating foreclosure data with sales data, a database can be created to measure the length of time a property is in foreclosure. This will allow for different categories of time to be incorporated in the hedonic model. Pennington-Cross (2004) was able to test the impact of time on the sales price of the foreclosed property itself with a similar database at the national level, although the author conducted a repeat sales study as opposed to a hedonic one. Additionally, that study looked at the sale of the foreclosed property and not at the neighborhood impact.

The second is an alteration in how proximity is assessed. The two previous studies mentioned take a straight-line distance approach. Authors either use the distance from the externality to the home as the variable of interest, or create buffers of a certain distance to use in operationalizing the externality variable. This dissertation advances that thinking by using face blocks as the geographic areas of interest. Instead of counting all the foreclosures within an eighth or quarter mile of the property, the foreclosure variable will be operationalized by counting all of the foreclosures within the property's face block. This method treats the foreclosure problem on a block-by-block basis, which is one of the most fundamental levels in which foreclosures can act as a negative externality, with the most basic impact occurring at the parcel level. That variable will enter the hedonic model along with the variables traditionally found in a hedonic model for house price related to the location of the property, its structural characteristics and the characteristics of the neighborhood.

The third improvement in methods will take place by accounting for spatial problems in the model. For example, Armstrong and Rodriguez (2006) use the residuals from their regression, LaGrange multiplier tests and their robust counterparts in conjunction with other specifications of spatial contiguity to test for spatial autocorrelation. The results of those tests led them to turn to a spatially estimated hedonic model. Likewise, Brasington and Hite (2003) decided on a spatial Durbin model for their study of environmental quality to address problems of spatial dependence. The study here will take similar precautions to test for spatial dependence, heterogeneity and autocorrelation and remedy any issues that arise through the use of the appropriate spatial statistical tools. This step is vital. Foreclosures within a face block may simply be picking up a "bad neighborhood" effect as opposed to a real impact by foreclosures. All of these improvements will receive more attention in the paragraphs below.

4.2 Hedonic Model and Externalities

One of the most widely used methods in modeling housing prices and the individual characteristics that determine the price of a home is a hedonic model. A good hedonic model will include variables about the location of the house, its structural characteristics and aspects of the neighborhood. It is not uncommon for researchers to use this basic hedonic model and then add a variable of interest to the model in order to see how it affects house prices. If this variable is external to the home, it can be considered an externality. There are two types of externalities. An externality that positively affects house price is considered a positive externality and one that negatively affects house price is likewise called a negative externality. Researchers have examined a myriad of externalities and their affects on house price over the years and a brief review of how analysts incorporate externalities into hedonic price models should serve as a good first step in the examination of foreclosure as a negative externality.

Ding, Simons and Baku (2000) examine the impact of residential investments on nearby property values in the City of Cleveland. The authors are interested in the impact of investments in both new construction and rehabilitation. The two investment types are incorporated into the hedonic model in several ways. First, the authors are concerned with distance. Therefore, in the operationalization of the investment variables, there are three distances of interest, 150 feet, 300 feet and 500 feet. In terms of how to measure the impact, two methods were used. One included all investment dollars within the previously mentioned distance buffers. This was done for new construction and rehabilitations, creating two variables. The total number of new constructions and rehabilitations within the buffers were also included as two separate variables. In order to determine what amount of money needs to be invested to make an impact, Ding, Simons and Baku (2000) use several different levels of investment. For example, one of the variables was the total investments of larger than $70,000 new constructions within 150 feet, similar variables were created at other cutoffs as well. The authors were able to conclude that the effect of residential investment is limited geographically, with the best impacts occurring within the 150 and 300 feet buffers. New construction had a greater positive impact than rehabilitation and there are positive impacts to investment in low income and non-minority neighborhoods. Finally, small-scale investments tended to have no impact on nearby property values.

In terms of negative externalities, Eshet, Baron, Shechter and Ayalon (2007) examine the impact of waste transfer stations on nearby property values. The externality is operationalized through a straight-line distance calculation from the property of interest to the waste transfer station. The authors concluded that significant negative impacts are only present for properties within 2.8 kilometers of a waste transfer station and that a home increases in value $5,000 per kilometer away from a station. Another negative externality study looked at the relationship between hog farms and house prices (Milla, Thomas & Ansine, 2005). The hog farm variable was created by taking the number of hogs in the nearest farm and dividing that number by the linear distance in feet from the property of interest to the hog farm. The authors concluded that there was a discount of 47 cents per hog at a distance of 0.75 miles, 52 cents at one mile and 42 cents at a distance of 1.25 miles.

The three studies mentioned above all include specific elements of the externality in the hedonic model. For example, all three studies incorporate distance into the model.

Ding, Simons and Baku (2000) are interested in residential investments (positive externality) that are within 150, 300 and 500 feet. Eshet, Baron, Shechter and Ayalon (2007) measure the distance from the waster transfer station (negative externality) to the property. Milla, Thomas and Ansine (2005) also calculate a straight-line distance from homes to hog farms. In the cases where there was more than one externality, some type of count or density was included. Ding, Simons and Baku (2000) use total amount invested and a count of investments within the buffers of interest. In the hog farm study, the authors use the number of hogs at the farm of interest in their calculation.

While the above examples show how researchers apply hedonic models to the study of externalities, Reichert (2002) takes a more detailed approach in examining all aspects of the regression equation when considering the appraisal of contaminated property. The author identifies the most important variables that should be included in a cross-sectional hedonic model. Those variables are square footage, bedrooms or bathrooms, and the age of property. This dissertation's models have those variables present as well as other variables of importance identified by Reichert (2002).

Another important aspect of every hedonic model is sample size. Reichert (2002) notes that the ideal sample size should be 30 observations per coefficient and at the least 10 observations per coefficient. The sample size for this dissertation more than meets those guidelines. Even though the sample size would allow for a large number of coefficients, Reichert (2002) warns against over-modeling and introducing extreme multicollinearity to the model. Care was taken to assure that multicollinearity was not an issue for any of the models in this dissertation. A final point to note from the Reichert (2002) study is the importance of functional form in model creation. This dissertation uses a semi-log model. The dependent variable was log transformed due to the skewed nature of its distribution, while the continuous independent variables are left untransformed. A double log model was also tested, but did not show a better fit than the semi-log model.

This dissertation will consider the externality of foreclosure as it relates to nearby property values. Previous authors have studied this phenomenon through the use of methods similar to those mentioned in the above paragraphs (Immergluck & Smith, 2006b; Shlay & Whitman, 2006). However, those methods of measuring the externality unsatisfactorily model the process of foreclosures' impact on neighboring properties. This deficiency should not eliminate this methodology that uses a straight-line buffer from the dissertation, but rather serve as a point of departure. That is, one of the models used will have this straight-line buffer. From there, an examination can be made between previous studies of other localities and Cuyahoga County and between previous methods and the new method that utilizes the face block.

4.3 Hedonic Model and Spatial Statistics

Missing from all of the studies cited thus far is the consideration that there may be spatial issues between the observations in their studies. For example, the sale price of a house may be significantly impacted by the sale price of a nearby home. Brasington and Hite (2003) take this into account in their study of the relationship between environmental quality and house price. The authors use a spatial Durbin model to address such spatial problems. This type of model includes a spatial lag of the dependent variable as well as a spatial lag of the explanatory variables. The variable of interest was the distance to the nearest hazard, which is similar to the way the previous studies operationalized their respective externalities. Findings from the study confirmed other studies on environmental quality, indicating that there is a small but significant impact. Houses located in an area with better environmental quality will sell for a slightly higher price than homes with lower levels of environmental quality. Armstrong and Rodriguez (2006) also include a spatial weights vector in their hedonic model studying the relationship between commuter rail proximity and house prices. They found that homes in cities with commuter rail sold for on average ten percent higher than homes located in cities without commuter rail service. In terms of distance, homes within one half mile of a commuter rail station received a ten percent premium, but location too close to a station resulted in a disamenity. While the authors in these two studies were concerned with the distance between homes and the externality of interest just as authors in the other studies were, the two most recent studies discussed also took into account spatial heterogeneity and spatial dependence.

In terms of a hedonic model for house prices, spatial heterogeneity refers to a systematic variation in housing prices and attributes across a region. For example, one section of the housing market may have older, smaller homes close to the downtown. As the distance to the CBD becomes greater, homes may become larger. There may also be homes in an exurban area that are on large lots. The assumptions of the regression model however, require that the variation is constant across the study area. Greene (1997) and Bowen, Mikelbank and Prestegaard (2001) note that the assumption of spherical error terms can be violated if spatial heterogeneity exists because the error terms may be small at the low end of the housing market and large at the high end.

The second spatial problem that can arise is spatial dependence. This occurs when there is interdependence upon the observations. For example, the price that one house sells for is likely similar to that of a nearby house for reasons that are not included in the model. Real estate agents routinely examine the sale prices of neighboring homes when determining what to list a house at or what to offer for a particular home. Bowen, Mikelbank and Prestegaard (2001) explain that spatial dependence problems can occur when local deviations from the market mean tend to follow one another at neighboring locations. This is especially prevalent when considering externalities, whether or not they are included in the model. Since neighboring houses share externalities common to the neighborhood, spatial dependence is found in the error term; totally if the externality is not in the model and partially if it is included. Such an addition to the error will again violate the assumptions of the regression model.

Fortunately, thanks to advances in technology and committed researchers, problems associated with spatial heterogeneity and spatial dependence can be remedied. Problems of spatial dependence are adjusted for with the spatial lag model. When studying real estate prices, like in this dissertation, the spatial lag model is theoretically appropriate. The price that a home sells for is partially dependent upon what a neighboring home has sold for in the past. Real estate agents often examine recent nearby sales when determining at what price to list a home or what amount should be offered to purchase a home. The spatial lag model accounts for these occurrences. The spatial error model adjusts for problems associated with spatial heterogeneity. This model is better suited to deal with data issues and data error. While the standard OLS regression model can handle data that is spatially homogeneous, the spatial error model can account for problems that occur due to spatial heterogeneity in the data.

This dissertation uses GeoDa to test for both of these problems and correct the problems that are found. The process is relatively straightforward (Anselin, 2005). First, the standard OLS regression is conducted with the LM diagnostics, LM-error and LM-lag. If neither of these is significant, the OLS results can be kept and interpreted. However, if one of the tests is significant, the appropriate spatial model should be run. For example, if LM-error is significant, a spatial error model is needed. Likewise, if LM-lag is significant, a spatial lag model is necessary. If both LM tests are significant, then the robust LM diagnostics should be consulted. Again, if the robust LM-error test is significant a spatial error model will be run and if the robust LM-lag test is significant, a spatial lag model will be used in the analysis. Since researchers have not accounted for these spatial problems in studies on foreclosure and property values, this dissertation makes a substantial contribution to the current literature by conducting such tests and making the appropriate adjustments.

4.4 Geographic Information System (GIS) Methods

Aside from traditional statistical methods, in this dissertation regression is used extensively, methods utilizing geographic information systems are also employed for efficient consumption of spatial data. The above section outlined how GeoDa helps in addressing problems of spatial heterogeneity and spatial dependence. In addition to GeoDa, ArcGIS is also used to deal with the large amount of spatial data and when necessary, assist in creating several spatial variables.

In every regression equation, there are variables that take into account neighborhood characteristics and access characteristics. Neighborhood characteristics can include race and ethnicity variables, income measures, median house value, and other variables that houses in a neighborhood share in common. Race and ethnicity variables are included in most models as those two variables affect demand. There are also variables associated with access that hedonic price models routinely include in the analysis. For example, the distance a home is from the highway is a good indicator of access as is the distance from the central business district (CBD). Distance from the CBD can be an excellent indicator of access to the job market, although, with polycentric cities becoming more common, this is not always the case.

Regardless of exactly which variables a researcher uses to account for neighborhood and access characteristics, the easiest way to include these variables in the model is through GIS. For each home in the study, neighborhood characteristics are joined to that home, providing a simple way to include variables such as race, poverty and income or education. Slightly more complex is the inclusion of access variables, but fortunately, GIS can assist the researcher by quickly providing distance to the highway and CBD.

Beyond the variables that are found in nearly every hedonic model dealing with house prices are the variables and characteristics specific to this dissertation. In this dissertation, the relationship between foreclosures and house prices is estimated. Doing so requires creating a model that better represents the process under study, as previous research has been limited by data and methods. However, to provide a point of commonality between this dissertation and previous studies, GIS is used to replicate those methods. From each observation, buffers of 1/8 mile are created and the number of foreclosures within that buffer counted. This will serve as one of the foreclosure variables included in a model to be discussed in the "Four Models Under Consideration" section. Comparisons can then be made between previous studies' methodologies and Cuyahoga County with the same methods and then, between the old methods and the new method undertaken in this dissertation with Cuyahoga County serving as a case study.

The new method introduced here is the utilization of face blocks, used by Community Research Partners (2008) in their study of vacant and abandoned property, as opposed to the straight-line buffers of other studies. Just as GIS was critical for other researchers to create buffers around their observations, so is it critical here in the creation of face blocks. A face block differs from the different levels of geography created by the US Census Bureau. It is the house that is used as an observation along with all of its counterparts on the same side of the street and those on the opposite side of the street, from intersection to intersection. Imagine standing in your front yard, your face block is the area that includes all of the homes on your street, including those to your right and left as well as those on the other side of the street. It is in this geography that the negative impacts of foreclosure take place and through the use of GIS, face blocks are created for each observation in Cuyahoga County. An illustration of a face block can be seen in Figure 3.

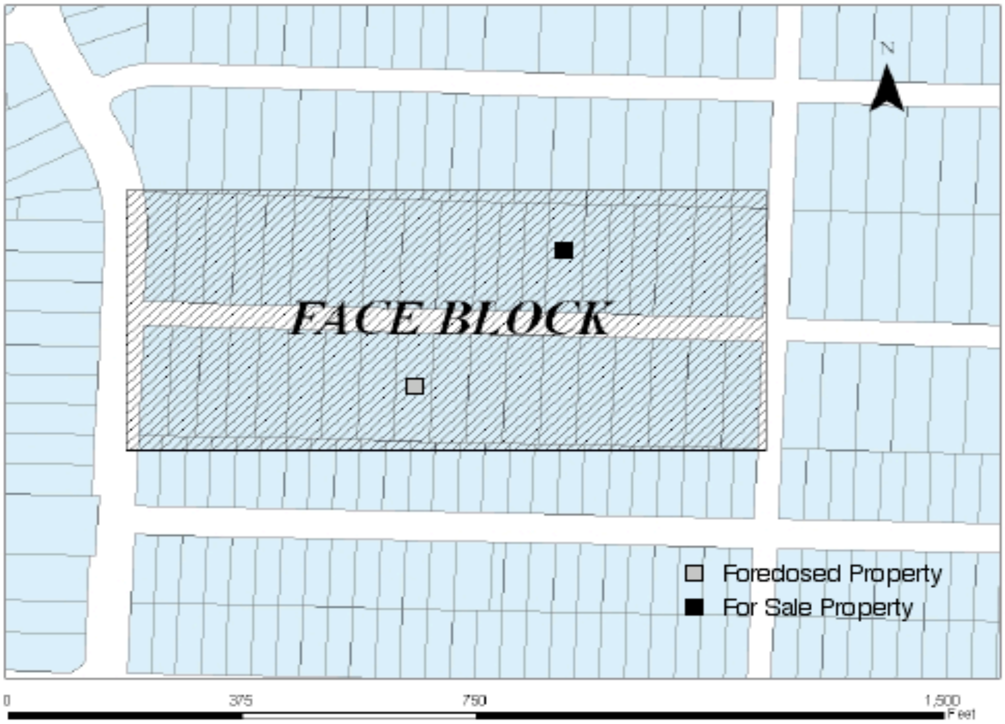

Figure 3. Face Block Illustration

Several different methods exist for creating face blocks or assigning face blocks, but this dissertation uses a spatial join method. Points represent the sales data and foreclosure data and the street network is composed of line segments. Each line segment has a unique identifier that can be used to identify face blocks as well. Therefore, a spatial join is done between the points and the lines, which then assigns the unique identifier in the road file to the sales data and foreclosure data. Now each sale or foreclosure has a face block assigned to it and comparisons can be made between the two files based upon this field. Once that has been completed, the number of foreclosures in each face block is calculated for the varying time periods in Excel utilizing the COUNT and IF functions.

