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How Much is your Home Worth? Essays on Housing Value and its Determinants

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Abstract

This first chapter uses neighborhood vacancies as a proxy for foreclosures and examines their impact on the value of surrounding neighborhood properties.

Often, the negative spillover of a foreclosure results from decay of the foreclosed property. Existence of a foreclosure within a neighborhood is proxied for by a vacant structure within 300 feet of the observed unit, resulting in a lower bound foreclosure externality.

Using the special neighbor sample of the American Housing Sample waves 1985, 1989 and 1993, small neighborhoods are observed and categorized into racially different neighborhoods (black, integrated or white neighborhood). Additionally, neighborhood-specific averages are constructed, such as mean income, crime and other characteristics. Estimating an hedonic housing price model, this study finds a decrease of about 15 percent for houses located within close proximity to a vacant structure. The effect is even bigger, approximately 18.5 percent, if a house is located near a vacant house in a black neighborhood vs. a white neighborhood.

These results suggest that a negative foreclosure effect exists, but that it differs in magnitude depending on the type of neighborhood as well as the general location of the neighborhood (i.e., city center, urban or rural).

The second chapter investigates the impact of a municipality's financial condition on the housing values within a municipality. The data consist of 68,882 housing

units located in 175 cities through 115 MSAs across 42 states. Information on the housing units' and owner's characteristics are drawn from the 2011 IPUMS and supplemented with MSA-level economic condition variables. The municipal financial information is drawn from the 2010 government census and consists of very detailed information of every local government's finances. The empirical results provide evidence that the financial state of a municipality affects local housing values.

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Chapter 1

"... but it was a Small eyesore": The Effects of Foreclosures on Neighborhood Housing Values

1. Introduction

Housing is a vital part of an economy, providing shelter for people, as well as an investment opportunity. Additionally, housing is the largest component of privately held wealth for the majority of Americans (Wolff, 2012), making it an important subject of research. The recent housing crash in 2007, with nation-wide high foreclosure rates and the resulting impact on individuals, communities and the country as a whole, has been the focus of the newest wave of research concerning housing. While housing prices have risen steadily over 60 years at an average rate of 15 percent per year since the first housing census in 1940 (United States Census Bureau, 2012), the dramatic increase in housing values between 1999–2006 has been unprecedented. One of the factors affecting the housing trend was The Community Reinvestment Act of

1977, which was designed to help individuals gain access to credit from depository institutions within their community (Federal Reserve, 2014), and was particularly aimed at low and moderate income people, who were considered higher risk and therefore unable to get credit prior. Another factor was the record low federal funds rate, following the 2001 recession, which made credit cheap. The combination of these factors, as well as other developments in the credit market did not only make credit available and affordable for a large fraction of the population, but also allowed for riskier borrowers to receive a mortgage, increasing demand for homeownership. In fact, homeownership rates rose consistently from 62.9 percent in 1965 until peaking at 69.1 percent in late 2005, followed by a decline in homeownership rates to 65 percent by 2013 (United States Census Bureau).

The general increase in prices and the easily available credit attracted investors who were hoping to make a quick buck by buying property today with the intention of reselling it in the near future at an expected higher price, hence making a profit. The additional demand for housing properties led to an unsustainable increase in housing prices and the formation of the housing market bubble. In 2006 housing prices peaked in most major metropolitan areas, according to Standard & Poor's Case-Shiller Index, at a level on average of more than 135 percent higher than before prices started to increase in 1999 (Standard and Poor's Dow Jones Indices, 2013).[1] By 2007 the so-called housing market bubble burst and the market experienced a dramatic downfall, with prices decreasing rapidly.

While the economy as a whole is slowly recovering since the recession in 2008, the housing market is not recuperating as quickly. As of March 2013, homeownership rates are still 4 percent lower than in 2005 and housing prices are only slowly

[1]The Case-Shiller Index is the leading house price index in the US housing market. Reporting changes in the residential real estate market in 20 metropolitan areas and across country (Standard and Poor's Dow Jones Indices, 2013)

recovering, having increased only 8–10 percent since hitting bottom in March 2012 (Blitzer, 2013). The downfall, combined with the slow recovery, means that many mortgage holders were, and some still are, in the unfavorable position of owing more than the current value of their homes. The recent US housing market downturn, following the 2007–2008 subprime mortgage crisis, is characterized by a particular large percentage of mortgage holders defaulting on their debt obligation, resulting in people living in houses that no longer belong to them, which decreases the incentive to maintain the home during this time and which they have to vacate in the end.[2] From 2008 through 2009 the industry experienced an all-time high in foreclosure rates. Although, there has been a decrease in foreclosure rates since then, the overall impact has been tremendous. As of April 2014, there have been an approximated 4.9 million completed foreclosures since September 2008 (National Mortgage Professional). Furthermore, housing vacancies reached a high in 2010 of 2.5 percent for single-unit structures and 9.2 percent for multi-unit structures (Standard and Poor's Dow Jones Indices, 2013). The values of properties in foreclosure likely decrease as time passes without the house being occupied and maintained; in addition, over time there may also be impacts on nearby properties due to a lack of upkeep on foreclosed and vacant properties.

This paper studies vacancies, many of which may be the result of foreclosures, and examines whether there is a negative effect on nearby property values due to the existence of foreclosed properties, that have reached the end-stage of foreclosure - vacancy, and if this effect differs depending on the type of neighborhood the foreclosure is in. Neighborhoods are categorized into three different types, determined by the race of the neighborhood occupants, in order to investigate whether the foreclosure

[2]People holding mortgages, making monthly payments technically do not own their homes either, but the mortgage issuer does. Generally speaking, as long as a borrower is in good standings with his creditors, making all necessary payments he is considered the homeowner.

effect differs based on neighborhood type. This study finds that there is, indeed, a negative effect of having a foreclosed property within close proximity; on average it decreases one's housing value by an estimated 15 percent. Also, neighborhoods in densely-populated areas, such as central-city, with properties in distress might experience less of a negative impact than properties in less populated areas if the proximity effect is offset by other factors. Intuitively this may be a result of differences in demand elasticities due to location. Using a proxy variable for distance it can be shown that the absolute value of the impact decreases if a vacancy does not occur close to one's own property. This spatial difference is a consistent finding within the housing literature. Additionally, having an abandoned structure close by when living in a black neighborhood decreases the housing value by 18.5 percent relative to the same house in a white neighborhood. The increase in magnitude, due to the neighborhood being 'black', is an interesting finding, that is consistent with the racial discrimination in housing literature, suggesting a potential need for government programs that specifically target minority neighborhoods.

Section 2 takes a look at the foreclosure literature, followed by the data explanation in Section 3. The model is developed in Section 4 and the estimation with results are reported in Section 5. Section 6 concludes the study.

2. Literature

There is a growing literature on foreclosure externalities due to the bursting of the recent housing market bubble. However, the models that have been used vary widely and, for the most part, have not been particularly rich. Earlier studies looked at a potential discount in the foreclosed properties themselves. Schilling et al. (1990) investigate sales of foreclosed condominiums in 1985 in Baton Rouge,

Louisiana. They estimate a 24 percent discount on such properties. The main issue with this study is that the authors solely look at condominium characteristics and do not control for location, quality or other conditions. The estimates are likely biased if systematic differences exist between foreclosed and ordinary properties, and could easily reflect other effects such as maintenance. More recently Campbell et al. (2011) estimate an hedonic pricing model. Looking at foreclosed single family-properties in Massachusetts between 1987 and 2007, the authors find a 22 percent discount rate on sales of properties in distress.

In general, there are multiple plausible explanations for spillover effects of foreclosures on nearby property values. One such explanation is that properties in distress tend to depreciate more than properties that are not in foreclosure, since the occupants of properties in foreclosure may stop maintaining the property. Maintenance is a form of investment, and homeowners who expect that they will never see any return on this investment have little incentive to maintain their home. This could potentially lower the values of surrounding properties in two ways: directly, if the presence of foreclosures pushes down surrounding prices, or indirectly if the condition of the foreclosed property lowers the marginal return to investment on neighboring properties. The second effect can lead to an overall decrease in neighborhood quality as other homeowners invest less in their own properties. Ioannides (2002) finds that the maintenance behavior of individuals is influenced by the maintenance behavior of their immediate neighbors. He uses the AHS special neighborhood sample from 1985, 1989 and 1993, which allows him to look at social interactions of residents at the neighborhood level.

The problem with neighborhood occupants decreasing their maintenance is that housing is immobile. Even if one would like to live in a well maintained neighborhood, one's home cannot simply be moved to a new location upon observation

of a general decrease in neighborhood quality. Therefore the choice of a unit to live in does not just depend on the characteristics of the unit itself— e.g., apartment vs. house, size, quality, or presence of outdoor space, such as a yard, porch or balcony— but also in large part on the location. Individuals' choices are generally highly dependent on their employment location and commuting preference. Since people spend a large portion of their leisure time within their community, neighborhood characteristics have a significant impact on the value of housing units. Sociologists and psychologists argue that neighborhoods play an important role in the well-being of individuals and society as a whole. In recent years, many local governments have placed an increasing emphasis on the development, maintenance and improvement of residential neighborhoods. Consequently, some neighborhoods are more desirable to live in than others. It has been shown that there exists a different house price gradient, meaning that housing units with the same characteristics will be valued differently depending on the type of neighborhood they are in, depending on neighborhood type as investigated by Myers (2004). She investigates racial discrimination in the housing market, differentiating between neighborhoods on the basis of racial composition. Given Myers' findings, it is possible that foreclosure effects could differ across neighborhoods.

Immergluck and Smith (2005) focus on foreclosures in Chicago from 1997–1998, using data on 9,600 single-family property transactions in 1999. They find that foreclosures have a significant impact on nearby property value (within one-eighth of a mile) resulting in a 0.9 percent decrease in value. This effect is even bigger in low-income neighborhoods, where a foreclosure decreases the value of surrounding properties by 1.8 percent per foreclosure. The authors also have data on type of mortgage, (i.e., government insured mortgages or conventional loan) which allow them to suggest that the effect is only significant for non-government insured mortgages.

Lin et al. (2009) develop a theoretical pricing model, which they test by using property sales in 2003 and 2006. The authors create a unique data set by randomly drawing from a nationwide data set of mortgages issued between 1990 and 2006. From that sample they choose the Chicago PMSA as their study area. Using an hedonic pricing model, controlling for neighborhood location and demographics, they regress housing sales price on house-specific characteristics, county and zip code dummies, quarter dummies and the number of foreclosures within a given surrounding area. They find that the spillover effect from foreclosure properties is significant, but decreases substantially with increasing distance from the property in distress and over time. The negative impact on neighboring property values ranges from -1.2 percent to -8.7 percent. The authors note that this is an upper bound and argue that while it is reasonable to assume that similar markets, such as Dallas, Atlanta and Detroit, might show similar results, other regions may experience smaller impacts from foreclosures.

Li and Morrow-Jones (2010) focus on the impact of neighborhood foreclosures on socioeconomic conditions of a household. Due to foreclosures, homeowners have to leave their properties and that, over time, can change the demographic composition of a neighborhood. The authors use foreclosure sales data from Cuyahoga County, Ohio between 1983–1989, and look at neighborhood changes from 1990–2000 in order to observe long-term effects of foreclosures. Using seemingly unrelated regressions, where the dependent variables are the neighborhood indicators that change over time (e.g., number of black occupants, female household heads, etc.), the authors find a positive relationship between foreclosure rates and changes in percentage of black population, female head-of-household, median household income and unemployment rate.