4.5 Four Models Under Consideration

This dissertation will utilize four hedonic price models in total to describe the process and interaction of foreclosures and residential property values. The first model is a simple, base hedonic model. It includes all of the traditional variables found in a hedonic model for house prices. However, it does not encompass any externality variables related to foreclosure. By examining this model, any irregularities can be identified and remedied. The second model is based upon previous research. It has an externality variable for foreclosures that is a straight-line buffer around each observation. The number of foreclosures in the buffer is counted and included in the model. This model is compared to previous research to identify any differences or abnormalities that exist in Cuyahoga County. The next two models are unique to this dissertation. The third model has a spatial measure of foreclosure based upon the face block. Finally, the fourth model is the complete model. It includes both the temporal and spatial measures of foreclosure to model foreclosures impact on property values as accurately as possible. The inclusion of a temporal aspect to foreclosure has not been seen in any research to date on foreclosures as a negative externality on house prices.

4.5.1 Base Model

The first model in this dissertation is a basic hedonic model for houses sold in Cuyahoga County in 2006 and 2007. This model will serve two purposes. First, it allows for the introduction and explanation of a large portion of the data used in the dissertation. Second, it provides the opportunity to examine the model in its most basic form and identify any irregularities that may have to be remedied before moving on to the more complex models that include foreclosure variables.

Every hedonic model that is built to describe house prices should include variables that fall into one of three categories, all of which function to explain the sales price. The sales price of the homes in Cuyahoga County in 2006 or 2007 serve as the dependent variable for all models in this dissertation. These data are acquired through the Center for Housing Research and Policy at Cleveland State University's College of Urban Affairs, who gets the data from the Cuyahoga County Auditor. The three categories are the structural characteristics of the home, characteristics of the surrounding social and natural environment, and locational characteristics. Structural characteristics of the home include such variables as square footage, number of bedrooms and the age of the home. For this dissertation, these structural characteristics are also obtained through the Center for Housing Research and Policy from the Cuyahoga County Auditor. The auditor has all structural characteristics for all buildings within the county and these data are updated every two years. The basic model for this dissertation will use data only for single-family residential buildings for the years 2006 through 2007.

Characteristics from the social and natural environment are the second category of variables included in the basic hedonic model. Within this category are variables that represent the racial makeup and income level of the neighborhood as well as indicators of neighborhood quality. In this dissertation, social characteristics are downloaded from the US Census Bureau website for all of the block groups in Cuyahoga County. The section on GIS methods outlines the inclusion of these variables with more detail.

The third category of variables that should appear in a hedonic model for house prices are locational characteristics. The creation of these variables is described in detail in the GIS methods section, and includes characteristics such as distance to the CBD. The basic model can be summarized in Equation 1 see below.

$$\text{Equation 1: } Y_{\text{house price}} = B_{\text{constant}} + B_{\text{structure}}X_1 + B_{\text{neighborhood}}X_2 + B_{\text{locational}}X_3 + \text{error}$$

The above model is calculated using the Ordinary Least Squares (OLS) criterion for a regression equation. The dependent variable is the natural log of house sale price. The first B is the constant, followed by a vector of structural characteristics, a vector of neighborhood characteristics, a vector of locational characteristics, and an error term. In addition to this method of calculation, tests are performed to determine whether or not spatial heterogeneity and spatial dependence are present.

4.5.2 Previous Model

This model and all subsequent models will use the base model for the core of the calculation. In addition to the vectors of structural, environmental and locational characteristics, a foreclosure variable is included in this model. By adding this variable to the model, it is then possible to assess the impact that foreclosure has on the sales price of a home, positive or negative. Just as previous researchers have used a straight-line distance buffer around each observation to assess foreclosure's impact, so does this model. Around each home sold in 2007 in Cuyahoga County, buffers of 1/8 mile are created. Within those buffers, the number of foreclosures in the year 2005 and 2006 is counted and then that number is added to the model as a variable. The entire OLS model can be seen below in Equation 2, with $B_{\text{straight-line}}$ representing the foreclosure variable based upon a straight-line buffer.

$$\text{Equation 2: } Y_{\text{house price}} = B_{\text{constant}} + B_{\text{structure}}X_1 + B_{\text{neighborhood}}X_2 + B_{\text{locational}}X_3 + B_{\text{straight-line}}X_4 + \text{error}$$

The inclusion of this model in the dissertation allows for comparisons to be made between previous research and the research conducted here. Beyond the model that has been found in prior research, this dissertation also tests for the problems of spatial dependence and spatial heterogeneity.

4.5.3 Spatial Model

With the exception of the testing for and potential fixing of spatial problems, this model offers the first differentiation from previous research. The first two models are based solely on the prior work of others, but in a different locale. Here, the methods are changed to better represent the process that is under study. Instead of a straight-line buffer, which does not well represent how urban space functions, a face block approach is taken, the details of which can be found in the GIS methods section. The face block approach works well for this dissertation because of the way foreclosures work as a negative externality. The negative externality occurs in part due to a prospective buyers vision. They see nearby homes, usually homes on the same block, and that will affect the asking price and ultimately the selling price. Homes that have been foreclosed upon or those in the process of foreclosure are likely to suffer from maintenance issues, as discussed earlier, and that negatively affects the value of the homes around it. When concentrated in an area, the problem may have a significant impact on house prices. Equation 3 shows this model in its entirety.

Equation 3: $$Y_{\text{house price}} = B_{\text{constant}} + B_{\text{structure}}X_1 + B_{\text{neighborhood}}X_2 + B_{\text{locational}}X_3 + B_{\text{face block foreclosures}}X_4 + \text{error}$$

The variable X_4 is a count of all the foreclosures in 2005 and 2006 that can be found within a home's face block. By interpreting that variable's coefficient, it can be seen if foreclosures exert a negative externality on house prices and if so, to what extent. Just as with the Base Model and Previous Model, tests are done for this model to assess the severity of problems associated with spatial heterogeneity and spatial dependence.

4.5.4 Spatial Temporal Model

The final model can be considered the complete model. It is the best representation of the process being studied given the constraints of data and technology. The models presented thus far only assess foreclosure as a negative externality across its spatial dimension. However, as discussed in the literature review, there is also a temporal dimension to foreclosure. In order to address this, foreclosures of varying lengths of time in each face block are included in the regression equation. As a variable, it will have foreclosures of a certain time category in the face block of the sold home This variable is broken out into five time categories of 90-day increments. The equation can be seen below as Equation 4.

Equation 4: $Y_{\text{house price}} = B_{\text{constant}} + B_{\text{structure}}X_1 + B_{\text{neighborhood}}X_2 + B_{\text{locational}}X_3 + B_{\text{fb\_time}}X_4 + \text{error}$

In addition to the calculation of this model at the county level, two other versions are examined. One is a suburban model and the other is a model for only the City of Cleveland. This enables comparisons and contrasts between city and suburb. It is possible that the foreclosure crisis has had less of an impact on suburban housing markets because they are more robust. It is also possible that the housing market in the City of Cleveland, already being depressed compared with the suburbs, is not as greatly affected by foreclosures. Additionally, it is important to separate the two housing markets because the Cleveland market tends to have unique constraints, such as potential environmental contamination, that are not found in the suburbs. These three variations of the final model provide much detail and texture to the discussion on foreclosures' impact on property values.

4.6 Hypotheses

4.6.1 Hypothesis One

H_0: Foreclosures that occur before the sale have no impact on the property's sales price within the same face block.
H_1: Foreclosures that occur before the sale have a negative impact on a property's sales price within the same face block.

Previous researchers have examined foreclosures' impact on property values through the use of a straight-line buffer. The straight-line buffer approach does not match urban space nor does it model the process of foreclosure as efficiently and effectively as the face block method, which is utilized in this dissertation. The use of a complex dataset enables only foreclosures that occur prior to the sale to be included in the model.

4.6.2 Hypothesis Two

H_0: The time that a property is in the foreclosure process has no impact on a property's sales price within the same face block.
H_1: The longer a property is in the foreclosure process, the greater the negative impact on a property's sales price within the same face block.

Previous research has not incorporated time into analyses of foreclosures' impact on nearby property values. This dissertation is able to do so by integrating data from the county clerk of courts and county auditor in order to effectively measure how long a property is in foreclosure. That measurement is then included in the analysis, creating a model that accurately measures foreclosures' impact on property values while properly modeling the process.

CHAPTER V

DATA

This dissertation requires data from multiple sources to create the appropriate dataset needed for analysis. Information is needed about foreclosures, deed transfers, sales, parcel information, and neighborhood details. Some data will also need to be calculated in GIS. All of the necessary data can be obtained from four data sources. The first two can be considered local sources. Information regarding foreclosures is available from the Cuyahoga County Clerk of Courts. Sales data and parcel level details as well as deed transfer records are all recorded by the Cuyahoga County Auditor. The data from both of these sources was gathered through the Center for Housing Research and Policy at the Maxine Goodman Levin College of Urban Affairs, Cleveland State University. The third source is the U.S. Census Bureau and data regarding neighborhood characteristics will be downloaded from the Bureau's website. Lastly, GIS will be used to calculate some of the neighborhood variables.

Foreclosure filings are updated on the county court website every two weeks.. This dissertation will use foreclosure data from 2005 through 2007. Each foreclosure has a parcel number associated with it. Using these data and data from the Auditor on sheriff sales, a timeline is created for each foreclosure to determine how long the property has been in the foreclosure process. During this time, maintenance on the property could be sparse, leading to the hypothesized negative externality. In terms of the data set, each foreclosure has a start date, foreclosure filing, and an end date, sheriff sale. If the sale of the non-foreclosed property occurs after the filing and before the sheriff sale, the foreclosure is counted as having a potential influence. The difference between the filing of the foreclosure and the sale of the non-foreclosure is calculated to determine into which time category the foreclosure is placed. This dissertation has five time categories of 90 days each.

Data from the county auditor actually serves three purposes in this dissertation. The first is to help identify the end of the foreclosure process through deed transfers or more specifically, sheriff sales. Sheriff sales that occur after a foreclosure filing can serve as the end date of the foreclosure process. By utilizing deed transfer records from the auditor; the foreclosure timeline can be better measured, as discussed in the previous paragraph. The second and third purposes of the auditor data are related to the hedonic model. This dissertation is focused on determining whether or not foreclosures affect property values, and if they do, what is the magnitude of that impact. Therefore, the dependent variable in the hedonic model will be sales prices from all single-family residential units from April 2006 through December 2007. The sales price of foreclosed properties is not included in the model. County auditor data can also provide a great number of the independent variables used in the hedonic model. These characteristics, such as square footage, number of bedrooms, and lot size, serve as the property characteristic variables.

While the auditor data provides the dependent variable and property characteristics, U.S. Census Bureau data will be downloaded at the block group level for the year 2000 to account for most of the neighborhood characteristic variables in the hedonic model. Also downloaded from the census will be a TIGER shapefile of the road network for Cuyahoga County. This will be used in the creation of face blocks. Important neighborhood characteristics can include the racial makeup, median income, poverty rate, median house value, and educational attainment among others. These variables are able to be included in the model by spatially joining the block group data to the parcel in GIS.

In addition to joining the census data to the parcel data, GIS will also be utilized to create location variables as well as the face blocks for the foreclosure variable. One location variable commonly included in hedonic models on house prices is the distance a property is from the CBD. This can be calculated in GIS, and often proves to be an important control variable. In order to best match the process that occurs when foreclosures impact neighboring properties' sales prices, foreclosures will be assigned to a face block in GIS. This dissertation will use TIGER line segments as face blocks (Community Research Partners, 2008). After the foreclosure is assigned a face block, linking the face block ID of the foreclosure with all sales that have the same face block ID creates the foreclosure variable. Using the dates of foreclosure filing and date of sales, time categories are created that serve as a count for all foreclosures within the face block that fall into each respective time frame. There are five categories of 90 days. This complex web of data and sources, including county court and auditor data, census data, and GIS created variables provide an excellent database from which to study the impact that foreclosures have on nearby property values.

All of these data results in the creation of two data files, one is sales data and the other is foreclosure data. After cleaning the sales data, there are just over 23,000 observations for study. Properties with sales prices identified as extreme outliers were eliminated. The foreclosure file has an equally large number of observations, 36,723. The two files have a primary key that links them geographically, the face block identifier from the spatial join. Through the use of this field and a few other important fields, the foreclosure variables are created, five in all. Each foreclosure variable is a count of the foreclosures within the face block of the sale for a certain time period based on 3 month or 90 day intervals. The first interval is 0 to 90 days, the second 91 to 180 days and so on until the final foreclosure variable is for the time period of greater than 360 days or approximately 12 months. The total of these five variables with serve as the foreclosure count for the model that only looks at space and not time while all five variables will be included in the spatial-temporal model.

With the foreclosure variables being the focus of the dissertation, it is important to not forget the other variables critical to a sound hedonic model. The first set of these variables can be classified as the structural characteristics of each observation. Based upon the data from the auditor, the style of each home can be determined. For this dissertation, dummy variables are created for the following styles: bi-level, bungalow, cape cod, colonial, contemporary, and split-level with ranch style homes serving as the reference group. There are also dummy variables that are created to differentiate between exterior wall materials. The first type is asbestos shingles. The second type is aluminum, vinyl or composite siding and the last type is wood framing. The reference group is homes with brick or stone finishes. There are also dummy variables that indicate what type of heating source a home has, forced heat versus other, and whether or not a home has central air conditioning. The final two dummy variables for structural characteristics are whether or not there is an attached garage and a porch. Beyond those dummy variables are also some ratio scale variables such as square footage, number of bedrooms, baths, half baths and fireplaces, age in years and the lot frontage and depth in feet.

Another set of variables important to the hedonic model is neighborhood or locational characteristics. One such variable is the distance to the central business district and the other are census variables and in this dissertation, these variables are measured at the block group level. These variables include the percentage of black residents, Hispanic residents, residents living in poverty and the median household income. Another locational variable included in the model is a waterfront indicator. This is another variable that became apparent after analyzing residuals.

Also included as neighborhood variables are the count of sheriff sales that occurred before the sales from 2005 to 2007 and a count of properties within the block group that were associated with a foreclosure filing or sheriff sale from 2001 to 2005, or impacted properties. The inclusion of the impacted variable came about through careful examination of the regression residuals. Both of these variables serve as a way to control for historic housing market trends in each neighborhood. Neighborhoods with more sheriff sales and impacted properties are likely to have lower price points and it is important to control for theses factors so as to not attribute that effect to foreclosures' effect on property values. The sheriff sales count variable can also be seen as a way to account for neighborhood liquidity. Neighborhoods with lower numbers of sheriff sales can be considered more liquid. Homes that go into foreclosure in those neighborhoods have a better chance of being sold prior to going to sheriff sale than foreclosures in neighborhoods with low liquidity. It is important to note that sheriff sales can include tax foreclosures as well as bank foreclosures.

Finally, there are variables included in the hedonic model that are specific to the sale. There are sales from multiple years in the model, so those need to be identified. Dummy variables are included for the years 2006 with 2007 serving as the reference. Also of importance in real estate is the season in which the home sold. Therefore, dummies are created for winter (December, January, February), spring (March, April, May) and fall (September, October, November) with summer (June, July, August) as the reference group.

After outlining all of the independent variables, a note should be made about the dependent variable, sales price. This variable is the price for which a specific home sold. In hedonic models dealing with house prices, it is not uncommon to perform a natural log transformation on the dependent variable. This is needed when the distribution of sales is skewed. In the case of the data for Cuyahoga County, the sales values are indeed skewed and a log transformation is the appropriate remedy. The interpretation of the coefficients is altered from a marginal unit increase to a percentage. For example, a coefficient of 0.08 can be interpreted as a one unit increase in X results in an eight percent increase in Y, in this case, sales price. A full list of variables can be found in Table II.

Table II. Variable List

VARIABLE	DESCRIPTION
BEDROOMS	# of bedrooms
BATHS	# of bathrooms
HALFBATH	# of half baths
FIREPL	# of fireplace
CRAWL	dummy crawlspace / reference basement
SLAB	dummy slab / reference basement
BSMFNSH	dummy finished basement / reference unfinished
BSMPART	dummy partially finished basement / reference unfinished
BUNGALOW	dummy bungalow / reference ranch
COLONIAL	dummy colonial / reference ranch
OTHERSTYLE	dummy other style / reference ranch
ASBESTOS	dummy asbestos shingles / reference brick
SIDING	dummy aluminum, vinyl, composite siding / reference brick
WOOD	dummy wood siding / reference brick
SALE06	dummy sale in 2006 / reference sale in 2007
WINTER	dummy sale in winter / reference sale in summer
SPRING	dummy sale in spring / reference sale in summer
FALL	dummy sale in fall / reference sale in summer
GARATT	dummy attached garage
AIR	dummy central air conditioning
PORCH	dummy porch
AGE	age in years
%BLACK	percent African American in the block group
%HISPANIC	percent Hispanic in the block group
%POVERTY	percent of persons living in poverty in the block group
CITYEAST	dummy home located on Cleveland's east side
CITYWEST	dummy home located on Cleveland's west side
INNER	dummy home located in the inner ring suburbs
SQFT1000	square feet of home in 1,000s of feet
INC1000	income in the block group in 1,000s of dollars
CBDMILE	distance to the CBD in miles
LOT1000	square feet of the lot in 1,000s of feet
HUDEN	housing unit density in the block group
WATER	dummy for waterfront property
IMPDEN	impacted property density in the block group
FORCTOT	total number of foreclosures on the face block
SHF_CNT	total number of sheriff sales on the face block
FORC1	foreclosures 1-90 days after filing on the face block
FORC2	foreclosures 91-180 days after filing on the face block
FORC3	foreclosures 181-270 days after filing on the face block
FORC4	foreclosures 271-360 days after filing on the face block
FORC5	foreclosures >360 days after filing on the face block
SLCOUNT	total number of foreclosures within an 1/8 of mile of home

CHAPTER VI

RESULTS

6.1 Case Study Area Description

Cuyahoga County is located in northeast Ohio and the largest city in the county is Cleveland. According to the 2000 Census, the county is home to just under 1.4 million residents, 69 percent of whom are white, 28 percent black and slightly over 3 percent Hispanic. Sixty-three percent of the housing units are owner-occupied. The median income is $39,168 and 13.13 percent of the people live in poverty. Over 15 percent of the residents have a bachelor's degree.

Serving as a reminder of the economic conditions of the Cleveland area outlined in the literature review, employment growth in Northeast Ohio has been modest when compared to Ohio (Yamoah, 2007). Likewise, Ohio's employment growth has been small when placed next to national numbers. To make matters worse, manufacturing, the largest employment sector in the region has lost jobs at a rate faster than the national average. This is especially troubling considering that the manufacturing sector has a comparatively decent wage. The other two largest sectors in terms of employment are health care and social assistance and retail trade. Unfortunately, these industries have relatively low average wages (Yamoah, 2007).

In addition to having a slow growth economy largely dependent upon the manufacturing sector, Cuyahoga County, like much of the country, experienced a growth in subprime lending around 2004. Subprime lending has been linked to foreclosure and potentially discriminatory lending practices based upon race and income (Apgar & Duda, 2005b; Immergluck & Smith, 2005; National Community Reinvestment Coalition, 2003). Figure 4 shows the percent of loans that were subprime by loan type, including home purchase, home refinance and home improvement. Subprime refinance loans peaked in 2004 at 29 percent and home improvement loans also peaked in 2004 at 22 percent. Subprime home purchase loans also saw a large share in 2004 at 23 percent, but peaked one year later at 25 percent. As the housing market crashed and credit became more difficult to obtain, subprime loans became less common.

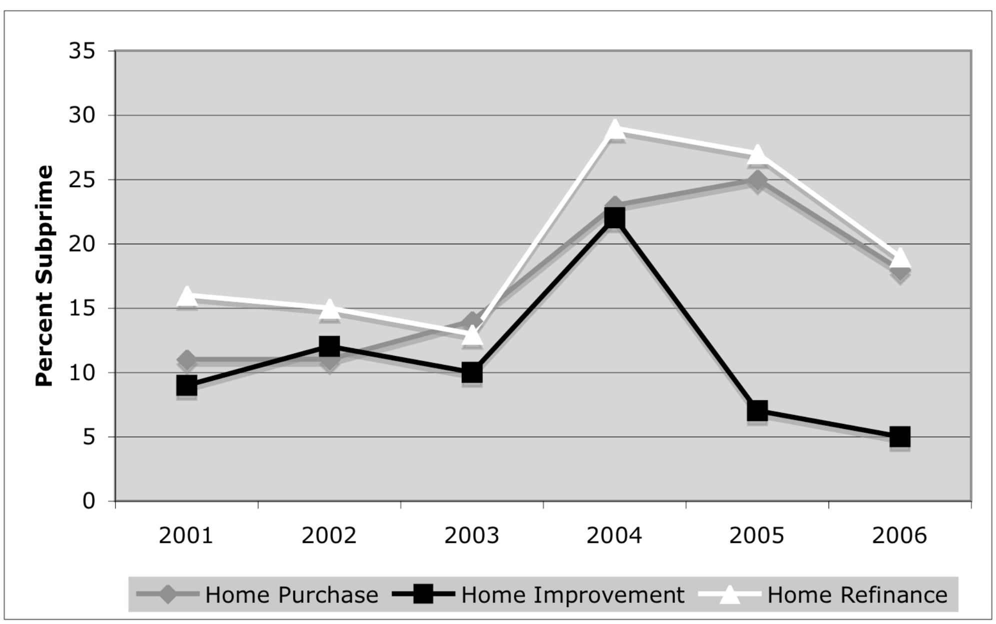

Figure 4. Subprime Loans by Type, Cuyahoga County, 2001-2006

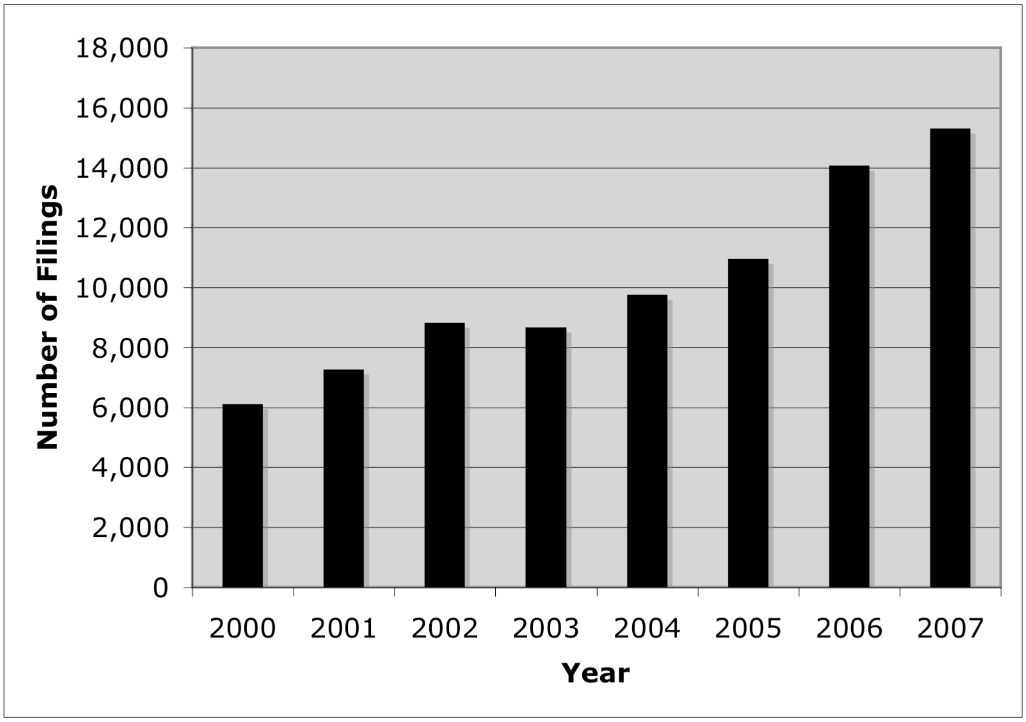

Figure 5. Foreclosure Filings, Cuyahoga County, 2000-2007

With Cuyahoga County having both a slow growth economy and a rise in subprime lending, it was an area ill prepared to handle any disturbances in the economy and housing market and this lead to an increase in foreclosures. Foreclosures filings in Cuyahoga County can be seen in Figure 5. Filings almost tripled from 2000 to 2007, from 6,131 to over 15,000 filings. This large growth in foreclosures makes Cuyahoga County a good study area because of the presence of foreclosures and the availability data.

6.2 Descriptive Statistics for Data

This section gives a more complete outline of the data collected for this dissertation. In Table III are the descriptive statistics of all the variables used in the analyses conducted. The minimum, maximum, mean and standard deviation are listed for each variable. There are a total of 23,310 observations in the data set, which spans the years 2006 and 2007. The easiest type of variable to identify from the table is the dummy variables. These variables have a minimum of 0 and a maximum of 1. Many of the structural characteristics are dummies. The value is 1 if the characteristic is present and 0 if it is absent. The time of sale variables are also dummies. There are also spatial dummies, two for the City of Cleveland (east and west) and one for the inner ring suburbs, leaving the outer ring suburbs as the reference group. Also, a dummy for waterfront property is included.

Structural characteristics that are not dummy variables include bedrooms, bathrooms and fireplaces. The average number of bedrooms is just over 3 and the average number of bathrooms is just over 1. The average number of half-baths and fireplaces is around 0.40, indicating that quite a few homes in Cuyahoga County do not have these amenities. Other ratio scale variables that fall into the structural characteristic category include age, square footage in thousands of feet and lot size in thousands of feet. The descriptives of the variables appear reasonable.

Table III. Descriptive Statistics of Regression Variables

	Minimum	Maximum	Mean	Std. Dev.
salesprice	$7,744	$1,745,000	$143,980	$116,293
FORC1	0	6	0.2	0.511
FORC2	0	6	0.19	0.492
FORC3	0	5	0.17	0.477
FORC4	0	5	0.14	0.432
FORC5	0	10	0.30	0.756
bedroom	1	8	3.13	0.753
baths	1	8	1.28	0.554
halfbath	0	5	0.41	0.54
firepl	0	7	0.42	0.581
crawl	0	1	0.02	0.141
slab	0	1	0.1	0.301
bsmfnsh	0	1	0.01	0.079
bsmpart	0	1	0.18	0.381
bungalow	0	1	0.05	0.219
colonial	0	1	0.4	0.491
otherstyle	0	1	0.33	0.47
asbestos	0	1	0.01	0.096
siding	0	1	0.58	0.493
wood	0	1	0.22	0.411
sale06	0	1	0.49	0.5
winter	0	1	0.14	0.346
spring	0	1	0.25	0.433
fall	0	1	0.26	0.438
garatt	0	1	0.34	0.474
air	0	1	0.35	0.477
porch	0	1	0.51	0.5
age	0	117	42.83	15.226
%black	0	100	19.79	31.449
%hipanic	0	55	2.81	5.577
%poverty	0	82	8.62	9.936
lnprice	8.954	14.372	11.613	0.777
innerring	0	1	0.44	0.497
cityeast	0	1	0.115	0.319
citywest	0	1	0.138	0.345
SHF_CNT	0	19	0.29	0.839
sqft1000	0.412	12.684	1.578	0.693
inc1000	6.336	200	49.69	22.786
cbdmile	1.357	20.441	9.626	3.609
lot1000	1.026	478.289	11.571	17.351
huden	36.776	12956.6	2571.45	1699.039
water	0	1	0.011	0.105
impden	0	1357.34	93.403	145.64

The neighborhood characteristics are all ratio scale. The average percentages of African American, Hispanics, and persons in poverty are 19.79%, 2.81%, and 8.62%. The percent of African American residents had the broadest range of values amongst those three, spanning values from 0 all the way to 100. Some properties are located within 2 miles of the central business district and others are over 20 miles away. The average distance is just under 10 miles. The density of housing units in the different block groups ranges from very dense, nearly 13,000 units per square mile, to very sparse, around 36 units per square mile.

The variables that are related to the foreclosure variables are the impacted density variable and the sheriff sale variable. The impacted density variable ranges from 0 to 1,357. This indicates that there are some block groups that have no history of sheriff sales or foreclosure filings, while others have a somewhat substantial history. On average, a block group in Cuyahoga County has 93 impacted units per square mile. The sheriff sale variable provides information about properties that have gone through the foreclosure process and have seen sold at auction. These properties often end up being owned by banks or speculators. Many properties had zero sheriff sales on the face block, as the average is only .29, but other face blocks were plagued by such properties. The maximum value for the sheriff sale variable is 19. A map of sheriff sales in Cuyahoga County by block group for the years 2005 – 2007 can be seen in Figure 6.