Little research on foreclosure externalities has been done using data from the

most recent housing crisis. Among the few are Rogers and Winter (2009), which looks at single-family housing sales and foreclosures from 1998–2007 in St. Louis County, Missouri. Accounting for spatial dependency, the authors estimate an hedonic pricing model where the log sales price is regressed on two sets of variables. The first includes timing of sale, house specific characteristics, and spatial characteristics, while the second set accounts for the marginal impact of foreclosures in a neighborhood by adding up all foreclosed properties within a specified spatio-temporal ring. The authors find a temporal and spatial decline in sales prices of neighboring properties. However, the presences of many foreclosures do not appear to magnify this effect, suggesting that the marginal overall effect is much smaller than previously thought. In contrast to similar papers, the authors do not have many neighborhood control variables, thus this data limitation might cause attenuation bias and understate the true effect of foreclosures.

Schuetz et al. (2008) inspect foreclosures and residential property sales from 2000–2005 in New York City. The authors use a conventional hedonic pricing model controlling for property and neighborhood characteristics as well as distance and time from property in distress. In accordance with other studies, they find there exists a negative effect of foreclosures on sales prices. In contrast to other studies, they find that this effect is increasing in distance and time. This could be a result of omitted variable bias. Property values in an urban setting, such as New York City, are usually correlated with distance to transportation such as the subway system and bus line, yet this study does not control for this. Similarly, Kobie and Lee (2011) use a spatial hedonic model and also find an increase in negative spillover from foreclosures. This research finds that this effect increases as time passes. The result suggests that government intervention designed to prevent or lessen the negative externality of foreclosure would need to occur in the early stages of a crisis.

One of the biggest impacts of foreclosed houses in neighborhoods comes from vacant or abandoned properties since, in addition to not being maintained, these can become havens for crime and drugs. One of the unique features of the last housing market crisis was a large number of vacant foreclosed properties. Immergluck (2010) uses nation-wide data on mortgages to look at the change of real estate owned (REO) property stock, by area, which is defined by the zip-code level, from 2006–2008.[3] Immergluck finds that, contrary to common beliefs, a bigger increase in REOs is found in central cities as opposed to suburban areas. In addition, being located in an area that experiences a huge boom versus one with more modest house price appreciation has a bigger impact on the REO increase. Immergluck's results also suggest that regardless of the geographical location, newly developed neighborhoods experience a larger default on foreclosures than established neighborhoods. The study concludes that there is a need for mortgage regulation, in terms of loan-level default risk, and monitoring of the spatial distribution of high-risk loans to prevent an over-localization of high-risk loans.

3. Data

The American Housing Survey (AHS) provides data on the U.S. housing market, housing unit characteristics and demographic characteristics enabling policy analysts, congressional staff and others to observe supply and demand of housing and suggest housing policies.[4] Although the survey is conducted by the U.S. Census bureau, it is designed and maintained by the U.S. Department of Housing and Urban Development (HUD), a government agency responsible for housing programs includ-

[3]REO - a class of properties that are owned by a bank, government agencies or other type of lender, after a completed foreclosure before it is being sold.

[4]Until 1981 the survey was conducted annually and therefore known as the annual housing survey.

ing neighborhood stabilization and affordable living programs.

The survey started in 1973 with a random draw of 60,000 housing units from the nation-wide housing stock. Since a redesign in 1985 the survey is conducted every two years and includes a base of approximately 47,000 units. The sample follows housing units, instead of occupants, and each unit stays in the sample until the survey undergoes a re-design, when a completely new sample is drawn.[5] The next re-design is scheduled for 2015.[6] Unfortunately, due to confidentiality restrictions, one cannot determine a unit's geographical location beyond the metropolitan statistical area (MSA).[7] From a research point of view, being able to establish a closer-knit neighborhood is important, given that people do not choose the neighborhood they live in at random, but put a substantial amount of time into searching for a location that suits their personal preference and is affordable. Hence, one can argue that the immediate neighborhood (e.g. the street one lives on) might have a considerable impact on the housing unit's value. Most studies, controlling for neighborhood characteristics, use zip-code or census tract identifiers to construct neighborhood variables. These neighborhoods can consist of up to 8,000 units, a measure substantially larger than what might reasonably be considered a neighborhood. Also, the distance to the central business district (CBD) and city center likely affects the housing values. Again, due to confidentiality protection of survey participants, location variables allowing the measurement of distance are usually not available. However, clustering housing units into small neighborhoods controls for location differences, since the distance to the

[5] A re-design generally includes some changes to the survey questionnaire and the way the survey is conducted, i.e. personal home visits vs. phone interviews or changing from paper questionnaires to electronically recording the interviewee's answers.

[6] A more detailed explanation of the sample design is provided by HUD and can be found at `http://www.huduser.org/portal/datasets/ahs/ahs_codebook.html`

[7] Theoretically, more detailed location identifiers (e.g. census tracts) exist. However, it is a lengthy process to gain permission to these data. The U.S. Census Bureau grants access to census tract data, which can be linked with the housing data only under special circumstances and a rather extensive application process.

CBD is approximately the same for each unit within a neighborhood.

In 1985, 680 "kernel" units from the national sample were chosen at random and these became the core of a special neighbor sub-sample. Each of these 680 units' ten closest neighbors were identified and, when possible, interviewed. Together, the kernel unit and neighboring units comprise a "cluster". The cluster neighbors had to be within a mile of the kernel unit and were not allowed to be separated from the kernel unit by a highway, river or any other natural or man-made structure that might serve as a barrier or border. In densely populated areas each cluster consists of 11 units, whereas in more rural areas, a cluster might contain fewer units, due to longer distances. Overall, the clusters are considered to be a much better representative of a neighborhood than census tracts or an area identified by zip-code level would be. In 1985, the total number of housing units in this special neighbor sample is 7,350. In 1989 and 1993 the same units in their respective clusters were revisited. Accounting for new construction in the existing clusters and the housing market overall, some units are added to the sample and interviewed. This leads to an increase of clusters in the sample, as well as an increase in the number of housing units in each cluster, now consisting of up to 20 housing units per cluster. The neighbor samples include 8433 and 11,293 housing units in 1989 and 1993 respectively.

This study focuses on single-family housing units, excluding multi-unit structures, mobile homes, units in transient hotels and others that do not meet the single-family house definition. In addition, only owner-occupied units that were regular interviewed units are of interest, since units that are being rented or non-interviewed units (e.g. vacant units), do not display the owner's self-reported housing value. Lastly, after excluding observations that did not meet the preliminary requirements or had missing values, observations located in neighborhoods with less than four owner-occupied single-family housing units were dropped. This final data adjust-

ment is necessary since neighborhood quality and amenities are measured based on the neighbor's information and might be biased if there are not enough neighbor's observed within a cluster. Pooling over the three waves of the data, there are 508 neighborhoods included in this study. There are 6,253 observations in total, where the average cluster contains 12.3 observations.

Table 1 reports summary statistics of the main variables used in this study, including housing characteristics, demographics of occupants, neighborhood characteristics and indicators for racially different neighborhoods. It is important to note that *value* refers to the owners' self-reported estimate of the value of his property. While it is possible that individuals could over- or under-estimate the value of their home Kiel and Zabel (1999) show that even though owners on average overestimate the value by about 5 percent there is no indication that this happens systematically more for specific groups, based on neighborhoods, house characteristics or demographics. The authors find that new home owners tend to be the ones that overestimate, but this declines the longer an owner lives in his home; to overcome the potential overestimation problem, this study controls for tenure.

3.1. *Neighborhood Characteristics*

The survey covers an array of neighborhood questions and the level of satisfaction of the respondent. These questions vary from objective observations (such as if there is an elementary school within a mile or if there is an abandoned property within 300 feet of one's house) to subjective evaluations of satisfaction of maintenance and quality of the neighborhood (such as level of noise, condition of roads, if there are bothersome problems or even crime within the neighborhood). The averages of these observations of each cluster are used to proxy for neighborhood amenities. Addition-

ally, for some of the variables of interest (i.e. crime, bad road conditions, problems within a neighborhood and the existence of a unit with bars on the windows) dummy variables are created, and these are used in some of the later regressions. Averages for neighbors' housing characteristics (e.g. number of rooms, value and property square footage), average level of education of the respondents and the average household income are calculated to proxy for neighborhood quality.[8]

3.2. *Neighborhood Types*

According to Webster's definition, a neighborhood is "a section lived in by neighbors and usually having distinguishing characteristics" (Merriam-Webster dictionary). Based on this definition, one can think of many different ways to define neighborhood types. This study focuses on the racial composition of a neighborhood. In the survey respondents are asked to identify their race, where the choices are "white", "black" or "other" (which include Chinese, American Indians, Japanese etc.). Most of the existing literature regarding racial differences in housing is concerned with differences between "blacks" and "whites", raising the question of how to treat "others" (who make up less than 4 percent of the sample). Following convention, "others" and "whites" are combined.[9] The racial variable is then used to calculate percentages of racial composition for each neighborhood. As in Myers (2004), dummy variables are constructed for "black neighborhood", which is composed of at least 30 percent black households, "white neighborhood", consisting of at least 85 percent of white households and "integrated neighborhoods", which consists of black households between 15–30 percent. Table 2 contains selected averages for each type of

[8]The results did not change when the median was used instead of the neighborhood averages. The corresponding results can be obtained upon request.

[9]Keeping "other" as a separate group and only including them in "integrated" neighborhood does not change the results.

neighborhood.

While the focus of this research is on the externality effect of a vacant unit, which is used as a proxy for foreclosure, in different types of neighborhoods, another important consideration is where (e.g. rural, urban or center-city), these types of neighborhoods are located. Due to the immobility of housing, Kiel and Zabel (2008) test whether including MSA, town and street-level control variables in estimating hedonic housing price equations matters. Using those three location variables, they find that all three levels are significant and conclude that people care not only about the street their house is located on, but also about the town they live in and even the broader area. This result becomes very clear when thinking about neighborhoods within a city; even if the neighborhoods appear identical in quality, the housing prices of similar housing units located in different neighborhoods can vary significantly depending on the location of the neighborhood. Houses located closer to the city-center, parks or train station tend to be more desirable and therefore might be valued higher, ceteris paribus. Unfortunately, the AHS does not report the actual distance to location points that might be correlated with the value of a housing unit. Luckily, this study is able to overcome this data limitation by grouping housing units into neighborhoods, where each house within a cluster has a similar distance to locations of interest. Based on Kiel and Zabel's findings of the importance of location, this study hypothesizes that the effect of a vacant house in an urban area, where housing units could be considerably closer to one another within a given neighborhood than in a rural area, might be different from the effect on a house located in the city center or rural area. Therefore, control variables are included that define additional 'locations', specifically, the general region (north, west, mid-west, and south) and area type (center-city, urban, other urban or rural area).