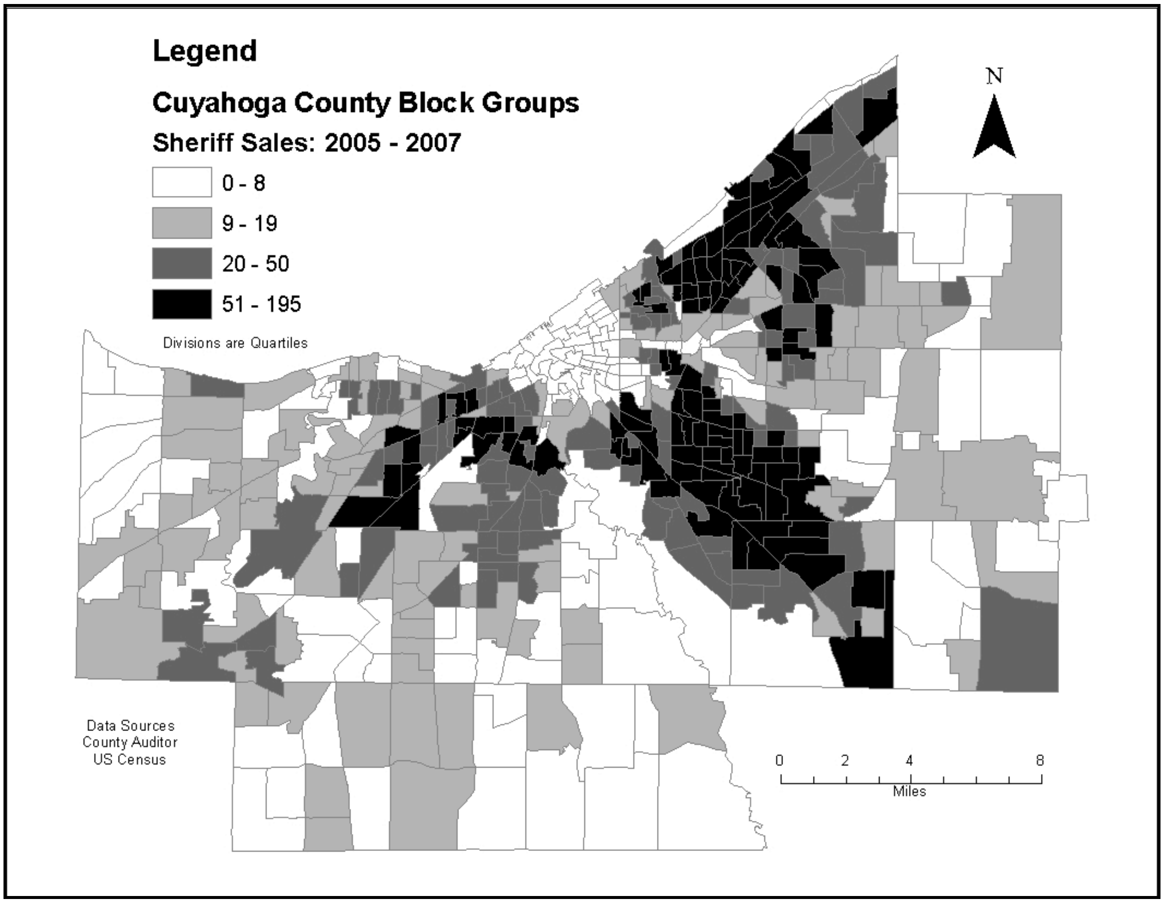

Figure 6. Sheriff Sales by Block Group, Cuyahoga County 2005 - 2007

The foreclosure variables, which are the variables of interest for this dissertation, have a similar pattern as that of the sheriff sale variable, although the maximum values are not as great. All minimum values are 0 and the highest maximum value is 9. All mean values are 0.30 or below, indicating that a substantial number of properties do not have any foreclosures within the face block. The mean values also tend to become smaller as the time periods move outwards towards longer time frames with the exception of the last time period. This would indicate that foreclosures early in the process are more common that those further along in the process. Two possible conclusions step from this. It is possible that foreclosures are being dealt with in a relatively short amount of time and the process is not being allowed to linger. It could also be indicative of the climbing foreclosure rates in 2006 and 2007. With many new foreclosure filings taking place, the early time categories should fill up the quickest. The frequency counts of the foreclosure variables can be seen in Table IV. The high counts of zero support the mean values from Table III. There is also a map (Figure 7) showing the geographic distribution of foreclosure filings by block group in Cuyahoga County for the years 2005 through June of 2008 as well as a map (Figure 8) by municipality showing the foreclosure count variables.

Table IV. Frequency Counts of Foreclosure Time Variables

COUNT	FORC1	FORC2	FORC3	FORC4	FORC5
0	19,491	19,614	19,911	20,429	18,554
1	2,892	2,848	2,602	2,232	3,053
2	604	530	484	363	958
3	110	115	107	90	337
4	23	20	22	11	140
5	8	2	4	5	47
6	2	1	-	-	22
7	-	-	-	-	7
8	-	-	-	-	5
9	-	-	-	-	6
10	-	-	-	-	1

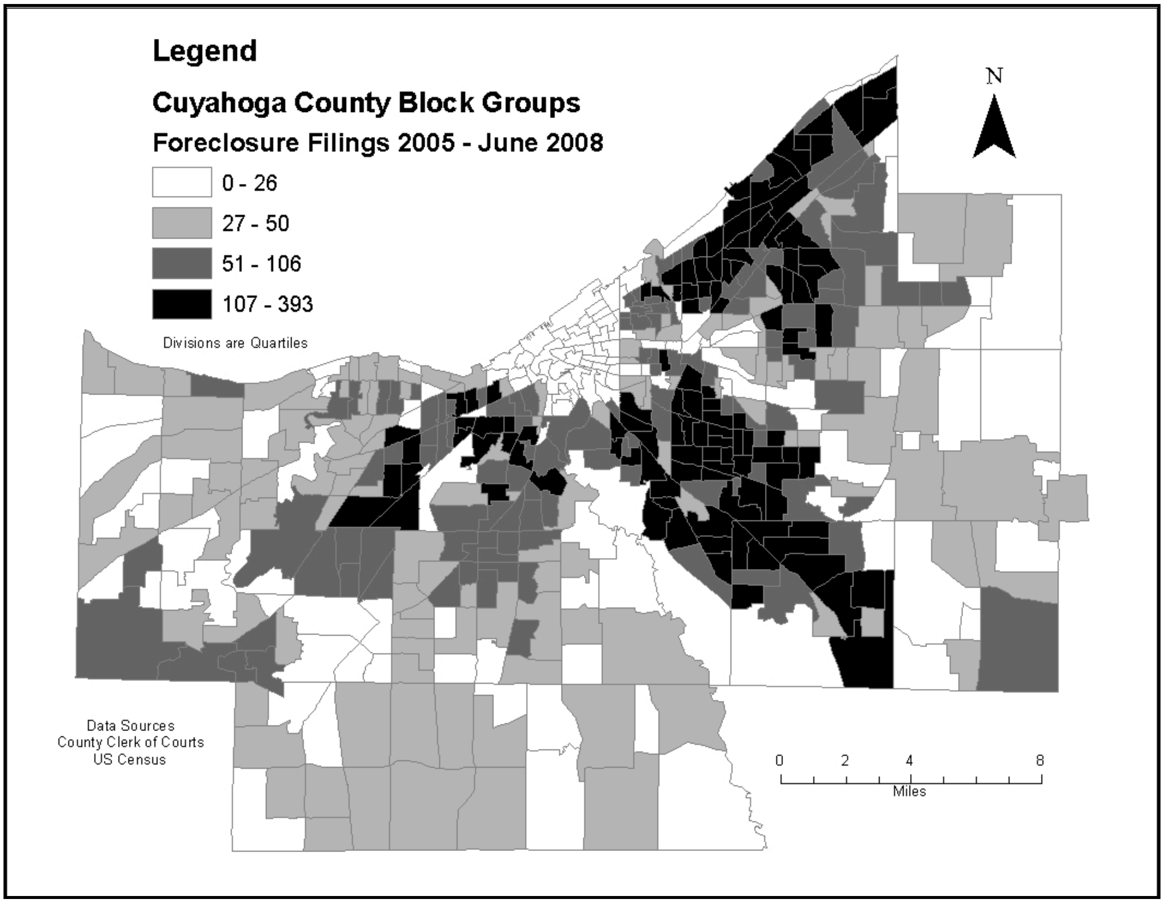

Figure 7. Foreclosure Filings by Block Group, Cuyahoga County 2005 – June 2008

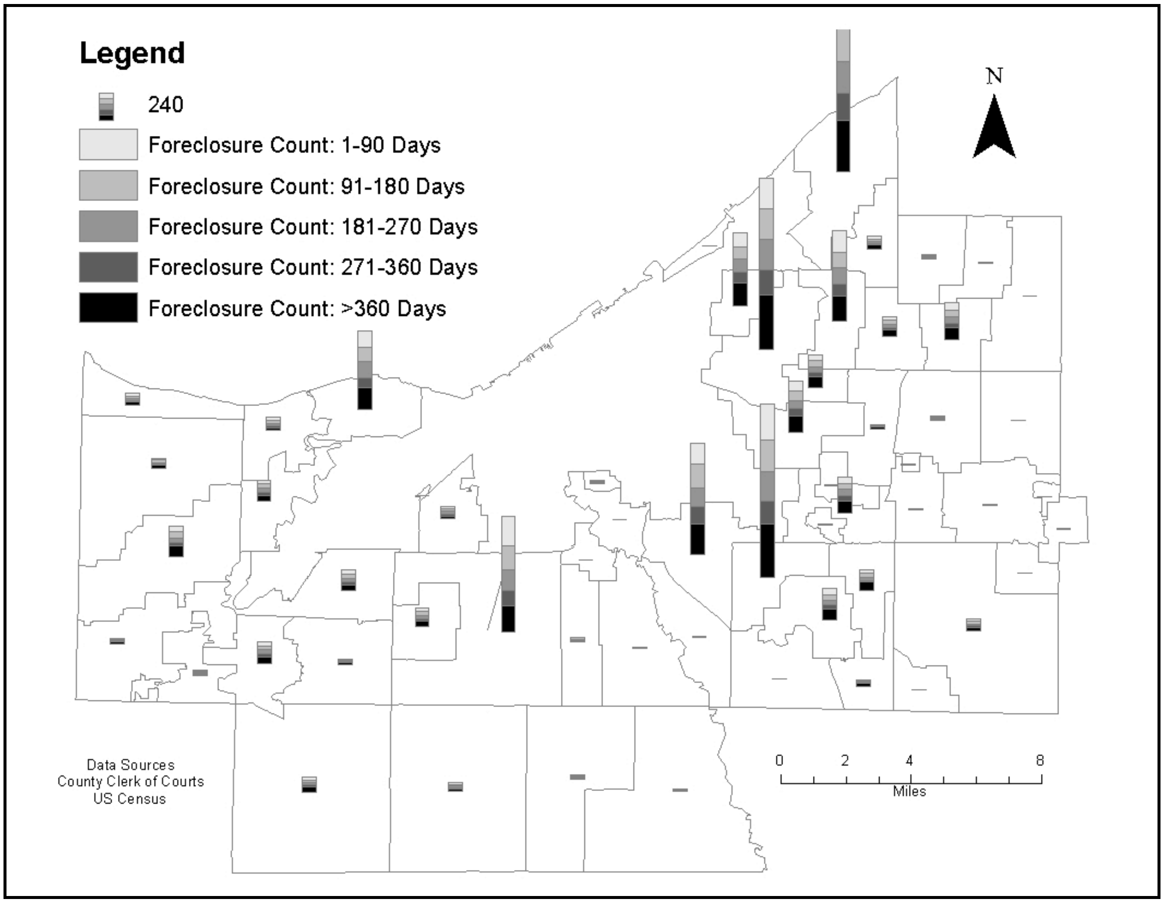

Figure 8. Foreclosure Time Period Distribution by Municipality, 2005 - 2007

The final variable of interest is the dependent variable of sales price for single-family residential properties. It is shown in the table in both the "standard" form and the log transformation. While the log transformation is used in the regressions due to the skewed nature of the variable, it is not easily relatable to real sales prices. Therefore, the actual sales price is shown as well. The minimum sales price included in the dissertation is just under $8,000. Lower prices were present in the data, but those values were eliminated when they were identified as extreme outliers. The same is true of the maximum value, which is $1,745,000. Higher values were present, but dropped from the dataset when the outlier analysis was conducted. The average sales price of a home in

Cuyahoga County over the years 2006 and 2007 was $143,980. Figures 9 and 10 show the geographic distribution of sales and average sales prices by block groups.

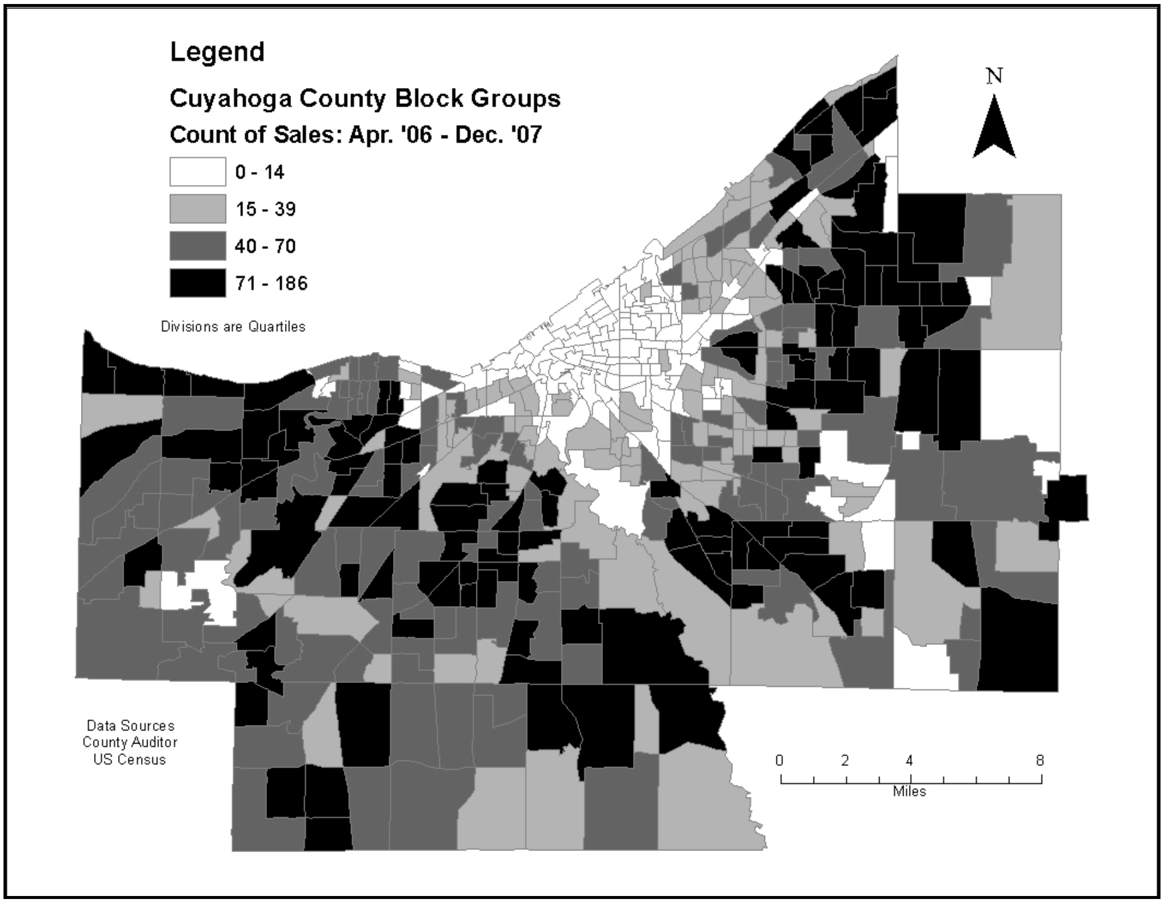

Figure 9. Count of Sales by Block Group, Cuyahoga County 2006 – 2007

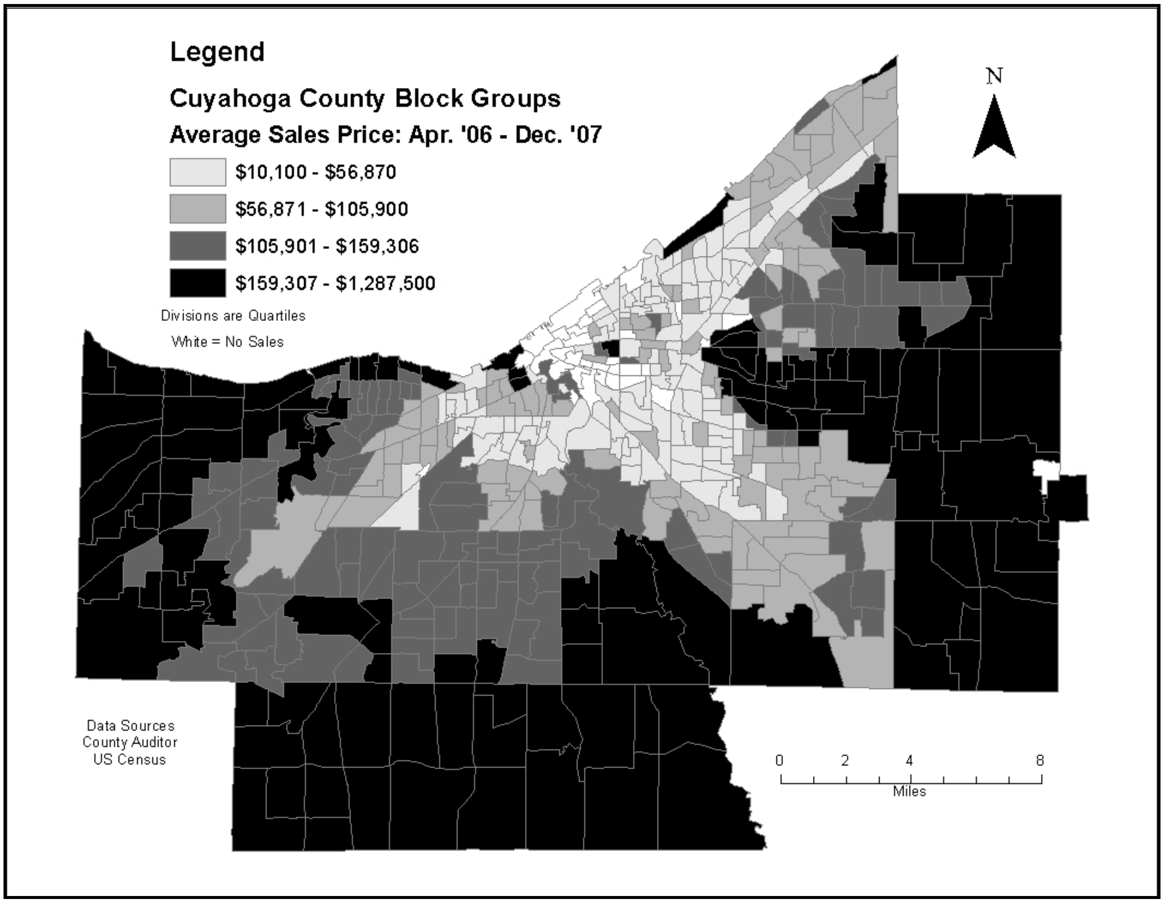

Figure 10. Average Sales Price by Block Group, Cuyahoga County 2006 – 2007

6.3 Spatial Diagnostics

As noted in the literature review and methodology sections, previous studies that have analyzed the impact of foreclosures on property values did not test for problems of spatial dependence or heterogeneity. Testing for these problems is one of the three major contributions of this dissertation. This is important, for if spatial problems exist, then the basic OLS assumption of the Best Linear Unbiased Estimate (BLUE) condition is violated. The OLS estimators become biased and inefficient (Anselin, 1988, 2005; Getis & Ord, 1992; LeSage, 1997).

The tests for spatial dependence and heterogeneity were conducted in GeoDa. The first step in conducting the tests is to create a spatial weights matrix. This establishes what observations will be considered neighbors. Such a matrix can be calculated based on contiguity or distance. Since the data for this dissertation is point data, a contiguity matrix cannot be calculated. Therefore, a spatial weights matrix based on distance was calculated.

There is no “rule of thumb” as to the appropriate distance of a spatial weights matrix, so several distances were tested. The first was very small, only 100 feet. The spatial diagnostics were then calculated. This was followed by the creation of matrices at distances of 250 feet, 500 feet, 750 feet, 1,000 feet, 1,500 feet, and finally a half-mile. All distances resulted in similar spatial diagnostics. Since no appropriate distance emerged from that testing, theoretical distances were considered. Distances of 2,000 feet to half of a mile are generally considered a comfortable walking distance and this is frequently taken into consideration in planning projects (Calthorpe, 1993). For that reason, spatial weights matrices based on a distance of a half-mile were used in the calculation of the spatial diagnostics.

Overall, the results of the tests were fairly consistent across the different models, which can be seen in Table V. While problems of dependence and error were found in all models, the values of the Robust LM error test indicated that nearly all of the models should be adjusted away from the traditional OLS model in favor of a spatial error model. The one exception was the spatial-temporal model for the City of Cleveland. The spatial diagnostics for that model indicated that a spatial lag model was most appropriate. The final calculations for this dissertation include five spatial error models and one spatial lag model. A discussion of the results will start below with the base model.

Table V. Spatial Diagnostics

		Moran's I	LM lag	Robust LM lag	LM error	Robust LM error
	Base Model	58.03	329.80	40.40	3,246.04	2,956.65
	Straight-Line Model	26.58	124.57	22.25	671.37	569.05
	Spatial Model	54.27	304.82	42.06	2,835.50	2,572.74
Cuyahoga	**Spatial Temporal Model**	54.36	305.05	41.91	2,844.85	2,581.71
Cleveland		11.70	195.08	88.07	111.37	4.37
Suburbs		61.10	213.08	26.01	3,606.94	3,419.87

LM = LaGrange Multiplier
all values significant at alpha = .01 except the Cleveland Robust LM error value, which is significant at alpha = .05

6.4 Base Model Results

The base model serves as a starting point for the other models in this dissertation, whose main concern is the foreclosure variables. The creation of a strong base model is important so that any traditional concerns with a hedonic model are dealt with early on, allowing the focus of the other models to fall solely on the foreclosure variables. The base model for this dissertation was thoroughly vetted. Tests were done for collinearity and the residuals of the model were examined several times. A double log model was also tested but the goodness of fit measures indicated the semi-log model was more appropriate. Variables were dropped and the model run without them to test the robustness of the other variables. Through this process of constructing an appropriate hedonic model for house prices in Cuyahoga County, some variables that were including in the beginning are no longer present and variables not in the model from the start were later included as they were identified as being important. The regression model descriptive statistics and diagnostics can be found in Table VI for all models and the results of the final base model can be found in Table VII. It includes all structural, neighborhood and locational characteristics necessary to accurately model house prices. The discussion of these results will be thorough, so that the examination of

Table VI. Regression Descriptive and Diagnostic Statistics

	Pseudo-R^2	**Log likelihood**	**Akaike info criterion**	**Schwarz criterion**	**# Obs.**	**Vars.**	**Df**
Base Model	0.694	-13,494	27,060	27,350	23,130	36	23,093
Straight-line Model	0.687	-7,735	15,542	15,807	11,824	36	11,788
Spatial Model	0.695	-13,453	26,981	27,287	23,130	38	23,092
Spatial Model Cuyahoga	0.695	-13,449	26,982	27,320	23,130	42	23,088
Spatial Model Cleveland	0.390	-5,502	11,086	11,360	5,879	41	5,838
Spatial Model Suburbs	0.698	-5,775	11,630	11,940	17,251	40	17,211
Double Log Base Model*	0.691	-13,523	27,121	27,418	23,130	36	23,093

*results can be found in appendix

Table VII. Base Model Regression Results

Variable	Coefficient	Std.Error	z-value	Probability
CONSTANT	11.57307	0.04869	237.68	0.00
BEDROOMS	0.01732	0.00501	3.46	0.00
BATHS	0.05236	0.00813	6.44	0.00
HALFBATH	0.05790	0.00702	8.25	0.00
FIREPL	0.03498	0.00635	5.51	0.00
CRAWL	-0.13088	0.02138	-6.12	0.00
SLAB	-0.11006	0.01116	-9.86	0.00
BSMFNSH	-0.00055	0.03548	-0.02	0.99
BSMPART	0.01407	0.00799	1.76	0.08
BUNGALOW	0.07262	0.01491	4.87	0.00
COLONIAL	0.02721	0.01067	2.55	0.01
OTHERSTYLE	-0.01369	0.00918	-1.49	0.14
ASBESTOS	-0.12324	0.03056	-4.03	0.00
SIDING	-0.04469	0.00824	-5.42	0.00
WOOD	-0.06360	0.00952	-6.68	0.00
SALE06	0.09423	0.00574	16.41	0.00
WINTER	-0.05011	0.00904	-5.54	0.00
SPRING	-0.01649	0.00738	-2.23	0.03
FALL	-0.05865	0.00730	-8.03	0.00
GARATT	0.01834	0.00921	1.99	0.05
AIR	0.05163	0.00713	7.24	0.00
PORCH	0.00753	0.00627	1.20	0.23
AGE	-0.00960	0.00032	-29.80	0.00
%BLACK	-0.00571	0.00034	-16.84	0.00
%HISPANIC	-0.01067	0.00161	-6.63	0.00
%POVERTY	-0.00331	0.00064	-5.16	0.00
CITYEAST	-0.21072	0.03288	-6.41	0.00
CITYWEST	-0.22175	0.03615	-6.13	0.00
INNERRING	-0.06711	0.02041	-3.29	0.00
SQFT1000	0.24016	0.00857	28.03	0.00
INC1000	0.00174	0.00030	5.70	0.00
CBDMILE	0.00484	0.00280	1.73	0.08
LOT1000	0.00188	0.00021	8.77	0.00
HUDEN	0.00001	0.00000	3.65	0.00
WATER	0.07276	0.02765	2.63	0.01
IMPDEN	-0.00019	0.00004	-4.96	0.00
LAMBDA	0.73649	0.01284	57.36	0.00

the other models can focus on the results of the foreclosure variables, which are the focus of this dissertation.

The base model is a spatial error model, as indicated by the spatial diagnostics from the above section. Since it is a spatial error model, it includes a term to account this problem, lambda. This variable is significant, which is expected. The constant term is also significant, justifying its inclusion in the model. The alternative would have been a regression through the origin. The remaining variables fall into several categories: structural, neighborhood, locational and time of sale.

In total, there are 20 structural variables in the base model. Of those 20, 16 are significantly different from zero. Two of the insignificant variables are indicators for partially finished basements (BSMPART) and finished basements (BSMFNSH). The insignificance of the variables would lead to the conclusion that there really is no different in sales price if the home's basement is unfinished, finished or somewhere in between. Also insignificant is one of the style indicators. It is the other category (OTHERSTYLE), which includes bi and split-level homes and contemporary designs among others. These styles of homes do not sell differently in terms of price than ranch style homes, which is the reference group. The final structural variable that is insignificant is the porch indicator (PORCH). Buyers do not show a preference for homes with or without a porch.

One of the strongest structural characteristics, in terms of z value, is square footage (SQFT1000). Its z value is over 28. For each increase of 1,000 feet to the square footage of a home, the price increases on average by 24 percent. The other size dimension is lot size in thousands of feet (LOT1000). The z value is smaller, at 8.77 and the coefficient is representative of a price increase that is less than two tenths of a percent. Bedrooms (BEDROOMS) and bathrooms (BATHS) are also related to the size of a home. Each bedroom increases a home's value by 1.7 percent and each bathroom increases by the price by over 5 percent on average. Half-baths (HALFBATH) increase the sales price by about 5 percent as well. One final internal characteristic is the number of fireplaces (FIREPL) in a house. For each additional fireplace, the price increases by 3.4 percent.

The exterior characteristics of the houses are summarized by the exterior wall variables (ASBESTOS, SIDING, WOOD). ASBESTOS is an indicator for asbestos singles. Houses with this characteristic sell for over 12 percent less than homes with a brick or stone exterior, which is the reference group. Houses with vinyl or aluminum siding (SIDING) only sell for 4 percent less than the reference group. Wood sided homes (WOOD) are valued at 6 percent less than brick or stone homes. All exterior wall coefficients had the expected result. Another exterior feature of a house is the garage (GARATT). According to the base model, an attached garage adds approximately 2 percent to the sales price of a home.

Briefly mentioned early was the style of the home. While the “other” category was not statistically different from ranch style houses, the other two style categories were significantly different. The first is homes classified as bungalows (BUNGALOW). These types of homes sold an average of 7 percent higher than ranch homes. The other style, colonials (COLONIAL), were priced almost 3 percent higher than ranches. Also mentioned early were variables related to a homes foundation. There were no differences among basement types, but both homes with a slab (SLAB) and those with a crawlspace (CRAWL) sold for less than homes with a basement. The discounts were 13 and 11 percent respectively.

The final two structural characteristics are the age of a home (AGE) and whether or not it has air conditioning (AIR). Both variables had the expected coefficient signs. Homes with air conditioning sell for 5 percent more than home without the amenity. As for the age of a home, each year discounts the home almost 1 percent on average. Taking a look at the structural characteristics as a whole, all the variables had the hypothesized sign and only 4 out of 20 were insignificant. The base model does a good job of describing the structural characteristics of homes in Cuyahoga County.

Beyond the structural characteristics, there are four time of sale variables. One is a dummy for the year of the sale (SALE06). Since the dataset includes data across two years, the dummy controls for differences between years. In this case, the dummy indicator is for 2006. The variable is significant and positive. Normally, one would expect this variable to be negative. However, the downturn in the housing market has led to lower property values and selling prices. The regression here backs up that observation. Homes in 2006 sold for 9 percent more than homes in 2007, on average. The other time of sale variables are for the season in which the home was sold. Summer is the reference group. Homes sold in winter (WINTER) and fall (FALL) sold for about 5 percent less than those sold in summer. The difference between a spring (SPRING) sale and a summer sale was about 1.7 percent. All of these variables turned out as expected.

The remaining variables are neighborhood or locational in nature. There are three spatial indicators, two for the City of Cleveland (CITYEAST and CITYWEST) and one for the inner-ring suburbs (INNERRING). The outer-ring suburbs serve as the reference group. Properties within the City of Cleveland sell for approximately 20 percent less than outer-ring suburban properties, regardless of which side of town. Inner-ring suburban properties only sell for 6.7 percent less than their outer-ring counterparts. These findings are also supported by the positive coefficient CBD distance variable

(CBDMILE), although it is only significant at an alpha level of .10. It should be noted that these spatial dummies were highly correlated with a school district variable and were measuring the same variation. After testing several different variable combinations, the school district variable was dropped.

There are also a group of socioeconomic variables at the neighborhood or block group level. These include the percent African American (%BLACK), percent Hispanic (%HISPANIC), percent of persons in poverty (%POVERTY) and the median household income of the block group in thousands of dollars (INC1000). The two race variables and the poverty variable have negative signs as expected. The percent African American variable has the highest z value at -16.84 and all three coefficients have an impact of 1 percent or less. The income variable has a positive sign, which is also expected. The coefficient is one-tenth of one percent.

The last two variables in the base model describe the housing stock of the neighborhood. The first is a density measure of impacted properties in the block group from 2001 to 2005 per square mile (IMPDEN). An impacted property has been associated with a foreclosure or sheriff sale, indicating a depressed housing market. As expected, the variable has a negative sign. The coefficient is one-hundredth of a percent. The other variable is also a density measure (HUDEN). It is a simple measure of housing units per square mile within the block group. This is the only variable with an unexpected sign. The variable's sign is positive, when it would be expected that denser areas would sell for less. The coefficient though is very small at one-thousandth of a percent.

Overall, the base model appears to be a strong hedonic model for house prices in Cuyahoga County. Nearly all the variables are significant and only one has an unexpected sign. This provides a great starting point for the remaining models in the dissertation. Each of the following models will start with all the variables from the base model and then add the foreclosure variable or variables. In doing so, most of the discussion time on the remaining models can focus on the foreclosure variables. For the remaining models, the base model variables will only be discussed if there is a substantial variation from the base model. The next model to be outlined is the methodology of previous researchers. The new foreclosure variable is a count of all foreclosure filings within an eighth of a mile of the sale (SLCOUNT). This model only uses data for the year 2007 due to the calculation of the foreclosure variable.