3.3. *Vacancy - proxy variable for foreclosure*

Foreclosure is a financial state of an occupant, describing a distress situation of a housing unit's owner and not necessarily of the unit. A neighbor might not be able to observe that someone within close proximity has entered the foreclosure state, especially if a property is in the early stages of the foreclosure process where it would be hard to observe a difference in the appearance of the property at all. Therefore, the potential negative effect of a foreclosed unit would begin to occur after a considerable amount of time has passed where the owner stops doing maintenance on his property. People invest time and money into the upkeep of their house and property as long as they can enjoy the benefit of it. An individual who has entered into foreclosure will be less likely to maintain his landscape, fix leaks in the roof to protect the structure from rotting internally or put on a new coat of paint.

Spivack (1991) shows that ownership patterns and vacancies are the most influential determinants of maintenance and upkeep decisions of homeowners. In cases where the foreclosure process leads to a relatively quick turn-over, such as in a short sale, and a new owner occupies the house relatively soon after, one would expect relatively little decay of the housing unit. Hence, the anticipated spillovers from a foreclosure would not be present. While the special neighbor sample does not include financial observations regarding mortgage obligations and property tax payments, making it impossible to have a foreclosure variable based on the financial state, the interviewer asks respondents whether there are abandoned houses within 300 feet from their home. An abandoned house may be the end-result of a foreclosure, when owners owe more on their home than it is worth and consequently choose to abandon their home. Therefore, "abandoned structure" is used to estimate the impact of foreclosures, and the estimates may provide an upper bound of the foreclosure effect

on housing value, since at that point the unit in distress is probably at its worse in terms of upkeep. Thus, it would have the largest negative effect on the surrounding properties and neighborhood. Considering that the foreclosure process itself, at the least, will take 6–12 months, by the time houses are vacated, they most likely are in worse shape in appearance than the ones that have not experienced a similar fate. In addition to using the abandoned unit variable as a proxy for foreclosure, a dummy variable is constructed for each neighborhood indicating that at least one interviewee responded that there is an abandoned house in close proximity.

Note that as a result of the design of the data used in this study (mainly the elimination of housing units that do not meet preliminary requirements), the likelihood of an abandoned structure to be located in a neighborhood that is considered a "slum" is very small. This study uses only neighborhoods with at least four owner-occupied, single-family houses with no missing values. In addition, assuming that the housing value is correlated with wealth, a neighborhood's average housing value can then be seen as an indicator of how "nice" a neighborhood is, where the higher the value, the nicer the neighborhood. The neighborhoods' average housing value across the entire sample ranges from $17,016 to $543,006 compared to the average value of neighborhoods with a vacant structure present, which ranges from $24,190 to $483,953. This shows that it is not necessarily the "poorest" neighborhoods that have an abandoned structure. Most studies researching a foreclosure effect use sales data, municipality tax data or other financial data that directly reflect the foreclosure state. Although this represents "true" foreclosure, it might not necessarily be the best representative for evaluating the externality associated with a foreclosed unit on nearby properties. This study presents a good alternative to the financial foreclosure variable and instead uses a proxy variable for foreclosure - having a vacant structure within 300 feet. The decay of a house resulting from the lack of upkeep,

arguably is the cause of a decrease in surrounding properties' values, hence making it an appropriate proxy variable that seems to be picking up the spillover effect of a foreclosure.

4. The Statistical Model

The utility a person gets from housing consumption varies greatly across individuals. Each unit is comprised of many unique characteristics. Bundled together in various ways, these characteristics will be valued differently not just dependent on a person's preference, but also the location. Having air conditioning in a geographical area where the average temperature is high will be valued more than having one in an area with more cold days in a given year. In addition, the location and the accompanying amenities will greatly influence the valuation as well. A well-maintained neighborhood, where the neighbors are friendly and the overall feeling is a communal one would generally be preferred to one where crime is observed and people are suspicious of the people who live nearby. Hence, it is necessary to look at each component individually and its impact on the value. An hedonic pricing model permits taking a variety of characteristics into consideration in order to estimate the marginal effects these have on the value of a house.

A large amount of research estimates the impact of housing characteristics, and various other factors that contribute to an individual's utility function of housing, on the price of a property. In order to separate out the individual components and to estimate the effect of those factors (especially an abandoned unit), on the value of owner-occupied surrounding property values, an hedonic housing price model is

estimated. The base reduced-form model is,

$$ln(value_{it}) = \alpha + X_{it}\beta_1 + Z_{it}\beta_2 + \beta_3 vacant_{it} + v_{it}, \quad (1)$$

where $ln(value_{it})$ is the log of an owner's self-reported housing value. The vector X_it contains observable house characteristics as well as demographics of the occupants. Neighborhood characteristics, excluding vacancies, are included in the vector Z_{it}. The last variable in the equation, *vacant*, is the foreclosure proxy, identifying an abandoned structure within 300 feet.[10] A more detailed description of the variables used in the hedonic pricing regression can be found in Table 3.

Myers finds evidence of differing racial price gradients within housing markets. A price gradient can be defined as the measure of changes in housing value as the racial composition of a neighborhood changes. Her general findings show that prices in neighborhoods decline as the ratio of black to white owners increases. She argues that this is evidence for the existence of racial discrimination in the housing market based on exclusion, a result from supplier discrimination and people prejudice combined.[11] The notion of different valuation gradients, based on the type of racial composition, leads to the question of whether foreclosures might impact neighboring housing values differently not just based on distance (as has been suggested in the literature), but also on the type of neighborhood.

To investigate these questions, a specification measuring the effect of a vacant structure in "black neighborhoods" versus "white neighborhoods" and "integrated neighborhoods" is estimated. Generally, it is possible that one specific type of neigh-

[10] In some regressions a dummy variable is used to indicate the existence of at least one foreclosure within a neighborhood. It is possible that in spatially large neighborhoods a foreclosure could be located far from some units and therefore the impact on the value of those housing units could be much smaller.

[11] A complete explanation of the specification of racially different neighborhoods and how the price gradient of housing differs based on the racial composition can be found in Myers (2004).

borhood exhibits more of the characteristics that, on average, are less desired, hence the price gradient for housing is likely to be different across neighborhood types. The detailed information available on housing units, occupants' characteristics and the neighborhood, permit controlling for those potential differences. The neighborhood variables of interest are defined in Table 4. The model

$$\begin{aligned} ln(value_{it}) = \alpha + X_{it}\beta_1 + Z_{it}\beta_2 + \beta_4 bhood_{it} + \beta_5 inthood_{it} \\ + \beta_6 bhood \times vacant_{it} + \beta_7 ihood \times vacant_{it} + \beta_3 vacant_{it} + v_{it} \end{aligned} \tag{2}$$

is estimated to determine the foreclosure effect in racially differentiated neighborhoods. The dummy variable for houses located in a neighborhood defined as black is *bhood*, and *inthood* indicates a unit in an integrated neighborhood. A house located in a black neighborhood with a nearby vacancy is captured by the interaction term $bhood \times vacant$, and $inthood \times vacant$ represents a nearby vacancy of a housing unit in an integrated neighborhood.

5. Estimation and Results

The raw data are an unbalanced panel spanning 8 years, which would suggest the use of fixed or random effects in the estimation. However, given the nature of housing (i.e. the main characteristics, such as rooms, baths, etc. being fairly stable over time) there is not much temporal variation in the data. Therefore, fixed effects would 'wash away' much of the effect, leading to noisy estimates.

The availability of detailed information of neighboring properties' characteristics, their inhabitants and general neighborhood amenities, is a unique feature of the data. In order to see how inclusion of detailed information on neighbors and neigh-

borhood "quality" impacts the results, various semi-log specifications are estimated. The semi-log specification does not just allow the dollar value of each characteristic to vary, it also makes the interpretation of the coefficient easy and intuitive; based on a unit change of the characteristic, the coefficient estimate can be understood as the percentage change in housing value. [12]

Table 5 shows the results of selected variables for the different specifications testing the model. Column one gives results of the most basic specification, including only house-specific characteristics and demographics of its occupants, while controlling for survey year and occupants' tenure. Number of rooms, bathrooms, age of the house, whether there was any water leaking into the house within the last 12 month and if the unit has any cracks or holes in floors, walls or ceiling are just some of the housing characteristics included. The demographic traits include age, marital status, gender, income and years of education, etc.[13] The point estimate on the abandoned house variable, which is significant at .01, suggests that living within 300 feet of such a unit decreases a housing unit's value by about 31.2 percent. The coefficients can be interpreted as the percentage change in housing value, since the left hand side variable of the model equation is in log form.

Column two shows results for the second specification, which includes neighborhood characteristics, such as the average demographics in the neighborhood (e.g. mean level of education and mean neighborhood income), the average characteristics of the surrounding units as well as other controls representing neighborhood quality (e.g. the percentage of reference people within a neighborhood reporting neighborhood problems, crime and bothersome noise). Not surprisingly, a unit's value is lower

[12]The non-linearity of the equation being estimated requires caution when interpreting the regression coefficient of dummy variables, since they slightly overestimate the effect. To overcome this issues the interpretation of the coefficients on dummy variables is done using the Peter E. Kennedy estimator (Kennedy (1981)), which allows for a less bias interpretation.

[13]A full list of variables included in all regressions is available in Table 4..

if located in a neighborhood where some of the respondents report bothersome neighborhood problems (*problems*). Intuitively, people do not want to live in an area where they do not feel comfortable, maybe feel unsafe walking around or even fear that their property will be violated. Therefore, houses in neighborhoods with less desired qualities will be valued less. The coefficient on average years of education, which is significant at the one percentile, can be interpreted that housing units in neighborhoods with higher educated people are, on average, more valuable. This may suggest that people prefer to live in neighborhoods where the inhabitants are more accomplished, which usually is correlated with higher paying jobs and therefore might portray higher quality characteristics than a neighborhood where people earn less money and are lower skilled. As the neighborhood level controls are added to the regression, the negative effect of a vacant house on the value of a close-by home decreases substantially to 14.5 percent, significant at .01. This indicates that the effect of an empty structure might be different based on the type of neighborhood it is located in.

Neighborhoods are categorized into different types based on racial composition. Prior research shows that housing value, for an identical unit, changes as more black people move into a neighborhood (Harris, 1999). The results for the third specification, which is considered the full model specification, are reported in column 3. In addition to owner, house and neighborhood characteristics, neighborhood type dummies and interaction terms of neighborhood type and a nearby vacant structure are included.

The marginal effect of vacancy on the expected housing value now depends on the type of neighborhood a house is located in. From equation two, the marginal

effect of *vacant* on *lnvalue* is given by

$$\frac{\partial lnvalue}{\partial vacant} = \begin{cases} \beta_3 & \text{if } bhood = 0,\ inthood = 0 \\ \beta_3 + \beta_6 & \text{if } bhood = 1,\ inthood = 0 \\ \beta_3 + \beta_7 & \text{if } bhood = 0,\ inthood = 1. \end{cases}$$

In Table 5, column 3, the coefficient on *vacant*, $-.06$, can be interpreted as the effect nearby foreclosure will have on the housing value in a white neighborhood; however this is not statistically different from zero. The estimated value of β_6 indicates that a house located near an abandoned structure within a black neighborhood has a lower value of about 25.7 percent, compared to the same unit in a white neighborhood, significant at .05. Living in a black neighborhood with a vacant unit present versus a black neighborhood with no vacancies can lead to a decrease in housing value of 30 percent, significant at .05. There are very few observations for integrated neighborhoods and even fewer for integrated neighborhoods with a vacant structure present. Therefore, it is not surprising, that the coefficient on $inthood \times vacant$, β_7, has a large standard error. Due to the data limitation, the focus of the analyses is on the difference between white and black neighborhoods.

Overall, the results suggest that there is a much smaller foreclosure effect in predominantly white neighborhoods versus black neighborhoods. An F-test is performed to test the hypothesis that the foreclosure effect is equal in all types of neighborhoods. Based on the large F-statistics the null hypothesis can be rejected. These findings contribute to the branch of research suggesting that there is racial discrimination within the housing market (whether it comes from prejudice or supplier discrimination), since it indicates that the negative effect of an abandoned structure within a black or integrated neighborhood is worse than in a white neighborhood.

Although this study controls for many neighborhood characteristics, the regression results could be influenced by other negative factors that are generally associated with racially different neighborhoods. As depicted in Table 2, housing values in predominantly black neighborhoods in general are lower than in white neighborhoods. A possible explanation could be that the housing units themselves are of lower quality, as a consequence of being built with cheaper materials and less experienced builders. Unfortunately, there is no way to control for these types of differences given the data. Another possible driving factor could be the general location a certain neighborhood is in. A black neighborhood in the city-center might arguably be different than a black neighborhood in the suburbs. Hence, controlling for location is vital, and this study approaches this problem by including regional as well as location type variables (i.e. city-center, urban, other urban and rural).

Columns 4–6 (Table 5) depict the results of including regional and area type variables to the first three specifications. In almost all specifications the coefficients on the location variables are highly significant, indicating that people are not just concerned with the immediate neighborhood they live in, but also the general area and region. After controlling for location, the coefficient on *vacant* in the basic model remains about the same at -0.35. In the fifth specification (column 5), the point estimate is significant at .01 and suggests a decrease in housing value of 15 percent in the presence of a foreclosure. In the full specification model (column 6), the point estimate of a foreclosed structure within a black neighborhood, significant at .1 indicates a decrease in the housing value of a unit located within 300 feet of such structure to be about 20 percent. The coefficient on *vacant* remains small, at $-.09$, but is now significant at .1. These findings suggest that even after controlling for many factors that are believed to affect a house's value the impact of a foreclosure on nearby property values differ based on the racial composition of a neighborhood.

All of the specifications are also estimated using a dummy variable to indicate whether there is an abandoned house in the neighborhood, compared to a dummy indicating that a foreclosure is within 300 feet, results are shown in Table 6. While the signs on the coefficient for 'foreclosure' stay the same in all specifications, significant at the one percentile, the magnitude slightly decreases. The decrease supports the believe, that the negative spillover of a foreclosed unit gets smaller with an increase in distance. Interestingly, the magnitude of the marginal effect of a vacancy conditional on the type of neighborhood it is in, increases (in absolute value). The coefficient on vacant unit in a black neighborhood versus one in white neighborhood is $-.33$, significant at .01. (in the last specification which includes all location controls as well as neighborhood type variables). These results are very similar to the results in the prior estimations (in Table 5). Indicating that the foreclosure effect found is not due to the particular construction of the foreclosure proxy variable.

6. Conclusion

The recent housing-bubble bust has led to particularly high numbers of foreclosures, negatively impacting home owners, neighborhoods, municipalities and the economy as a whole. In order to help the recovery and lessen the burden, the federal government has provided financial aid in a number of ways (e.g., the Neighborhood Stabilization Act), but the benefits of this type of government involvement are uncertain. If the foreclosure effect is not as bad as often assumed, this money might be better spent on other programs. Throughout the past two decades, an increasing amount of research has focused on investigating the externality effect of foreclosure on surrounding property values. While the results differ regarding the magnitude, there is a general consensus that a negative foreclosure effect exists. In addition, it

has been shown that the effect lessens the farther away a foreclosure is located, in fact the distance considered "far" is fairly small, around 1/8 of a mile.

Housing markets throughout the U.S. differ considerably. Due to data limitation, most studies focus on a small housing market, such as a specific county in Ohio, or the city of Chicago, making a generalization of research results not possible. This study uses a special neighbor sample from the American Housing survey from 1985, 1989 and 1993. The pooled data consist of 6,253 observations, so-called 'cluster' units, and their closest 10 neighbors. Housing units are clustered into very small neighborhoods, which are located across 46 states, and the neighborhoods are categorized into three different types (i.e. black, white or integrated), based on race.

Spillovers from foreclosures are often attributed to the general decay of the unit due to a lack of maintenance. Therefore, this study uses a foreclosure proxy variable, that captures the negative spillover effect. Observing an abandoned structure within 300 feet of an interviewed housing unit, is used to proxy for foreclosure.

This research finds that the value of a housing unit decreases by approximately 15 percent if it is located within 300 feet of an abandoned structure. Much of the previous literature focuses on how housing values are impacted by the existence of a foreclosure within a close-knit territory (i.e. a neighborhood), where the measure of what is considered a neighborhood differs widely in size across research projects, with some as big as census tracts (up to 8000 housing units per neighborhood) and others much smaller, such as a city block. Importantly, housing values seem to be impacted only if a foreclosed house is within close proximity to the property. In other words, a foreclosure in a rural neighborhood of 1 square mile will have a much more limited impact on housing values compared to a foreclosure in a dense, urban street neighborhood.

Additionally, this study's findings suggest that the foreclosure effect differs, de-

pending on the type of neighborhood a vacant house is in. Living in a house located near a foreclosed structure within a black neighborhood approximately decreases the house's value by 18.5 percent. Which is considerably larger than the decrease in housing value when not controlling for racial composition of the neighborhood. Overall, the findings are consistent with previous studies that focus on negative externalities resulting from foreclosure, the importance of location (e.g. urban, rural, suburban) on housing price, and findings on racial discrimination in housing prices.

From a policy viewpoint, the ability to test neighborhood effects on the value of housing is interesting and important, and can be useful in predicting the development of housing markets, which are a large component of our economy. While foreclosure certainly has a very large impact on a person's current and potentially future financial situation, the effect on neighbors and the community might not be as large as previously believed in every housing market. Since many housing policies are federal policies, housing research provides useful insights for policy makers, which is particularly important considering how much money has been provided to lessen the financial burden for people and communities through programs such as the Neighborhood Stabilization Act.

Table 1.1: Summary Statistics

	Mean '85	Std. Dev.	Mean '89	Std. Dev.	Mean '93	Std. Dev.
Housing Unit						
Property Value ($)	143,397.10	92,079.16	182,106.20	142,658.90	160,670.70	114,093.90
Number of rooms	6.45	1.575	6.48	1.632	6.54	1.630
Number of bathrooms	1.51	0.686	1.56	0.683	1.57	0.708
Age of unit (years)	4.82	2.073	4.84	2.230	4.79	2.105
Household						
Age of reference person	51.90	15.692	51.97	16.008	53.22	16.256
Size of household (# of people)	2.87	1.442	2.81	1.444	2.74	1.434
Percent married	0.72	0.449	0.67	0.470	0.64	0.481
Percent male	0.77	0.420	0.75	0.435	0.68	0.466
Years of schooling (reference person)	16.67	6.977	17.36	6.845	17.45	6.879
Years occupants have lived in unit	5.45	2.500	5.27	2.631	5.70	2.595
Log of household income ($)	10.76	1.099	10.76	1.228	10.78	1.071
Neighborhood Characteristics						
Log of average neighborhood income ($)	10.95	0.474	10.99	0.470	10.97	0.456
Average years of schooling in neighborhood	16.65	4.222	17.36	4.091	17.42	4.094
Percent of houses in neighborhood reporting						
crime	0.20	0.209	0.22	0.234	0.23	0.232
bothersome problems	0.37	0.216	0.38	0.213	0.39	0.225
units with bared-up windows	0.10	0.260	0.12	0.293	0.13	0.291
Abandoned units	0.02	0.139	0.02	0.155	0.03	0.179
Number of Observations	3,045		1,940		2,240	

* All monetary values are in 2009 dollars

Table 1.2: Selected House, Household and Neighborhood Characteristics by Neighborhood Type

	Neighborhood Type		
	White	Black	Integrated
House			
Average house value $	167,411	118,273	119,322
Average number rooms	6.54	6.37	6.04
Average square footage	1,949	1,782	1,688
Household			
Average number of people in house	2.81	2.93	2.98
Percent married	71.31	55.82	65.13
Average years of school	17.49	14.89	17.74
Average annual household income ($)	68,431	50,946	63,271
Neighborhood			
percent of people reporting:			
Crime	20.2	34.6	23.5
Bad roads	17.1	36.4	23.5
Neighborhood problems	37.9	41.6	51.3
Vacant structures	1.7	9.1	0.8
Number of Observations	5,479	541	238
Number of Neighborhoods	431	47	30

*All monetary values are in 2009 dollars

Table 1.3: Foreclosure and Neighborhood Type Variables

Variable	Description	Range
black	I (race=black)	{0,1}
pctblack	percentage of houses in cluster where head of household is black	{0,1}
whood	I (pctblack<.15}	{0,1}
bhood	I (pctblack>.3}	{0,1}
inthood	I (.15 <pctblack >.3}	{0,1}
pctvacant	percentage of abandoned houses in neighborhood	{0,1}
vacantd	=1 if at least one abandoned unit in cluster, =0 otherwise	{0,1}
vacant	=1 if an abandoned structure is within 300 feet, =0 otherwise	{0,1}
bhood $\times$*vacant*	bhood * vacantd	{0,1}
inthood $\times$*vacant*	inthood * vacantd	{0,1}
pctnprobsd	percent of households reporting neighborhood problems	{0,1}
pctcrime	percent of households reporting crime in neighborhood	{0,1}
pctebarcl	percent of houses with bars on windows	{0,1}
nleak	neighborhood average of houses with water leaks	{0,1}
nholes	neighborhood average of houses with holes in floor	{0,1}
ncracks	neighborhood average of houses with cracks or holes in ceiling or walls	{0,1}
meaneducation	average years of education in neighborhood	{3.2, 26}
nincome	average neighborhood income ($)	{7,811, 224,5643}