6.5 Previous Model Results

This model replicates the methodology utilized by previous researchers to examine the impact that foreclosures have on neighboring property values. Since the model only has data for the year 2007, it is expected that there should be some differences between the coefficients of this model and that of the base model. Results can be found in Table VIII. The first notable difference is that there is no year of sale variable. It was simply not necessary. There were also a few variables that were significant in the base model that were not significant in the straight-line model. The bedroom variable (BEDROOMS) went from being significant at an alpha of .01 to .10. The asbestos single indicator (ASBESTOS) is no longer significantly different from a brick or stone exterior. A home sold in the spring (SPRING) does not sell for a price different from a home sold in the summer. The type of garage (GARATT) doesn't have an impact on sales price and the impacted density variable (IMPDEN) is also no longer significant. The variables that were insignificant in the base model are also insignificant in the straight-line model.

The variable of interest is the foreclosure variable (SLCOUNT). For this model, it is a count of all the foreclosure filings (2005-2006) within an eighth of a mile of a home sold in the year 2007. The variable is significant at an alpha level of .01 and the coefficient has the expected negative sign. The impact is approximately 1 percent, given by the coefficient of -0.01. This corresponds extremely well with the findings by Immergluck and Smith (2005b). Those authors found the impact of foreclosures in Cook County to be 0.9 percent. The difference between that study and this dissertation is only one-tenth of a percent. Considering that the average sales price in Cuyahoga County was about $140,000, that is a discount of $1,400 per foreclosure within an eighth of a mile on average. The similarities between this dissertation's model and previous studies are promising. The potential for comparisons going forward is excellent.

Table VIII. Previous Model Regression Results

Variable	Coefficient	Std.Error	z-value	Probability
CONSTANT	11.55209	0.06422	179.87	0.00
BEDROOMS	0.01261	0.00743	1.70	0.09
BATHS	0.06104	0.01206	5.06	0.00
HALFBATH	0.06786	0.01042	6.52	0.00
FIREPL	0.02557	0.00932	2.74	0.01
CRAWL	-0.16780	0.03221	-5.21	0.00
SLAB	-0.11813	0.01665	-7.09	0.00
BSMFNSH	0.06630	0.05376	1.23	0.22
BSMPART	0.01247	0.01184	1.05	0.29
BUNGALOW	0.07898	0.02244	3.52	0.00
COLONIAL	0.02843	0.01583	1.80	0.07
OTHERSTYLE	-0.01568	0.01369	-1.15	0.25
ASBESTOS	-0.06984	0.04618	-1.51	0.13
SIDING	-0.05378	0.01223	-4.40	0.00
WOOD	-0.07124	0.01403	-5.08	0.00
WINTER	-0.04832	0.01231	-3.93	0.00
SPRING	-0.00719	0.01101	-0.65	0.51
FALL	-0.07505	0.01181	-6.36	0.00
GARATT	0.00955	0.01372	0.70	0.49
AIR	0.06949	0.01070	6.50	0.00
PORCH	0.00062	0.00945	0.07	0.95
AGE	-0.00929	0.00048	-19.36	0.00
%BLACK	-0.00570	0.00039	-14.52	0.00
%HISP	-0.01286	0.00196	-6.56	0.00
%POVERTY	-0.00398	0.00093	-4.29	0.00
CITYEAST	-0.26100	0.04050	-6.44	0.00
CITYWEST	-0.22625	0.04077	-5.55	0.00
INNER	-0.07061	0.02386	-2.96	0.00
SQFT1000	0.25632	0.01264	20.28	0.00
INC1000	0.00282	0.00041	6.94	0.00
CBDMILE	0.00234	0.00346	0.68	0.50
LOT1000	0.00174	0.00031	5.62	0.00
HUDEN	0.00002	0.00000	4.40	0.00
WATER	0.11012	0.04307	2.56	0.01
IMPDEN	-0.00005	0.00006	-0.80	0.43
SLCOUNT	-0.01041	0.00135	-7.72	0.00
LAMBDA	0.55175	0.01922	28.71	0.00

6.6 Spatial Model Results

The spatial model is the first change in methodology from previous studies. In this model, the foreclosure variable is not created using the straight-line method. Instead, the foreclosure variable is a count of all the foreclosure filings that are in the foreclosure process at the time of sale (FORCTOT). This alteration has two main advantages. First, a face block is a real urban space, not an arbitrary distance from a house. The second advantage is that the impact of foreclosures on neighboring properties is largely thought to be visual and the face block provides a geography that is based on this hypothesis. This is discussed in detail in the literature review and methodology chapters.

In addition to the foreclosure variable, another new variable is also included. Since the face block foreclosure variable accounts for all foreclosures in process, the other variable measures properties that have been foreclosed and sold at sheriff sale. Therefore, the other new variable is a count of all sheriff sales that took place before the sale within the face block from 2005 to 2007 (SHF_CNT). This distinction is not made in the previous studies, but it is an important separation from a policy standpoint. Prior to sheriff sale, policy should focus on helping homeowners keep their homes. After the sale, the focus should be on assuring the property does not sit idle under the ownership of a bank or speculator.

The spatial model uses the exact same dataset as the base model. An examination of the coefficients present in both models reveals that they are very similar. Only one variable, the garage indicator (GARATT), changes from significant to insignificant. All other variables that were significant stayed so with the same sign and approximately the same coefficient. This indicates that the base model accurately describes housing prices.

Table IX. Spatial Model Regression Results

Variable	Coefficient	Std.Error	z-value	Probability
CONSTANT	11.57419	0.04834	239.45	0.00
BEDROOMS	0.01727	0.00500	3.45	0.00
BATHS	0.05230	0.00812	6.44	0.00
HALFBATH	0.05672	0.00701	8.09	0.00
FIREPL	0.03514	0.00634	5.54	0.00
CRAWL	-0.13057	0.02135	-6.12	0.00
SLAB	-0.11155	0.01115	-10.01	0.00
BSMFNSH	0.00006	0.03543	0.00	0.99
BSMPART	0.01448	0.00798	1.82	0.07
BUNGALOW	0.07762	0.01490	5.21	0.00
COLONIAL	0.02859	0.01065	2.68	0.01
OTHERSTYLE	-0.00927	0.00918	-1.01	0.31
ASBESTOS	-0.12186	0.03051	-3.99	0.00
SIDING	-0.03151	0.00841	-3.75	0.00
WOOD	-0.06698	0.00951	-7.04	0.00
SALE06	0.08670	0.00586	14.79	0.00
WINTER	-0.04964	0.00903	-5.50	0.00
SPRING	-0.01773	0.00737	-2.40	0.02
FALL	-0.05669	0.00730	-7.77	0.00
GARATT	0.01618	0.00920	1.76	0.08
AIR	0.05012	0.00712	7.04	0.00
PORCH	0.00813	0.00626	1.30	0.19
AGE	-0.00955	0.00032	-29.72	0.00
%BLACK	-0.00550	0.00034	-16.38	0.00
%HISP	-0.01066	0.00159	-6.70	0.00
%POVERTY	-0.00326	0.00064	-5.08	0.00
CITYEAST	-0.21892	0.03257	-6.72	0.00
CITYWEST	-0.22468	0.03560	-6.31	0.00
INNER	-0.06550	0.02016	-3.25	0.00
SQFT1000	0.23914	0.00856	27.95	0.00
INC1000	0.00180	0.00030	5.95	0.00
CBDMILE	0.00457	0.00277	1.65	0.10
LOT1000	0.00189	0.00021	8.84	0.00
HUDEN	0.00001	0.00000	3.86	0.00
WATER	0.06998	0.02761	2.53	0.01
IMPDEN	-0.00015	0.00004	-3.89	0.00
FORCTOT	-0.00754	0.00209	-3.61	0.00
SHF_CNT	-0.02916	0.00398	-7.33	0.00
LAMBDA	0.72879	0.01312	55.57	0.00

Both of the new variables, foreclosure and sheriff sale counts (FORCTOT and SHF_CNT), are significant at an alpha level of .01. Results of the spatial model can be found in Table IX.

The foreclosure count variable's coefficient (FORCTOT) is -0.0075, which correspond to a 0.75 percent decrease in sales price. The straight-line model in this dissertation had a decrease of about 1 percent associated with its foreclosure variable and previous studies had an impact of 0.9 percent. The impact at the face block level is slightly less than what was seen at a straight-line distance of an eighth of a mile. This may be in part due to the exclusion of sheriff sale properties, which is a separate variable in the spatial model. The coefficient for this variable is -0.029 or nearly 3 percent. That would be a discount of $4,200 per sheriff sale within the face block for a $140,000 home, on average. The impact per foreclosure within the face block is only $1,050 on average for the same priced home. This highlights the importance of analyzing the different parts of the foreclosure process separately. The final model, also called the spatial-temporal model, does just that. It has five foreclosure categories of 90 days each, the last one encompassing properties that have been in the foreclosure process for over a year. It also includes the sheriff sale count variable (SHF_CNT). In doing this, it can be seen when properties in the foreclosure process begin to have a negative impact on nearby properties.

6.7 Spatial Temporal Model Results

This model includes all of the methodological improvements proposed in the dissertation. Tests for spatial problems were conducted and the model utilizes the face block geography. It also includes time categories for the foreclosure variables. By incorporating these categories, a threshold can be found where foreclosures begin to have a negative effect on property values. The categories are 90 days each and the last category includes all foreclosures that have been in process for over a year. The hypothesis is that properties in the foreclosure process longer will have a greater negative impact on nearby property values. This model is also conducted for three different levels of geography. There is an equation for all of Cuyahoga County and then there are separate models for the City of Cleveland and the suburbs. The last two are presented to examine differences between the central city and suburbs. Results of all three regressions can be found in Tables X – XII.

Before discussing the foreclosure variables in some detail, it is again important to compare the other variables in the three equations to the results seen in the base model. The Cuyahoga County spatial-temporal model is nearly identical to the base model in terms of coefficient signs and significance levels. The only slight difference of note is that the garage variable (GARATT) is no longer significant at the traditional alpha cutoffs of .01 and .05. However, it would be significant at an alpha of .10. The suburban model, which is constructed with 17,251 observations, is also similar to the base model, but with a few more apparent differences. The "other" style category (OTHERSTYLE) is now significant with a negative sign, indicating that those styles of properties sell for about 2 percent less than ranch homes. The asbestos single indicator (ASBESTOS) is not significant. This may be due to the small number of observations with that type of exterior wall in the suburbs. The percent Hispanic (%HISPANIC) and percent in poverty (%POVERTY) are also insignificant. Again, this may be due to the small number of those populations living in the suburbs. The two other deviations from the base model are that the porch indicator (PORCH) is positive and significant and the housing unit density variable (HUDEN) is insignificant. Overall though, the suburban spatial-temporal model is very similar to the base model.

The Cleveland spatial-temporal model offers the most substantial differences from the base model. Firstly, the Cleveland model is calculated using the spatial lag method. All other models use the spatial error model. Beyond that basic difference, many of the coefficients are dissimilar as well. It should also be noted that the predictive power of the Cleveland model was not very strong. While R squared is really only a pseudo R squared when dealing with spatial error or lag models, those values were close to the R squares of the OLS models. For all Cuyahoga models and the one suburban model, the R squares approach 0.70. For the Cleveland model, the R square is below 0.40. This finding supports the decision to separate the City of Cleveland observations from the suburban observations and is an indication as to the heterogeneous nature of the Cleveland housing market. The low R square coupled with the greater number of insignificant coefficients indicates that the Cleveland model is not as strong as the other models.

The first major difference in coefficients is the insignificance of both the bedroom (BEDROOMS) and bathroom (BATHS) variables. Only one of the exterior wall indicators is significant. When looking at the time of sale variables, the seasonal dummies are not significant. The year of sale indicator (SALE06) is still significant. The garage variable (GARATT), which has fluctuated significance from model to model, is again insignificant. Most of the neighborhood socioeconomic variables remained significant, but the poverty variable (%POVERTY) did not for the Cleveland model. The spatial dummy for the east side of the city (CITYEAST) was not significant, which showed no difference between homes sold on the east or west side. The final variable that is not significant in the Cleveland model is the waterfront indicator (WATER). These differences between the Cleveland model and the other models in this dissertation are highlighted to note that there may be some drawbacks to the results obtained from the Cleveland model.

With the differences between the spatial-temporal models and the base models described in some detail, the focus of this section should now turn to the final set of foreclosure variables, which are the crux of this dissertation. As a brief reminder, it is hypothesized that foreclosures further along in the process will have a greater negative impact on neighboring properties. This should be seen in the regression with significant values for the later foreclosure categories along with higher z values. In the Cuyahoga County spatial-temporal model, the first four foreclosure variables are insignificant. Foreclosures within the face block of a home being sold do not have a negative effect on the sales price if the foreclosure process is less than a year in progress. However, foreclosures beyond a year of the filing (FORC5) do have a significant negative impact on property values. The final foreclosure category has a z value of -3.72. The coefficient is -0.017, or 1.7 percent. This is greater than the coefficient seen in the spatial model and the straight-line distance model. It appears those coefficients were “watered down” by the inclusion of foreclosures that were early on in the process. Those properties have not had time to deteriorate in any substantial way. Using $140,000 as the average sales price again, the impact is almost $2,400 per foreclosure within the face block. The sheriff sales count (SHF_CNT) is similar to the other models with a significant, negatively signed coefficient of almost 3 percent.

Moving from the Cuyahoga County model to the suburban model, some differences arise. The pattern of the foreclosure variables is not clean cut. The second foreclosure variable (FORC2), as a count of the properties in the foreclosure process 91 to 180 days from the filing, is significant and positive. The third foreclosure variable (FORC3) is nearly significant at an alpha level of .05. The table is rounded to two decimals, but the z value of the coefficient is -1.956, which almost meets the -1.96 cutoff. This variable has a negative sign. Despite those inconsistencies, the final foreclosure variable (FORC5) is significant with a negative sign as is the sheriff sale count (SHF_CNT). The final foreclosure variable (FORC5) has a coefficient of 3.1 percent, which would be $4,340 per foreclosure within the face block. The coefficient of the sheriff sales count (SHF_CNT) climbs from almost 3 percent to 4.4 percent.

Seeing as how the final foreclosure variable (FORC5) and the sheriff sales variable (SHF_CNT) have a greater percent impact on the sales price in the suburban model than in the Cuyahoga model, it would then follow that those variables would have lower coefficients in the Cleveland model. Examining the foreclosure variables reveals that none of those variables are significant. Within the City of Cleveland, foreclosures do not have any impact on the sales price of a home. The sheriff sales count variable

(SHF_CNT) is still significant, but the coefficient is slightly lower than the other models, with a negative impact of 2.3 percent.

The results from the four models offer much to discuss. There are the differences between the straight-line, spatial and spatial temporal models. There are also differences between the Cuyahoga, suburban and Cleveland spatial-temporal model. These differences and the findings in general offer important implications for policy formulation. The following chapter will draw out the importance of the results and offer policy recommendations based upon the findings. Prior to this discussion, the next section will cover three alternative models that were used to assess the validity of the previous models as well as offer some texture and depth to the foreclosure variables.