Table 1.4: Name and Description of Variables

Variable Name	Description
Dependent Variable	
value	self-reported owner-estimated market value of property
Unit Characteristics	
rooms	number of rooms in unit
baths	number of bathrooms in unit
half baths	number of half bathrooms in unit
unitsf	square footage of unit
ac	indicator if you unit has air condition (central or window units)
porch	indicator if unit has porch, balcony or deck
garage	indicator if unit has garage or covered parking space
leak	indicator if water leaked into the unit in the last 12 months
holes	indicator if unit has holes in floor
cracks	indicator if cracks or holes in wall or ceiling in unit
built	age of the unit
singlefamily	indicator if it is a single-family housing unit
Household Characteristics	
age	age of reference person
agesq	age squared of reference person
per	number of people living in the unit
married	indicator if reference person is married
male	indicator if reference person is male
grade1	years of education of reference person
ln(income)	log of total household income
movedin	years reference person has lived in unit
Characteristics of Neighborhood	
nage	mean age of reference people in neighborhood
nperson	mean number of people in household in neighborhood
pctmarried	percent of married couples in neighborhood
pctowner	percent of owner-occupied housing in neighborhood
nlnincome	log of mean household income in neighborhood
meaneducation	average years of schooling of all reference people in neighborhood
nhousingcharacteristics	average of all housing characteristics in neighborhood (e.g. rooms, bathrooms, ac, age of units, square footage, garage, porch, holes, cracks, leak)
pctcrime	percent of units reporting crime in neighborhood
pctnprobs	percent of units reporting bothersome problems within neighborhood
pctebarcl	percent of units in neighborhood for which enumerator observed bars on windows
Location and Year Dummies	
city	indicator that unit is in central city of MSA
rural	idicator that unit is in rural area
urban	indicator that unit is in urban area
other urban	indicator that unit is in an urban area other than outside a metropolitan city
north	indicator that unit is located in the north
south	indicator that unit is located in the south
west	indicator that unit is located in the west
midwest	indicator that unit is located in the mid west
y85	indicator that unit was observed in 85
y89	indicator that unit was observed in 89
y93	indicator that unit was observed in 93

Table 1.4: Name and Description of Variables continued

Variable Name	Description
Type of Neighborhood variables	
black	indicator that reference person is black
white	indicator that reference person is white
other	indicator if reference person is neither black or white (e.g. Asian, Native American)
pctblack	percentage of houses with black reference person
pctwhite	percentage of houses with white reference person
bhood	indicator for black neighborhood (>30% of black)
whood	indicator for white neighborhood (<15% of black)
inthood	indicator for integrated neighborhood (15% <of black reference people >30%
vacant	indicator the at least one person in neighborhood observes an abandondened/vandalized structure within 300 feet
pctvacant	percentage of abandoned houses in neighborhood
vacantd	indicator that at least one abandoned structure in neighborhood
bhood $\times vacant$	indicator for being in a black neighborhood with an abandoned unit nearby
whood $\times vacant$	indicator for being in a white neighborhood with an abandoned unit nearby
inthood $\times vacant$	indicator for being in an integrated neighborhood with an abandoned unit nearby

Table 1.5: Selected Hedonic Price Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)
Housing Characteristics						
# of rooms	0.0532***	0.0577***	0.0568***	0.0481***	0.0583***	0.0578***
	(0.0077)	(0.0071)	(0.0071)	(0.0069)	(0.0067)	(0.0067)
# of baths	0.186***	0.0425***	0.0421***	0.155***	0.0376***	0.0375***
	(0.0218)	(0.0175)	(0.0173)	(0.0190)	(0.0161)	(0.016)
unit's age	−0.0238**	−0.0296**	−0.0292**	−0.0234**	−0.0294**	−0.029***
	(0.0037)	(0.0056)	(0.0056)	(0.0036)	(0.0053)	(0.0053)
Owner Characteristics						
married	0.0892***	0.0272	0.0216	0.0763***	0.0251	0.0212
	(0.0210)	(0.0176)	(0.0175)	(0.0187)	(0.0165)	(0.0165)
years of education	0.0168***	0.00236**	0.00243**	0.0130***	0.00222**	0.00229**
	(0.0016)	(0.0013)	(0.0013)	(0.0014)	(0.0012)	(0.0012)
log of income	0.119***	0.0127**	0.0130**	0.0920***	0.0142**	0.0141**
	(0.0133)	(0.0083)	(0.0084)	(0.0111)	(0.0078)	(0.0078)
Neighbor's Characteristics and Demographics						
mean # rooms		−0.102***	−0.0944***		−0.0914***	−0.0883***
		(0.0102)	(0.0103)		(0.0098)	(0.0098)
mean # baths		0.183***	0.173***		0.171***	0.171***
		(0.0285)	(0.0283)		(0.0257)	(0.0257)
average age of units		0.0504***	0.0498***		0.0546***	0.0529***
		(0.0071)	(0.0071)		(0.0068)	(0.0068)
mean of lnincome		0.926***	0.904***		0.763.***	0.746***
		(0.0229)	(0.0231)		(0.0226)	(0.0228)
average level of education		0.0096***	0.0096***		0.0076***	0.0079***
		(0.0027)	(0.0027)		(0.0026)	(0.0026)
Neighborhood						
problems (%)		−0.0225	−0.0370		−0.1070***	−0.1120***
		(0.0306)	(0.0306)		(0.0291)	(0.0292)
crime (%)		−0.0608*	−0.0468		−0.0793**	−0.0739**
		(0.0341)	(0.0345)		(0.0343)	(0.0345)
bhood			−0.135***			−0.0828***
			(0.0229)			(0.0221)
inthood			−0.0882***			−0.0928***
			(0.0316)			(0.0299)
bhood x vacant			−0.298**			−0.2050*
			(0.1240)			(0.0111)
inthood x vacant			0.194			0.1580
			(0.138)			(0.15)
vacant	−0.3730***	−0.1570***	−0.0614	−0.3510***	−0.1640***	−0.0982*
	(0.0695)	(0.0573)	(0.0626)	(0.05660)	(0.0520)	(0.0595)
Constant	9.137***	0.473***	0.673***	9.837***	2.441***	2.637***
	(0.1090)	(0.2240)	(0.2250)	(0.1010)	(0.2280)	(0.2300)
Observations	6,253	6,253	6,253	6,253	6,253	6,253
R-squared	0.351	0.546	0.549	0.492	0.603	0.604
Owner Characteristics	Y	Y	Y	Y	Y	Y
Neighborhood Characteristics	N	Y	Y	N	Y	Y
Neighborhood Type Dummy	N	N	Y	N	N	Y
Geographic Characteristics	N	N	N	Y	Y	Y

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Table 5 presents the results of estimating an hedonic price model with log of house value as the dependent variable and a dummy variable to indicate whether there is a vacant house within 300 feet. Columns 4–6 include additional location variables that are not reported.

Table 1.6: Selected Hedonic Price Regression Results (using a Neighborhood dummy)

	(1)	(2)	(3)	(4)	(5)	(6)
Housing Characteristics						
# of rooms	0.0533***	0.0580***	0.0568***	0.0480***	0.0587***	0.0580***
	(0.0077)	(0.0072)	(0.0071)	(0.0068)	(0.0066)	(0.0067)
# of baths	0.1900***	0.0431**	0.0435***	0.1570***	0.0384***	0.0389***
	(0.0212)	(0.0172)	(0.0166)	(0.0184)	(0.0158)	(0.0154)
unit's age	−0.0238***	−0.0296***	−0.0295***	−0.0234***	−0.0294***	−0.0292***
	(0.0037)	(0.0057)	(0.0056)	(0.0036)	(0.0053)	(0.0053)
Owner Characteristics						
married	0.0892***	0.0272	0.0204	0.0763***	0.0251	0.0194
	(0.0210)	(0.0176)	(0.0175)	(0.0187)	(0.0165)	(0.0164)
years of education	0.0160***	0.00228*	0.00239*	0.0121***	0.0021*	0.0022*
	(0.0016)	(0.0014)	(0.0014)	(0.0014)	(0.0012)	(0.0012)
log of income	0.1190***	0.0127**	0.0134**	0.0920***	0.0141**	0.0146**
	(0.0072)	(0.0064)	(0.0063)	(0.0065)	(0.0059)	(0.0059)
Neighbor's House Demographics and Characteristics						
mean # rooms		−0.1020***	−0.0929***		−0.0914***	−0.0871***
		(0.0102)	(0.0102)		(0.0097)	(0.0097)
mean # baths		0.183***	0.178***		0.171***	0.177***
		(0.0245)	(0.0243)		(0.0239)	(0.0238)
mean age of units		0.0504***	0.0503***		0.0546***	0.0537***
		(0.0071)	(0.0071)		(0.0068)	(0.0068)
mean of lnincome		0.926***	0.891***		0.763***	0.730***
		(0.0229)	(0.0231)		(0.0226)	(0.0228)
average level of education		0.0096***	0.0094***		0.0076***	0.0079***
		(0.0027)	(0.0027)		(0.0026)	(0.0026)
Neighborhood						
problems (%)		−0.0225	−0.0403		−0.1070***	−0.1150***
		(0.0306)	(0.0305)		(0.0291)	(0.0290)
crime (%)		−0.0588*	−0.0558		−0.0763**	−0.0781*
		(0.0343)	(0.0349)		(0.0346)	(0.0348)
bhood			−0.0427			−0.0024
			(0.0326)			(0.0320)
inthood			−0.0518			−0.0515
			(0.0333)			(0.0325)
bhood x vacant			−0.375***			−0.278***
			(0.0832)			(0.0763)
inthood x vacant			0.285***			0.2810***
			(0.0730)			(0.07454)
vacant	−0.3350***	−0.0989***	−0.0061	−0.3200***	−0.1280***	−0.0543
	(0.0399)	(0.0335)	(0.0344)	(0.0345)	(0.0312)	(0.0335)
Constant	9.137***	0.473**	0.810***	9.837***	2.441***	2.795***
	(0.109)	(0.224)	(0.225)	(0.101)	(0.228)	(0.230)
Observations	6,253	6,253	6,253	6,253	6,253	6,253
R-squared	0.357	0.546	0.551	0.497	0.604	0.606
Owner Characteristics	Y	Y	Y	Y	Y	Y
Neighborhood Characteristics	N	Y	Y	N	Y	Y
Neighborhood Type Dummy	N	N	Y	N	N	Y
Geographic Characteristics	N	N	N	Y	Y	Y

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Table 6 presents the results of estimating an hedonic price model with log of house value as the dependent variable and a dummy variable to indicate whether there is a vacant house in the neighborhood. Columns 4–6 include additional location variables that are not reported.

Chapter 2

The Financial State of Municipalities and the Effect on Housing Values

1. Introduction

In recent years concerns about the financial stability of local governments have risen significantly. Detroit, MI and Harrisburg, PA are just two examples of cities that have experienced tremendous financial problems over the last 10 years. Considering the increase in the number of municipal bankruptcy filings since the early 2000s (`http://www.governing.com/gov-data/municipal-cities-counties-bankruptcies-and-defaults.html`), such concerns might seem appropriate. Although, the number of municipalities that have formally entered bankruptcy is small, a number of local governments have experienced fiscal strain during the past 30 years. While there seems to be no consensus in the literature regarding what exactly qualifies a municipality to be in financial distress, some

financial measures that provide a way to test the fiscal solvency of a local government have been developed and more or less accepted.

A local government could find itself in a financially undesirable situation for a number of reasons. The recent economic and financial literature focused on the relationship between revenues, capital expenditure and debt incurred by local governments (DeSanto et al., 1991, Watson et al. 1995, Kloha et al. 2005, Trussell and Patrick, 2009, 2011). One of the prime reasons for concern comes from the investment side. As a municipality displays signs of financial strain it becomes harder to raise funds, by issuing bonds, to pay for various capital outlays and other local government projects. Another potential impact has not received much attention from a research point of view– the impact on housing values in financially distress municipalities.