6.8 Alternative Models

The first alternative model has been mentioned previously, the double log model. This model can be found in Table XIII in the appendix. The double log model was calculated for the base model to compare with the base model presented earlier, which only took the log of the dependent variable, sales price. This alternative was important to test for a different functional form. Looking at the regression diagnostics in Table VI, no advantage is apparent between the double log model and the semi-log model. Therefore, the semi-log model was used as the main model in the dissertation. That type of model had a slight R square advantage and was more prevalent in the literature.

The final two alternative models were conducted for the suburban observations to provide more depth and information about the relationship between foreclosures and properties values in the suburbs. Since the Cleveland model did not show an impact at the parcel level, these two alternatives were not calculated for those observations. The first of these two models was a pseudo-Tobit model. In order to still calculate the spatial error model, all observations that had zero foreclosures in the face block were excluded. This was done to see if there were actually two different models present in Cuyahoga County, one for homes without foreclosures and another for homes with foreclosures in the face block. The results can be seen in Table XV in the appendix, but there are no apparent differences between this model and the models already outlined in this chapter.

The final model provides more detail to the relationship between foreclosures, time, and property values. The spatial-temporal models already presented treat the relationship between foreclosures and property values as linear. As an example, the suburban model's fifth foreclosure variable has a coefficient of -3.1 percent, which means that each additional foreclosure within the face block has a negative impact of 3.1 percent. However, this relationship may not be linear. There may be a critical level of foreclosures where the impact increases greatly. In order to test for this, the foreclosure variables were divided up into dummy variables. Each time period had three different dummies with the exception of the final time period, which had four dummy variables. The dummies are represented as Dxy, where x is the time period and y is the number of foreclosures within the face block. D11 is a dummy variable for the first time period (1-90 days), with a one if there is one foreclosure in the face block and zero otherwise. The final dummy variable in each time period includes foreclosure counts of three and greater, except the fifth set of dummies, where it is a count of four foreclosures and greater as the last dummy variable. For each set of dummies, zero foreclosures within the face block is the reference group.

The results, which can be seen in Table XVI in the appendix, are intriguing and offer two main points of discussion. The first is that the inconsistencies seen in the suburban spatial-temporal model remain. The first time period dummies are all insignificant, but time periods two through four are a hodgepodge. The most interesting results from the model are the dummy variables for the fifth time period. The coefficients are all negative, as expected. For one foreclosure, the negative impact is about three percent. Two foreclosures within the face block have a negative impact of about six percent. The three-foreclosure dummy has a coefficient of about -12 percent. This somewhat linear increase stops at the final dummy variable. Its negative impact is only slightly more than 12 percent, indicating that the critical number of foreclosures on a face block is three. These findings also lend support to the first models presented that assume a linear relationship between the number of foreclosures and the impact on property values. The relationship shown in the dummy variable model is generally linear until the final category. The next chapter will discuss the results and the policy implications that can be taken from them.

Table X. Spatial Temporal Model Regression Results, Cuyahoga County

Variable	Coefficient	Std.Error	z-value	Probability
CONSTANT	11.5750	0.0483	239.46	0.00
BEDROOMS	0.0173	0.0050	3.47	0.00
BATHS	0.0522	0.0081	6.43	0.00
HALFBATH	0.0565	0.0070	8.05	0.00
FIREPL	0.0351	0.0063	5.54	0.00
CRAWL	-0.1310	0.0213	-6.14	0.00
SLAB	-0.1112	0.0111	-9.97	0.00
BSMFNSH	0.0010	0.0354	0.03	0.98
BSMPART	0.0148	0.0080	1.85	0.06
BUNGALOW	0.0776	0.0149	5.21	0.00
COLONIAL	0.0287	0.0107	2.69	0.01
OTHERSTYLE	-0.0093	0.0092	-1.01	0.31
ASBESTOS	-0.1212	0.0305	-3.97	0.00
SIDING	-0.0318	0.0084	-3.78	0.00
WOOD	-0.0670	0.0095	-7.04	0.00
SALE06	0.0845	0.0060	14.16	0.00
WINTER	-0.0498	0.0090	-5.50	0.00
SPRING	-0.0182	0.0074	-2.46	0.01
FALL	-0.0562	0.0073	-7.69	0.00
GARATT	0.0163	0.0092	1.77	0.08
AIR	0.0500	0.0071	7.02	0.00
PORCH	0.0082	0.0063	1.30	0.19
AGE	-0.0096	0.0003	-29.75	0.00
%BLACK	-0.0055	0.0003	-16.37	0.00
%HISP	-0.0107	0.0016	-6.69	0.00
%POVERTY	-0.0033	0.0006	-5.12	0.00
CITYEAST	-0.2189	0.0326	-6.72	0.00
CITYWEST	-0.2242	0.0356	-6.30	0.00
INNER	-0.0655	0.0202	-3.25	0.00
SQFT1000	0.2393	0.0086	27.97	0.00
INC1000	0.0018	0.0003	5.96	0.00
CBDMILE	0.0046	0.0028	1.65	0.10
LOT1000	0.0019	0.0002	8.85	0.00
HUDEN	0.0000	0.0000	3.86	0.00
WATER	0.0703	0.0276	2.55	0.01
IMPDEN	-0.0002	0.0000	-3.90	0.00
FORC1	-0.0081	0.0061	-1.34	0.18
FORC2	0.0040	0.0063	0.64	0.52
FORC3	-0.0073	0.0065	-1.12	0.26
FORC4	-0.0005	0.0072	-0.07	0.94
FORC5	-0.0166	0.0045	-3.72	0.00
SHF_CNT	-0.0289	0.0040	-7.26	0.00
LAMBDA	0.7289	0.0131	55.59	0.00

Table XI. Spatial Temporal Model Regression Results, City of Cleveland

Variable	Coefficient	Std.Error	z-value	Probability
W_LNPRICE	0.4240	0.0366	11.57	0.00
CONSTANT	6.3867	0.4157	15.36	0.00
BEDROOMS	0.0109	0.0131	0.83	0.41
BATHS	0.0317	0.0300	1.06	0.29
HALFBATH	0.0695	0.0260	2.68	0.01
FIREPL	0.0602	0.0233	2.58	0.01
CRAWL	-0.1660	0.0454	-3.66	0.00
SLAB	-0.2031	0.0400	-5.08	0.00
BSMFNSH	0.0205	0.1119	0.18	0.85
BSMPART	0.0361	0.0298	1.21	0.23
BUNGALOW	0.1793	0.0415	4.33	0.00
COLONIAL	0.0843	0.0340	2.48	0.01
OTHERSTYLE	0.0501	0.0319	1.57	0.12
ASBESTOS	-0.1093	0.0583	-1.88	0.06
SIDING	-0.0267	0.0286	-0.93	0.35
WOOD	-0.0854	0.0315	-2.71	0.01
SALE06	0.1704	0.0175	9.73	0.00
WINTER	-0.0014	0.0250	-0.05	0.96
SPRING	-0.0147	0.0218	-0.68	0.50
FALL	-0.0355	0.0213	-1.67	0.09
GARATT	0.0430	0.0438	0.98	0.33
AIR	0.1469	0.0283	5.20	0.00
PORCH	0.0131	0.0196	0.67	0.50
AGE	-0.0138	0.0008	-17.75	0.00
%BLACK	-0.0020	0.0004	-4.72	0.00
%HISP	-0.0048	0.0014	-3.48	0.00
%POVERTY	-0.0013	0.0012	-1.10	0.27
CITYEAST	-0.0453	0.0365	-1.24	0.21
SQFT1000	0.2684	0.0344	7.80	0.00
INC1000	0.0046	0.0016	2.89	0.00
CBDMILE	0.0087	0.0061	1.43	0.15
LOT1000	0.0100	0.0028	3.53	0.00
HUDEN	0.0000	0.0000	3.09	0.00
WATER	-0.0418	0.1564	-0.27	0.79
IMPDEN	-0.0002	0.0001	-2.79	0.01
FORC1	-0.0088	0.0130	-0.68	0.50
FORC2	-0.0162	0.0135	-1.20	0.23
FORC3	-0.0042	0.0137	-0.31	0.76
FORC4	0.0022	0.0149	0.15	0.88
FORC5	0.0071	0.0091	0.78	0.44
SHF_CNT	-0.0235	0.0081	-2.90	0.00

Table XII. Spatial Temporal Model Regression Results, Suburban Cuyahoga County

Variable	Coefficient	Std.Error	z-value	Probability
CONSTANT	11.5362	0.0442	261.18	0.00
BEDROOMS	0.0187	0.0047	3.97	0.00
BATHS	0.0600	0.0069	8.66	0.00
HALFBATH	0.0528	0.0060	8.85	0.00
FIREPL	0.0282	0.0054	5.25	0.00
CRAWL	-0.0911	0.0223	-4.09	0.00
SLAB	-0.0934	0.0095	-9.82	0.00
BSMFNSH	-0.0057	0.0310	-0.18	0.85
BSMPART	0.0119	0.0067	1.77	0.08
BUNGALOW	0.0561	0.0139	4.03	0.00
COLONIAL	0.0209	0.0095	2.20	0.03
OTHERSTYLE	-0.0194	0.0079	-2.45	0.01
ASBESTOS	-0.0611	0.0410	-1.49	0.14
SIDING	-0.0254	0.0073	-3.48	0.00
WOOD	-0.0525	0.0083	-6.30	0.00
SALE06	0.0573	0.0053	10.71	0.00
WINTER	-0.0666	0.0083	-8.04	0.00
SPRING	-0.0176	0.0066	-2.66	0.01
FALL	-0.0651	0.0066	-9.92	0.00
GARATT	0.0241	0.0076	3.17	0.00
AIR	0.0406	0.0060	6.81	0.00
PORCH	0.0121	0.0055	2.21	0.03
AGE	-0.0065	0.0003	-20.68	0.00
%BLACK	-0.0053	0.0004	-15.17	0.00
%HISP	-0.0055	0.0044	-1.25	0.21
%POVERTY	-0.0015	0.0008	-1.81	0.07
INNER	-0.0637	0.0168	-3.80	0.00
SQFT1000	0.2485	0.0073	34.25	0.00
INC1000	0.0015	0.0003	5.98	0.00
CBDMILE	0.0008	0.0025	0.32	0.75
LOT1000	0.0015	0.0002	9.02	0.00
HUDEN	0.0000	0.0000	0.22	0.82
WATER	0.0717	0.0224	3.20	0.00
IMPDEN	-0.0001	0.0001	-2.00	0.05
FORC1	-0.0037	0.0065	-0.58	0.56
FORC2	0.0175	0.0065	2.68	0.01
FORC3	-0.0136	0.0070	-1.96	0.05
FORC4	-0.0060	0.0078	-0.77	0.44
FORC5	-0.0312	0.0050	-6.28	0.00
SHF_CNT	-0.0440	0.0045	-9.88	0.00
LAMBDA	0.7517	0.0131	57.47	0.00

CHAPTER VII

DISCUSSION & CONCLUSION

This dissertation began with a brief introduction to US homeownership policy and how the many pieces in place to promote homeownership created the environment for a housing market crash. The literature review then outlined the foreclosure process and provided some more detail to the factors behind the current foreclosure problem. With a substantial growth in foreclosures in recent years, there are various impacts related to the problem. A few of these are discussed in the literature review, with a bulk of the dialogue focused on the impact that foreclosures have on nearby property values. The end of the literature review and the beginning of the methods section identify deficiencies in existing studies. Then, remedies for those problems are offered in detail. After gathering the data, the models necessary to appropriately describe foreclosures' impact on neighboring properties were conducted and the results were presented in the previous chapter. This chapter takes the opportunity to discuss those results at length. There are two main parts to the results. The first is related to the similarities and differences between the various models. The second part focuses on the findings of the final model, with the spatial variations. This last part also serves as a chance to discuss policy implications based upon the findings of this dissertation.

Before looking to future research opportunities and policy implications, it is important to take a critical look at some of the limitations of this dissertation. The first limitation is the face block itself. It does a very good job modeling the process that was under study, but there are a few shortcomings. The foreclosure variables as measured in this dissertation do not account for properties in adjacent face blocks. It is possible that foreclosures behind the property for sale or foreclosures in face blocks to the left or right of the property for sale have an impact on the sales price. It is also possible that the density of each individual face block plays a role in the impact. This can be explored further in a future study. Another limitation is related to spatial dependence and spatial heterogeneity. While all of the models controlled for one of these spatial problems, the spatial diagnostics indicated that both were problematic. The most problematic spatial feature of the data was controlled. A final limitation is the use of Cuyahoga County as the case study area. It has been well documented that Cuyahoga County was impacted early and heavily by the foreclosure crisis. Therefore findings of this dissertation would be best generalized to similar areas. Places that did not experience a similar increase in the volume of foreclosure may have a different dynamic occurring. It should be noted that these limitations are not to be considered all encompassing.

It would be foolish to think that this dissertation answered all questions about the impact of foreclosures on property values. Two future areas of research on the topic appear ready for discovery. The first is corner properties that are in foreclosure. This dissertation moved away from an arbitrary straight-line distance to a real urban space of the face block. However, corner properties offer a unique challenge. They potentially impact multiple face blocks and future research could focus specifically on these properties. Which face block do they impact? Is it more than one? Is the impact of a corner property greater than that of a property in a different location? These are some of the questions that need answered about corner properties. The second area for future study is post-auction properties. This dissertation focused on the pre-auction side of foreclosure as this would lead to policy recommendations based on keeping people in their homes. The post-auction side of the problem is also important and needs to be explored in the future in more detail. One final area to consider in the future relates to how foreclosures impact neighborhood housing market liquidity, which could in turn have an impact on property values. This type of study would employ a liquidity measure as the dependent variable with foreclosures and other controls as independent variables. Given these limitations and future directions, this dissertation advances the current thinking on foreclosures' impact on property values in important ways.

Differences between the models show the progression from the old methodology to the new methodology offered in this dissertation. This section can be somewhat brief as the differences are relatively straightforward. Utilizing the methodology of previous researchers for Cuyahoga County, the negative impact of foreclosures within an eighth of a mile of a home was found to be just above 1 percent. This corresponded very well with previous findings. When moving from the straight-line distance count at an eighth of a mile to the face block count, the foreclosure impact dropped slightly to 0.75 percent. For this model, properties were separated at the point of sheriff sale. Properties considered foreclosures are somewhere in the process between the filing and the sheriff sale. The sheriff sales count is a count of all properties that have already been sold at auction. This variable had an impact of 2.9 percent. The previous model could be counting these properties in with the foreclosure properties. There is no way to tell based on that methodology. Therefore, this step in the progression of dissertation results highlights the importance of differentiating between “pre-foreclosures”, filing to auction, and “post-foreclosures” or properties already sold at auction. Sheriff sale properties have a larger negative impact than properties still in the foreclosure process at the time of the sale.

This presents the first of three places to interject with policy implications. Previous studies identified that foreclosures had a negative effect on nearby property values. However, it was not certain what part of the process was most influential. The spatial model offers minimal differentiation in the foreclosure process, showing that properties sold at auction have a greater negative impact than properties still in the process of foreclosure. In terms of policy, the results from the spatial model indicate that it would be better to keep homes in the foreclosure process rather than letting them go to auction where the highest bid may be placed by the bank or a speculator. As noted in the literature review section, there are several areas of the country that extended the length of the foreclosure process as part of their policy interventions against foreclosure. The findings from the spatial model support that type of policy.