The hedonic pricing literature is vast, as researchers attempt to quantify the impact of individual housing characteristics, neighborhood demographics and amenities on the value of housing units. A large portion of the literature shows the importance of school quality on housing prices. In the Tiebout sorting model, homeowners self-select into areas with amenities that satisfy their desires (Bayer et al., 2004; Fack and Grenet ,2010: Nguyen-Hoang and Yinger, 2011). However, few studies have investigated the link between a city's fiscal solvency and its impact on housing values. The primary objective of this study is to show the effect of cities financial state has on housing prices. In a traditional hedonic framework, it can be expected that the revenues collected by a city, debt incurred and capital outlays will directly impact the provision of high quality roads, schools, public places and other public services that affect the quality of life for the cities' residents. Homeowners in localities that are unable to provide a sufficient level of public service or have a large decline in the service previously provided may experience a decline in their housing value due to the decrease in the city's 'attractiveness' and the potential resulting decline in housing

demand.

This study uses four different data sources to construct a data set suitable to investigate the effect of municipality's financial state on housing values. The data contain information on 68,882 housing units located in 175 different cities across 42 states. Following the financial literature, financial ratios are constructed to proxy for four types of a city's financial solvency; cash-solvency, budget solvency, long-term solvency and service solvency. In line with findings of Trussell and Patrick (2009), the results suggest that cities with a higher revenue to end-of-year debt ratio, measuring cities cash-solvency, on average have higher housing values in subsequent years. The higher ratio indicates that a city is financially stable, at least in the short-run and is likely able to provide the kinds of services and amenities that residents value, therefore increasing housing demand. A "beautify the downtown" campaign may, in fact, lead residents to want to live in the urban center; examples include San Diego, CA and Greenville, SC, though the outcomes have been a mix of success and failure.

On the other hand, cities with a high revenue to capital outlays ratio tend to have lower housing values. Many of the amenities that provide utility to residents, such as highways construction and repair, building of green places and improved school quality, require capital outlay. If a city's revenues are not used for such expenses residents might be more likely to move, decreasing the demand for housing and housing prices. These results provide evidence that the financial stability of a city has a positive impact on housing values, whereas cities that are financially unstable will impact housing values negatively. A more detailed analysis of all solvency measures can be found in the result section. The paper is organized as follows: Section II looks at the previous literature, Section III presents the data, Section IV presents the model and results and Section V concludes.

2. Literature

Over the years there have been numerous theories attempting to explain changes in housing prices. Several studies investigate how regulatory mechanisms imposed by local and state government affect local housing prices. Courant (1976) shows that zoning restrictions increased housing prices. Katz and Rosen (1987) suggest that municipal regulated land-use prevents cheaper land from being developed, especially impacting lower-income and middle-income residents. These regulations keep housing prices artificially high imposing higher costs on home builders, which are passed through to municipal residents. Katz and Rosen (1987) find that housing prices are 17 percent to 38 percent higher in communities with extensive land-use regulations.

Pollakowski and Wachter (1990) note that, since regulations are not independent of each other, investigating them one-by-one, such as land-use constraint singularly, lower the net total impact on housing prices. Land-use constraints might be an explicit regulation that limits the number of housing units available to lower-income individuals within a community (the implicit regulation). At the same time, it boosts median income and, with that, revenues collected from 'over-inflated' housing prices. As individuals are able to move between municipalities, these areas may alter the regulatory framework or provide differential services to generate a desire for individuals to move there (such as limiting the number of lower-income houses that can be built, increasing the supply of high-income individuals who would want to move into the municipality). The authors find that land-use regulations increase housing prices and developed land prices, which potentially limits the entry of lower-income individuals into the municipality. However, municipality land-use regulations cause spillover effects to other municipalities, mitigating (somewhat) the negative effects on

lower-income individuals. Malpezzi (1996) does not limit regulation to land-use constraints, but finds that the regulatory regimes of municipalities raises housing rents and lowers homeownership rates.

Kane, Staiger, and Reigg (2005) investigate the impact of de-regulation on housing values. They find that housing prices are influenced by the amenities of a locality, such as school quality. The authors show that there are differences in housing prices along the boundary of school districts, and argue that these results mitigate the impacts school desegregation.

Many housing and urban development studies have focused on changes in housing prices as a response to municipalities competing for desirable individuals, a modification of the traditional Tiebout sorting model, where municipalities offer the amenities that will attract the most desirable individuals. Rhode and Strumpf (2003) note that movement by households into geographic areas that are closely aligned with their own demographic features, such as race, are inconsistent with the Tiebout model, where residential choice depends solely on local public goods. They argue that individuals will sort into more homogeneous communities over time. Bayer et al. (2004) note that school quality plays a central role in the determination of housing demand. Individuals tend to create communities with like-minded individuals, and sort themselves based on the amenities provided by these localities. Thus, with a decline in services, such as school quality, housing demand may be adversely affected as individuals seek to find alternative locales. Fack and Grenet (2010) find that better public schools lead to an increase in housing demand and an increase in housing prices of 1.4 to 2.4-percent. However, the authors also find that these housing price effects may be minimized with the availability of alternatives, such as private schools. This finding is supported by other studies, such as Nguyen-Hoang and Yinger (2011), who find that, on average, a standard deviation increase in school quality (measured by

standardized test scores) leads to a rise in housing prices by as much as 4-percent. Thus, it appears that neighborhood sorting plays a role in housing prices, and changes to the provision of services will impact housing prices immensely.

Ozannae and Thibodeau (1983) explain that the dispersion of municipal powers, where there is a greater concentration of municipalities in an area, leads to a lower value of housing. As the municipalities compete for the scarce desirable individuals, they change amenities and regulations to lower the value of housing. Likewise, Hendershott and Thibodeau (1990) find that municipalities engage in competition for services, so that a higher concentration of municipalities leads to lowered housing prices in that area. Some authors have attempted to explain longer-term changes in housing prices. DiPasquale (1992) notes that much of the time series movement in both house prices and the homeownership rate can be explained by changes in the demand for housing, which is a result of variations in interest rates, inflation, and tax policies.

After the most recent financial crisis, which began at the end of 2007,where many cities were impacted by the bust of the housing bubble, many theories have suggested a variety of causal mechanisms. In contrast to the studies that have found that housing prices are based on traditional fundamentals, Lai and Van Order (2010) have noted that the fundamental relationships between housing prices and its causal factors have changed in recent years.The authors note that these observed fundamentals explain a small fraction of the more recent changes in house prices. Glaeser, Gottlieb, and Gyourko (2010) agree, finding that real interest rate changes had only a 20-percent impact on the increase in housing demand from 1996 to 2006. They argue that the fundamental policies that have changed the demand for housing (which affects the price of housing) have been altered. In a similar vein, Shiller (2009) argues that traditional fundamentals have not played a large role in explaining huge hous-

ing price variations, instead irrational exuberance of investors has played a key role. Soo (2014) investigates the role of these animal spirits, and finds that the positive or negative tones that are found in newspaper articles influence aggregate price trends in housing markets by a significant amount.

This study uses the Tiebout sorting model as a starting point and investigates the relationship between housing value and the municipal financial state. Many studies investigating the solvency of a municipality utilize bond rating, since these are readily available, whereas detailed financial information on municipalities is more tedious to collect. As municipal bond ratings decrease (for a variety of reasons, such as a decrease in the expected solvency of a municipality), people anticipate that the services the municipality may provide (or the regulations that the municipality will have to put into place) may not be as unique as they once were (or available at all). Individuals will vote with their feet and leave the area, depressing housing prices by decreasing the demand for housing. Thus, the impacts of revenue and expenditure streams on fiscal solvency can impact the services provided by a municipal, city, or county government.

Throughout the last 10 years there has been an increase in research studies in the public finance and financial literature, exploring municipal financial distress, its causes and how to measure it. While there still seems to be no definite agreement on the best measures, a variety of factors have been identified, that impact the probability of financial distress for local governments. Watson et al. (1995) note that these factors include 1) problems with financial management; 2) a declining population; 3) structural changes within the city's economic base; 4) natural or man-made disasters; and 5) civic distrust. Population decline is similar to Tiebout sorting; people see increases in crime or deteriorating services and move, which further degrades the tax base of the local government. Watson et al. (1995) also note that fiscally stressed cities

are often more receptive to risky economic ventures and strategies in an attempt to boost the economic prospects and cause people to move back. Watson (1995) includes, as a case study, the history of Bessemer, Alabama. Bessemer depended for a long time on the steel industry. The author notes that "Bessemer, Alabama, located less than twenty miles out of Birmingham, enjoyed a healthy economy for many decades deeply rooted in the steel industry. Since its founding in 1886, Bessemer was known as a wealthy industrial city that was economically dependent on a heavy industrial manufacturing sector and its superior mineral resources. The national economic changes of the 1970s and 1980s coupled with the 'lack of competitiveness of American steel companies' greatly impacted the local economy in Bessemer. Because the city had relied so heavily on the iron and steel industries for the employment of a majority of its residents, changes in the national economy caused Bessemer's unemployment to skyrocket to 35 percent in 1983" (Watson, 1995, pp. 48–49).

A number of studies examine the links between housing values and municipal or state bond ratings. Liu and Thakor (1984) find that state bond rating differences are due to four main factors: (1) total net direct debt; (2) per capita debt; (3) the unemployment rate; and (4) the median home value. The authors find that only the median home value does not have a significant impact on bond yields. This may lend credence to this study's theory, that the causal mechanism, at the least, might work in the reverse direction. Mason and Rosner (2007) find that the mis-pricing of residential mortgage backed securities by ratings agencies, caused individuals to discount other forms of debt, such as municipal bonds, again signifying the traditional link that people believe, that housing prices affect municipal bond ratings. Denison (2003), Greenwald (2010), and Nanda and Singh (2004) note that focusing on bond ratings may be a faulty measure, due to the mis-pricing of bonds by ratings agencies or the fact that they are covered by insurance, distorting the true price of fiscal solvency.

In order to analyze the impact of fiscal solvency on the services provided by a municipality, township, city, county or special district, which potentially has an impact on the desire of individuals to move to a specific location, a financial measure has to be constructed. Unfortunately, there are issues with generating testable conclusions from the multitude of financial distress definitions at a local level. The GAO (1990) defines fiscal distress as a condition where worse-off residents pay higher taxes than better-off residents to receive the same services. DeSanto et al. (1991) define fiscal distress as persistent shortfalls in cash flows. Kloha et al. (2005) define it as a failure to meet the needs of the community. Raman (1982) defines a fiscally distressed government as one with a downgraded bond rating; this definition is a bit weaker, as a downgrade from AAA to AA+ is likely to be a minimal issue.

Trussell and Patrick (2011) operationalize fiscal distress as a persistent decline in revenues to expenses. The authors focus on special districts, which are local government organizations that are created by local governments to provide a limited number of services, such as natural resource protection, based on the idea that these will be more efficient. They find that fiscal distress is positively correlated with revenue concentration and debt usage. In an earlier study, Trussell and Patrick (2009) define revenue concentration as the number of revenue streams a district has. Somewhat surprisingly, the results suggest that fiscally distressed districts have more diverse revenue sources, lower capital expenditures (likely a proxy for no ability to generate future revenues or that future distress is indicated by decreases in capital expenditures), higher debt usage (likely a proxy for a fiscal shortfall), and are larger in size than non-distressed districts. The most important indicator of fiscal distress is a low level of capital expenditures relative to total revenues and bond proceeds, as this means that the district does not have the funds to provide services. Districts that increase capital expenditures relative to total revenues and bond proceeds by

0.10 are associated with a 0.271 decrease in the odds of fiscal distress.

3. Data

3.1. Data Overview

Data for this study are compiled from four different sources; the Integrated Public Use Microdata Series (IPUMS) , the United States Government Census, the Bureau of Labor Statistics and the Bureau of Economic Analysis [1].

Information on housing units' values and characteristics and household demographics are drawn from the 2011 IPUMS 1% unweighted sample. The IPUMS data consist of samples of the American population drawn from the American Community Surveys of 2000-2013, and is maintained by the Minnesota Population Center at the University of Minnesota (Steven Ruggles, J. Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek, 2010). The data provide detailed information on individual persons and households over time. This study investigates separately the impact of the financial condition on the value of single-family housing units and rented units, since individuals residing in rented units do not report the housing units value, but rather the contracted rent. In order to investigate the impact of municipalities financial state on the value of the housing units within the municipality it is vital to observe the geographic location of the housing unit. While the exact location of each individual in the sample is recorded, confidentiality requirements prevent use of this information. Since 1990, the smallest observable geographic areas are places with a population of more than 100,000. Consequently, less densely populated areas are not identifiable. All observations whose location can

[1] A more detailed explanation of the data and the matching process appears in the Appendix.

not be identified to at least the city level and that have missing values are eliminated, leaving 68,882 observation in 175 different cities, lying in 115 Metropolitan Statistical Areas (MSAs), across 42 states. Summary statistics by city are shown in Table 1.

In order to establish similar sized areas (containing 100,000 people or more) the Census Bureau separates metropolitan areas into public use micro areas (PUMAs). This study uses the PUMAs to construct 'community' controls, including percentage of black households, percentage of population with a college degree, mean housing value, percentage of households married and average age.

It can be expected that, on average, the housing stock of a city with a high unemployment rate and low-level per capita personal income will be of lower value than that of a city with low unemployment and high-level per capita personal income, regardless of the city's financial state. Therefore, measures are included to control for differences in economic activity across cities. MSA level economic controls, such as the unemployment rate, the per capita income and the change in population from the previous year are drawn from the Bureau of Labor Statistic (`(http://www.bls.gov/data/)`) and Bureau of Economic Analysis websites (`(http://www.bea.gov/)`).

The financial measures for each city government are drawn from the 2010 U.S. Census of Government. Since 1850 the U.S. Census has compiled financial statistics of state and local government on an annual basis. At first only very broad categories were reported (e.g. tax levies, governmental debt and wealth), but over time the reported financial data have become more detailed. Today, the financial data consist of over 700 different variables describing different revenue sources (taxes, interest income, etc.), expenditures (government workers' wages, education, safety, etc.) and indebtedness (long-term and short-term debt, interest payment, etc.) of each government type. The 2010 Census of government consists of 24,447 observations, of which 3,512 are cities within the U.S. Only the cities that match the IPUMS sample are used. The

financial variables are used to construct measures that represent a cities financial state.

3.2. Financial Condition Measures

Fiscal hardship can result from either reduced revenues (e.g. due to a depressed property base resulting from a declining economy), increase in expenditures or capital outlays above a sustainable level (if the city cannot actually afford to provide all their services), or high debt burdens (where any revenues must be spent on servicing debt i.e. paying interest). Following Wang et al. (2007), financial solvency (which is comprised of cash, budget, long-run and service-level) is the focus as the financial state measure. The focus here is not on developing a new measure of financial state, but the impact it has on individuals living within a given community. Therefore, the most agreed upon and widely accepted financial condition measures are used. Table 2 summarizes the financial indicators used to proxy for each of the four solvencies.

The multidimensional concept of the financial condition of a city permits a more complete evaluation of cities financial condition. Even though all four solvency measures are related to one another it is vital to explore each one of them. An unfavorable value in the short-term does not necessarily imply that the municipality is going to experience severe financial problems in the future, whereas a favorable short-term solvency indicator, does not imply long-term financial stability.

Three ratios are used to proxy for *Cash Solvency*;'Debt-to-Cash' (total debt outstanding/total cash and securities), 'STDebt-to-Cash' (short-term debt at end-of-year/total cash and securities), and 'Revenue-to-STDebt' (general revenue/short-term debt at end-of-year). These ratios measure a city's ability to cover its current liabilities with its current assets. In general, a smaller value for the first two ratios

and a larger value for the Revenue-to-STDebt can be understood as having a larger cash solvency. A municipality with a large cash solvency would appear financially more stable and therefore should have a positive impact on housing values.

The 'Operating ratio' (total revenues/total expenses), is used as a proxy for *Budget Solvency*, which reflects a municipality's ability to balance its budget by raising sufficient revenues to cover its expenses. While a high value indicates financial stability, when solely looking at this ratio one has to be careful in interpreting the reliability of it as a measure of financial stability. Most states in the U.S. require local governments to balance their budgets, which means that many local governments will have a favorable value for the operating ratio, but might actually experience financial distress. Regardless of this issue, the ratio should have a positive impact on housing value.

Two different ratios are constructed to measure a municipality's *Long-Run Solvency*. 'LTLiability' (total long-term debt outstanding/total interest on debt), measuring a municipality's indebtedness and 'LTLiabilityperC' (total long-term debt outstanding/population). A higher value is associated with lower long-term solvency, which means that the municipality experiences difficulties to meet its long-term obligation. These obligations include current obligations, which arise annually, as well as any obligations that only enter into the budget when they have to be paid, such as new road building, future pension obligations, future debt payments etc.

Service-Level Solvency measures a city's ability to continue to provide the current level of service. Three indicators are constructed, 'TperC' (total taxes/population), 'RperC' (total revenue/population) and 'EperC' (total expenditure/population). Each of these measures relates to the amount of funds a city raises and spends per resident, or how much of the revenues are raised by 'burdening' the residents (through property taxes, income taxes etc). A high level of per capita taxes

should be reflected in a lower housing value, while a high value of per capita revenue should impact housing value in a positive way. Descriptive statistics of the financial indicators are in Table 3.

4. The Statistical Model

Individuals consume "housing services", which are determined by, or are a function of, various attributes in a specific housing unit. Bundled together, these attributes will be valued differently, not solely on an individual's preferences, but also on the location. The location and the accompanying amenities will greatly influence the valuation as well. Research has shown that a well-maintained neighborhood, where neighbors are friendly and the overall feeling is communal would generally be preferred to one where crime occurs and people are suspicious of those who live nearby (Bishop et al. (2011)). Hence, it is necessary to look at each component and its impact on the value individually. A hedonic pricing model permits taking a variety of characteristics into consideration in order to estimate the marginal effects these have on the value of a house.

A large number of research studies estimate the impact of housing characteristics and various other factors, that contribute to the utility an individual gets from housing consumption, and their impact on the value of housing. However, these housing and demographic characteristics are not the only factors that influence the value of a house. Like compensating wage differentials, there will be compensating house price differentials based on the locality one resides in. These compensating housing differentials are based on a variety of factors, including the amenities provided by the city or MSA. Another incentive that drives housing demand is school quality, where individuals are willing to pay higher housing prices in areas with higher school quality as

noted by Bayer et al. (2004), Fack and Grenet (2010), and Nguyen-Hoang and Yinger (2011). Other authors provide evidence that municipal competition, where municipalities compete by providing larger quantity or better quality amenities, drives housing prices (Hendershott and Thibodeau, 1990; Ozanne and Thibodeau, 1983). Thus, it is likely that high levels of amenities such as green spaces, safe and vibrant downtowns, quality roads, and competent public service staffs will lead to higher housing demand, increasing the value of the houses in a given city.

However, the provision of public goods by cities is constrained (in some cases) by balanced budget amendments, where cities must balance their budget based on some time frame found in their local charter laws. Fiscal solvency is a measure for the ability of a city to provide high levels of public goods to its citizens, which may attract citizens from nearby, local cities. To capture the various effects, the hedonic pricing model takes the form

$$ln(value_i) = \alpha + X_i\beta_1 + Z_i\beta_2 + C_i\beta_3 + FS_i\beta_4 + v_i, \tag{1}$$

where $ln(value_i)$ is the log of an owner's self-reported housing value. The vector X_i contains observable house characteristics, Z_i contains observable demographic characteristics, C_i contains city and MSA control variables, and FS_i represents the fiscal solvency of a city. A more detailed description of the variables used in the hedonic pricing regression can be found in Table 4.

5. Estimation and Results

A variety of different city-level financial measures are implemented to capture the impact of the financial state of cities on housing values. Analogous to the hedonic

price literature, controls for dwelling type and size, owner/renter demographics, and community control variables are included, to capture the impact of these features on housing prices. All regressions are estimated using state fixed effects and city-level robust standard errors, Tables 5–8.

All models show that an increase in the number of rooms for a house, which in combination with number of bedrooms serves as a proxy for the size of a house, leads to an increase in the value of the unit. As expected, an increase in the number of bedrooms in the housing unit increases the housing value across all specifications. A 1 bedroom increase in a house leads to a 6.7 percent increase in the value of a house. The magnitude of this coefficient and its significance is constant across models. This supports intuition and previous findings, as houses with more bedrooms also tend to be larger in size. The magnitude for an increase in the value of the house caused by an increase in the number of bedrooms is larger than that for an increase in the number of rooms (6.7 percent compared to 3.5 percent). This finding holds for owner occupied units as well as rented units. Table 8 column 2, shows the results for renter occupied units. Here, an extra bedroom leads to an increase in rent by about 8.4%. Intuitively, most apartments have a living room and a dining room, but differ in terms of number of bedrooms and bathrooms, hence, the number of bedrooms has a larger impact on rent than the number of rooms.

The impact of various demographic variables are similar across all models (Tables 5–8). Increases in household income lead to increases in the value of a house. This may come from a variety of factors. One is that homeowners, as their income increases, may choose to improve or add features to their home that increase the value of their home, such as a landscaped yard, a backyard patio, or even a garage. A second is that as homeowners get more income, they often move to newer, larger, and more expensive homes, a phenomenon that has been referred to as “keeping up

with the Joneses".

Similarly, the level of education by the head of household has a consistent and significant impact on the value of a house. While it is hard to see how education would have a direct effect on the value of housing, it can be argued that education is proxying for some level of quality or wealth effect. On average, people with higher levels of education have higher levels of income and over time are able to acquire higher levels of wealth. Wealthier people are likely to demand different amenities in their neighborhood and community, and are willing to contribute to them, for example through maintenance on their home and property, then less wealthy people. Owners with a bachelor degree live in more valuable homes, this result is likely due to the fact that more highly educated households are paid more and can afford higher-priced homes. Interestingly, Table 5, shows that not only an owner's own education matters, but the level of education in the 'community' as a whole. As the percentage of people with a bachelor's degree increases housing values increase as well. More highly educated individuals are more likely to be able to afford luxury household services, such as landscaping or maid services, which makes the home more visually appealing from the outside. Similarly, since homeowners tend to move into neighborhoods with individuals with similar characteristics, highly educated neighborhoods are also likely to have higher housing values.