There is also support for landbanking based upon the results from this model. With properties sold at sheriff sale having a greater negative impact than properties still in the foreclosure process that would indicate that those who are purchasing homes at auction are not investing very much money. The purchase appears to be the only actual investment. If the property is landbanked, it can then be held until an owner with the intent of improving the property is able to purchase it. This is definitely an area for future study as Cuyahoga County is prepared to begin their landbanking program. A final policy implication from this model is related to the real estate process of finding comparables ("comps") in order to determine the price of a home that is for sale. In the current housing market with foreclosures and sheriff sale properties, this model shows that the "comps" process could be skewed by including said properties. Those properties should either not be included or adjusted for accordingly.

The final model, the spatial-temporal model, offers even more detail in regards to the foreclosure process. Not only is there the difference between before and after auction, but also time categories are created to determine how long the foreclosure process has taken when the nearby home was sold. In doing so, it can be seen when the foreclosure begins to have a negative impact. Previous studies simply identify foreclosures as a negative with no measurement of time. Five categories of 90 days each, the final category including all foreclosures beyond a year of the filing, reveal that foreclosures do not have a negative impact on property values until a year after the foreclosure filing. The coefficient for this variable was 1.7 percent. Comparing that with the results from the spatial model and it appears that properties early on in the process were "watering down" the foreclosure variable in that model. The coefficient was only 0.75 percent.

This provides the second opportunity for a policy interjection. While the division between pre and post auction is still present, the results of the spatial-temporal model show that the impact of foreclosures on nearby property values does not begin until a year after the foreclosure filing. From a policy standpoint, this adds another layer to the findings of the spatial model. That model led to the conclusion that the foreclosure process should be extended in order to avoid the property's sale at auction. However, when examining the spatial-temporal model, the conclusion is slightly different. Not only should there be an attempt to keep properties from going to auction, but the goal of a policy intervention should focus around providing a remedy within one year of the foreclosure filing. Therefore, extending the foreclosure process may not be the best policy. If the foreclosure process is to be lengthened, it needs to be coupled with some type of intervention to quickly address the foreclosure problem. One possible policy could be a mediation between borrower and lender to reach new loan terms that make the monthly payment more affordable for the borrower. The spatial-temporal model makes it apparent that foreclosures can simply not be allowed to linger in the process for over a year.

The spatial-temporal model also offers an opportunity to examine how the foreclosure process is impacting homes in different areas of a metropolitan region. The discussion thus far has focused on Cuyahoga County. All models in this dissertation were conducted for the county. The final model, which included all methodological improvements, was also conducted for the City of Cleveland and for the suburbs of Cuyahoga County. While the countywide model did not show an impact until a year after the foreclosure filing, the two spatial differentiations presented different insights. In the City of Cleveland, foreclosures did not have a negative impact on the sales price of a home. This was true for all time categories. The sheriff sale count was still significant, but the coefficient dropped from almost 3 percent to 2.3 percent. Homebuyers in Cleveland do not view foreclosures as a negative externality.

This finding can lead to several possible conclusions. The first is that buyers in Cleveland do not see nearby foreclosures as a risk. The city has been experiencing foreclosures on a regular basis much longer than suburban locales and the presence of foreclosures may simply be part of the housing market in Cleveland. There is also the possibility that homes in Cleveland are not as well maintained compared to suburban counterparts. Therefore, when property maintenance suffers towards the end of the foreclosure process, it is not as noticeable as in areas where the home maintenance level is greater. A final piece to this puzzle may be that Cleveland homebuyers have less information when purchasing a home. This may be due to less education or less income. Also, realtors working on commission may not want to put the same effort into an $80,000 home as they would a $200,000 home. Whatever the reason, the buyer may simply not be aware of nearby foreclosures, especially if deferred maintenance is difficult to detect. It is also possible that on average, which is how a regression assesses the variables, neighborhoods in Cleveland are beyond the tipping point as to when foreclosures negatively impact nearby properties. From a policy standpoint, it would be pertinent to implement policies in Cleveland neighborhood by neighborhood, focusing first on neighborhoods not yet past the tipping point. Stabilizing such neighborhoods before they tip should be a priority. It should also be noted that while foreclosures were not found to have a negative impact on property values, there are numerous other ways in which foreclosures can negatively impact a neighborhood that are beyond the scope of this dissertation. Along with that, policies should still be undertaken to address the foreclosure problem in the City of Cleveland.

The spatial-temporal model with only suburban homes had slightly less straightforward results. The first significant time period in the suburban model is the 91 to 180 day interval. However, this variable has a positive coefficient, indicating that those foreclosures have a positive impact on sales prices. The next time period, 181 to 270 days, is also significant, but negative. The fourth time period is insignificant and the final time period, foreclosures in process longer than a year, is significant with a negative sign. This final coefficient is consistent with the countywide model. However, the coefficient is much larger at 3.1 percent as opposed to 1.7 percent. The sheriff sale variable also has a larger coefficient. It jumps from just below 3 percent to 4.4 percent. The gap between the foreclosure and sheriff sale variables has been diminished. Despite some inconsistencies, the findings from the suburban model indicate that foreclosures have a much greater impact on property values in the suburbs. In fact, coupling the suburban model with the City of Cleveland model, foreclosures' impact on property values appears to be more clearly a suburban problem. Not only is the impact larger when considering only suburban homes, but the negative impact occurs earlier. The positive impact is also interesting, indicating that homes in the suburbs in foreclosure may actually be assets to neighborhoods early on in the foreclosure process.

From this discussion, a return to the two dissertation hypotheses can be made. The first null hypothesis stated roughly that foreclosures within the same face block of a sold property have no impact on the sales price. This hypothesis can be rejected. The foreclosure variable in the spatial model was significantly different from zero with a negative sign. The second null hypothesis stated as a property was in the foreclosure process longer, there would not be a greater negative impact on the sales price of a home within the same face block. For Cuyahoga County, this hypothesis can be rejected. Properties early on in the foreclosure process had no impact on sales price while properties in the foreclosure process for more than a year had a negative impact. In the City of Cleveland, there is a failure to reject this hypothesis. No impact on sales price was seen for any of the foreclosure time categories. For the suburban model, rejecting or failing to reject the hypothesis is not straight forward, but generally, the hypothesis is rejected. However, foreclosures early in the process had a positive impact, which was not hypothesized. The third and fifth foreclosure categories were significantly differently from zero with a negative sign, but the fourth category was insignificant. So while the general idea of the null hypothesis can be rejected for suburban properties, the data do not follow the alternative hypothesis exactly.

To summarize, there are three main conclusions to draw from the findings of this dissertation. The first is that properties post-auction have a greater negative impact than properties that are still in the foreclosure process and have yet to be sold at auction. With that being said, foreclosures that drag on a year after the filing also have a significant negative impact on property values. Therefore, policies aimed at ameliorating the foreclosure crisis in regards to negative impacts on property values should 1) focus on preventing properties from going to auction, 2) reach a remedy to the foreclosure within a year of the filing and 3) aim to stabilize blocks that have fewer than three foreclosure, as shown in the alternative dummy variable model. The final conclusion is rather interesting considering that foreclosure has largely been seen as an urban problem up until the recent crisis. In terms of the impact on property values, the foreclosure problem appears worse in the suburbs than in the central city for the time period of 2006 to 2007.

It may also be that the foreclosure problem has become so bad in the central city that it can no longer be measured at the parcel level as is done in this dissertation. While it is often difficult to get suburban government officials to work with central city government officials, the findings of this dissertation indicate that both groups should come together to find appropriate and effective policy measures to combat the foreclosure crisis.

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APPENDIX

APPENDIX A

Table XIII. Double Log Base Model Regression Results

Variable	Coefficient	Std.Error	z-value	Probability
CONSTANT	6.30949	0.26990	23.38	0.00
HALFBATH	0.05940	0.00703	8.45	0.00
FIREPL	0.03430	0.00638	5.37	0.00
CRAWL	-0.12808	0.02141	-5.98	0.00
SLAB	-0.10219	0.01124	-9.09	0.00
BSMFNSH	0.00432	0.03553	0.12	0.90
BSMPART	0.01844	0.00801	2.30	0.02
BUNGALOW	0.10649	0.01505	7.08	0.00
COLONIAL	-0.01499	0.01110	-1.35	0.18
OTHERSTYLE	-0.04712	0.00958	-4.92	0.00
ASBESTOS	-0.12419	0.03061	-4.06	0.00
SIDING	-0.03928	0.00829	-4.74	0.00
WOOD	-0.07515	0.00951	-7.90	0.00
SALE06	0.09613	0.00575	16.72	0.00
WINTER	-0.05204	0.00905	-5.75	0.00
SPRING	-0.01649	0.00739	-2.23	0.03
FALL	-0.06158	0.00731	-8.42	0.00
GARATT	0.01069	0.00924	1.16	0.25
AIR	0.05335	0.00716	7.45	0.00
PORCH	-0.00379	0.00626	-0.60	0.55
%BLACK	-0.00567	0.00034	-16.75	0.00
%HISPANIC	-0.01083	0.00162	-6.66	0.00
%POVERTY	-0.00156	0.00072	-2.17	0.03
CITYEAST	-0.18411	0.03285	-5.60	0.00
CITYWEST	-0.15924	0.03619	-4.40	0.00
INNER	-0.04538	0.02023	-2.24	0.02
WATER	0.04690	0.02773	1.69	0.09
IMPDEN	-0.00019	0.00004	-4.83	0.00
LNBED	0.03679	0.01559	2.36	0.02
LNBATH	0.09706	0.01287	7.54	0.00
LNSQFT	0.46740	0.01732	26.98	0.00
LNAGE	-0.23240	0.00878	-26.48	0.00
LNINC	0.14266	0.01929	7.40	0.00
LNCBD	0.06802	0.02490	2.73	0.01
LNLOT	0.10833	0.00766	14.14	0.00
LNHUDEN	0.03566	0.00760	4.69	0.00
LAMBDA	0.73353	0.01295	56.66	0.00

APPENDIX B

Table XIV. Pseudo-Tobit Model Regression Results, Cuyahoga County Suburbs

Variable	Coefficient	Std.Error	z-value	Probability
CONSTANT	11.32666	0.08232	137.59	0.00
BEDROOMS	0.01899	0.00934	2.03	0.04
BATHS	0.04680	0.01542	3.04	0.00
HALFBATH	0.05311	0.01214	4.37	0.00
FIREPL	0.04114	0.01120	3.67	0.00
CRAWL	-0.08857	0.04628	-1.91	0.06
SLAB	-0.11258	0.01941	-5.80	0.00
BSMFNSH	-0.05822	0.06307	-0.92	0.36
BSMPART	0.02437	0.01275	1.91	0.06
BUNGALOW	0.06501	0.02482	2.62	0.01
COLONIAL	0.00607	0.01922	0.32	0.75
OTHERSTYLE	-0.01415	0.01617	-0.88	0.38
ASBESTOS	-0.21886	0.07226	-3.03	0.00
SIDING	-0.00232	0.01455	-0.16	0.87
WOOD	-0.08234	0.01667	-4.94	0.00
SALE06	0.08217	0.01111	7.40	0.00
WINTER	-0.07901	0.01540	-5.13	0.00
SPRING	-0.01631	0.01328	-1.23	0.22
FALL	-0.08772	0.01272	-6.89	0.00
GARATT	0.02871	0.01545	1.86	0.06
AIR	0.02873	0.01162	2.47	0.01
PORCH	0.01180	0.01084	1.09	0.28
AGE	-0.00670	0.00061	-10.99	0.00
%BLACK	-0.00467	0.00039	-11.82	0.00
%HISPANIC	0.00661	0.00743	0.89	0.37
%POVERTY	-0.00381	0.00133	-2.88	0.00
INNERRING	-0.09743	0.02612	-3.73	0.00
SQFT1000	0.29227	0.01811	16.14	0.00
INC1000	0.00314	0.00058	5.39	0.00
CBDMILE	0.00232	0.00398	0.58	0.56
LOT1000	0.00207	0.00046	4.47	0.00
HUDEN	0.00002	0.00001	2.47	0.01
WATER	0.00726	0.05986	0.12	0.90
IMPDEN	-0.00017	0.00007	-2.55	0.01
FORC1	-0.00804	0.00810	-0.99	0.32
FORC2	0.01382	0.00819	1.69	0.09
FORC3	-0.01456	0.00857	-1.70	0.09
FORC4	-0.00298	0.00939	-0.32	0.75
FORC5	-0.02738	0.00640	-4.27	0.00
SHF_CNT	-0.04616	0.00605	-7.64	0.00
LAMBDA	0.50318	0.02356	21.36	0.00

APPENDIX C

Table XV. Dummy Variable Model Regression Results, Cuyahoga County Suburbs

Variable	Coefficient	Std.Error	z-value	Probability
CONSTANT	11.53656	0.04416	261.24	0.00
BEDROOMS	0.01869	0.00472	3.96	0.00
BATHS	0.06010	0.00693	8.68	0.00
HALFBATH	0.05294	0.00597	8.87	0.00
FIREPL	0.02811	0.00537	5.24	0.00
CRAWL	-0.09184	0.02225	-4.13	0.00
SLAB	-0.09360	0.00951	-9.84	0.00
BSMFNSH	-0.00563	0.03103	-0.18	0.86
BSMPART	0.01178	0.00674	1.75	0.08
BUNGALOW	0.05570	0.01392	4.00	0.00
COLONIAL	0.02080	0.00947	2.20	0.03
OTHERSTYLE	-0.01958	0.00793	-2.47	0.01
ASBESTOS	-0.06040	0.04101	-1.47	0.14
SIDING	-0.02513	0.00730	-3.44	0.00
WOOD	-0.05237	0.00833	-6.29	0.00
SALE06	0.05666	0.00537	10.55	0.00
WINTER	-0.06619	0.00829	-7.99	0.00
SPRING	-0.01725	0.00661	-2.61	0.01
FALL	-0.06450	0.00657	-9.82	0.00
GARATT	0.02412	0.00760	3.17	0.00
AIR	0.04044	0.00596	6.79	0.00
PORCH	0.01205	0.00548	2.20	0.03
AGE	-0.00649	0.00031	-20.64	0.00
%BLACK	-0.00528	0.00035	-15.05	0.00
%HISPANIC	-0.00561	0.00436	-1.29	0.20
%POVERTY	-0.00156	0.00085	-1.84	0.07
INNERRING	-0.06358	0.01675	-3.80	0.00
SQFT1000	0.24843	0.00725	34.25	0.00
INC1000	0.00155	0.00026	5.99	0.00
CBDMILE	0.00077	0.00246	0.31	0.75
LOT1000	0.00152	0.00017	9.01	0.00
HUDEN	0.00000	0.00000	0.25	0.80
WATER	0.07138	0.02238	3.19	0.00
IMPDEN	-0.00011	0.00005	-2.13	0.03
D11	-0.00530	0.00874	-0.61	0.54
D12	-0.00672	0.02043	-0.33	0.74
D13	0.00091	0.04473	0.02	0.98
D21	0.01295	0.00879	1.47	0.14
D22	0.02801	0.02139	1.31	0.19
D23	0.09390	0.04503	2.09	0.04
D31	-0.00016	0.00924	-0.02	0.99
D32	-0.05506	0.02297	-2.40	0.02
D33	-0.05950	0.04961	-1.20	0.23
D41	-0.01950	0.01007	-1.94	0.05

D42	0.02994	0.02658	1.13	0.26
D43	0.00271	0.05579	0.05	0.96
D51	-0.03342	0.00866	-3.86	0.00
D52	-0.06209	0.01617	-3.84	0.00
D53	-0.12455	0.02890	-4.31	0.00
D54	-0.12530	0.03893	-3.22	0.00
SHF_CNT	-0.04423	0.00446	-9.91	0.00
LAMBDA	0.75153	0.01309	57.43	0.00