Literature on racial discrimination in housing markets has shown that primarily black neighborhoods have lower housing values. The negative coefficient on *nblack*, percentage of black households in a given Puma, supports these previous findings. This result supports the argument for the existence of racial sorting, or each race segmenting into a different and distinct part of the MSA, which can lead to significantly lower housing values. A similar explanation is noted by Rhode and Strumpf (2004). Another potential explanation is "white flight", where whites may

choose to leave a given area ones 'blacks' start to move in and relocate to the suburbs (another city or another MSA), depressing home values. We find similar results when using rent as the dependent variable; a 10 percent increase in the fraction of blacks in a given PUMA leads to a 30% decrease in rent.

This study utilizes a wide variety of city financial measures to capture the impact of the cities financial state on housing values. To show why it is important to look at different financial ratios, capturing different types of solvency, instead of relying only on a few, the hedonic regression is run separately using only 'one type' of solvency before including all measures in one regression.

Table 5 shows the regressions results including the financial ratios capturing a city's cash solvency and budget solvency. Column 1 shows that the $debt - to - cash$ ratio has no impact on the value of a house. The $STdebt - to - Cash$ ratio, on the other hand, has a significant and negative impact on the value of houses in a city. The coefficient, in column 2 and 3, suggest that a 10-percent increase in this ratio leads to a 3.2 to 3.3-percent decrease in the value of houses within that city. Since short-term debt must be paid back quickly, increases in this ratio means that the financial obligations, to pay back interest and principal, have increased. If cities have no changes in their ability to pay back this debt, it is likely that they will start reducing "luxury" expenditures, such as improving city amenities, to pay down the debt to meet their balanced budget amendments. This means less money spent on neighborhood parks, city green spaces, and downtown clean-up efforts, until the short-term debt has been reduced to a more manageable level. This result seems to confirm the findings in Trussell and Patrick (2009). The authors noted that fiscally distressed special districts had higher debt usage. Thus, the use of short-term debt may be a proxy for a distressed city.

The results for the regressions including the financial ratios capturing service

solvency are depicted in Table 6. Per capita revenues and per capita expenditures do not significantly affect housing values within the city. However, an increase in per capita taxes within a city leads to an increase in the value of houses within that city. The coefficient on $TperC$, suggest that a 10 percent increase in per capita tax revenue leads to a 7.8 percent increase in the value of a home. Column 5 shows the regression results when all service solvency proxies are included. The point estimate of $TperC$ suggests an increase in housing value by about 9.5 percent a result of an increase in per capita tax revenues of 10 percent, significant at .05. This may be due to a variety of factors, if taxes within a city are higher, residents of that city may expect a higher level of amenities being provided, affording them a more luxurious lifestyle. These higher level amenities may attract more individuals into the city. Bayer et al. (2004), Fack and Grenet (2010), and Nguyen-Hoang and Yinger (2011) show that better school quality funded by higher taxes increases housing values. Therefore, if the higher taxes are used to improve school quality housing values may increase, as more educated and wealthy individuals may choose to move into these areas. Another plausible explanation is that cities may levy higher taxes on richer areas. When a city levies higher property taxes on more prestigious areas, populated with more high income individuals, higher housing values will lead to higher taxes, as local city leaders realize that they can capture more rents from the populace, which will in turn increase housing values.

A third explanation is that individuals within the city, and the city leaders, levy higher taxes as a way to limit the amount of in-migration by lower income individuals. Pollakowski and Wachter (1990) note that land-use regulations may be a way to limit low-income individuals from moving into areas, by limiting the amount of low-income housing that can be built. Taxes may be another barrier to entry for lower-income individuals. All else equal, lower-income individuals are less able to pay high

property taxes or local income taxes, and as such may hesitate to move to these areas, even if they provide better quality (and higher quantity) amenities. Additionally, this study finds an increase in the revenue to capital outlays ratio leads to a decrease in the housing value, shown in Table 6 column 4. However, the decrease is very small, a 100-percent increase in this ratio leads to a 0.3 percent decline in housing values within a city. Though the effect is not large in level terms, it is significant at .1. Many amenities provided by a city require significant capital outlays. New highways, improvements to primary schools, fire departments, parks, and sidewalks are but some of the services provided by a city that require these outlays. If revenues are not being spent on these capital outlays, it is likely that they are being spent in other ways that residents of the city may not agree with. For instance, a city may use the increase in collected revenues to provide services that are targeted at a minority of residents, which can drive the residents not impacted out of the area. Trussell and Patrick (2009) note that special districts that have lower capital expenditures are more likely to be fiscally distressed. In fact, they note that increasing capital expenditures, relative to revenues and bond proceeds, by 10 percent lead to a 27.1 percent decrease in the odds of fiscal distress. If cities anticipate that they may not be able to generate enough revenues in the future, they may halt capital expenditures to provide for their budget shortfalls in the future. A lack of capital expenditures is therefore a proxy for no ability to generate future revenues. If individuals in the city witness this, they may choose to flee to neighboring cities or suburbs that may not be as impacted, or that do provide the specific type of capital expenditures that they desire.

Table 8, column 2 shows regression results where rent is used as the dependent variable. Apartment rents decrease as the *operatingratio* increases. Apartment rents also decrease as $TperC$ increase. As total revenues to total expenditures increases

(*operatingratio*), it is likely a sign of a booming economy. This may hint that individuals are substituting away from apartment living and towards purchasing houses, leading to a decrease in the former and an increase in the latter. It is akin to an income effect, where individuals utilize their higher incomes to purchase homes. The fact that per capita tax revenue decrease apartment rents is likely the fact that per capita taxes can be used as a barrier to entry for lower-income individuals (or anyone that city residents deem undesirable). For instance, increasing local sales taxes may push individuals who live in apartments to look for alternative locations to live.

6. Conclusions

A large portion of the finance literature has looked at potential causes leading to fiscal distress of cities and many studies in the urban and housing literature have investigated the impacts of various demographic and housing factors on the value of housing. In recent years there has been an increase in concern over the financial stability of cities and its effects, however, few studies have looked at the impact of fiscal solvency of cities on the value of housing. It has been shown that people do not choose their location of residence randomly, contrary, a lot of thought and considerable searching goes into that decision. While employment plays an important role many other factors have an influence on people's decision as well. People not just care about the characteristics of a housing unit, but also about their neighbors, the quality of their immediate neighborhood, access to public transportation, school quality and the amenities and services their community provides. Cities with high revenues are able to use their revenues to finance amenities within the city that can attract new residents and keep current residents in the area. Likewise, when cities have large amounts of capital expenditures, it is likely that they are financing amenities that

are desirable to certain segments of the population. However, if a city's financial situation becomes uncertain, it is likely that there will be decreases in the level of services provided or increases in taxes. Both scenarios are likely to be perceived as a disamenity to residents and negatively impact the demand for housing in such a city and with that may lead to a decrease in housing values.

Utilizing very detailed financial information on 175 cities, numerous financial condition measures are constructed proxying for four types of cities financial solvency. A hedonic housing price regression is estimated to measure the effect of these financial measures on the value of housing within a city. The results suggest that cities financial activities have a significant effect on housing values, where less financially stable cities experience a decrease in housing value compared to cities that appear to be financially stable. It is vital to focus on different solvency measures, since a city that appears to be financially stable in the short-run might experience problems in the long-run, while cities that appear to have financial shortages in the short-run, might actually be stable in the long-run. Additionally, cities with a high per capita revenue level may appear financially healthy, but if these revenues are not spend on services that their residents desire housing values may be impacted negatively.

While the results suggest that there is a negative effect of long-term solvency on housing values this effect is not statistically significant. This could be due to residents not fully knowing, or understanding the financial long-term obligation of their respective community. Short-term solvency has a negative impact on housing values as well, where an increase of 10 percent in $stdebt - to - cash$ will lead to decrease in housing value of 2.3 percent. Intuitively, if a city can not cover its short-term obligations with its 'cash on hands', people might observe an immediate change in service level. Interestingly, housing values increase by 0.7 percent as the per capita tax revenue of a city increases by 10 percent. The increase in tax revenues does

not have to come from an increase in property taxes, but could be a result of an increase in tax revenues from businesses operating in the city, potentially attracting more people. Additionally, if these taxes are used to fund public goods that are in larger quantity or higher quality it will attract citizens from different areas, further increasing the effect of a booming economy on the demand for housing, and leading to higher housing values.

The results support the notion that city-level fiscal solvency is an important determinant in housing prices, measured by a number of different indicators. This research can be extended by implementing a richer model exploring the individual substitutability between apartment rents and housing prices, as individuals search for city-level amenities that fit their preferred specifications. Also, it would be interesting to explore city-level efficiency of revenue and expenditure streams in providing a desirable area for homeowners to migrate to.

Table 2.1: Summary Statistics by City

City	Housing value ($)	Rent	# of Rooms	Property Tax	% black	% with HS degree	Unemployment rate	per capita income	population	% change in population	Revenue per capita
Akron, OH	85,488	464	3.65	9.47	0.275	0.602	0.090	40,171	207,934	0	1.87
Albany, NY	156,128	628	1.68	5.81	0.250	0.705	0.072	46,828	94,172	0.2	2.74
Alexandria, VA	449,041	1,362	3.87	17.22	0.172	0.667	0.061	60,547	140,024	1.9	4.73
Allentown, PA	123,850	558	2.25	6.21	0.095	0.555	0.087	41,495	107,117	0.4	1.63
Anaheim, CA	321,773	1,048	3.11	10.02	0.025	0.523	0.115	44,897	333,249	0.7	3.23
Anchorage, AK	243,633	933	2.54	11.75	0.047	0.612	0.067	50,719	279,671	1.2	5.52
Ann Arbor, MI	180,726	805	2.16	9.11	0.058	0.767	0.069	41,378	115,092	1	2.55
Arlington, TX	135,346	687	3.90	13.96	0.154	0.589	0.076	44,450	371,038	1.8	2.48
Augusta-Richmond	109,081	465	2.82	5.41	0.513	0.578	0.098	35,237	192,142	0.8	1.88
Austin, TX	223,990	783	3.03	12.27	0.072	0.643	0.066	41,641	743,074	3.1	4.29
Bakersfield, CA	175,921	684	3.40	10.22	0.067	0.509	0.148	33,123	315,837	0.9	1.24
Baltimore, MD	164,847	649	3.34	10.68	0.577	0.595	0.076	52,242	637,455	0.7	5.86
Baton Rouge, LA	141,636	613	3.29	3.47	0.510	0.640	0.077	38,442	227,071	0.5	5.11
Beaumont, TX	97,932	568	3.22	8.51	0.475	0.582	0.112	36,937	109,579	0.3	2.17
Bellevue, WA	359,569	1,077	4.09	15.99	0.019	0.687	0.087	51,350	121,347	1.4	2.45
Boise, ID	194,111	623	3.79	11.70	0.006	0.654	0.083	34,691	202,832	1.6	1.26
Boston, MA	388,368	958	2.10	6.94	0.221	0.708	0.066	58,530	599,351	0.9	6.92
Bridgeport, CT	194,907	606	2.45	11.23	0.340	0.505	0.085	78,708	136,695	0.9	4.85
Brownsville, TX	82,939	360	2.87	7.32	0.002	0.396	0.115	23,698	172,806	1.2	1.75
Buffalo, NY	95,050	480	3.36	5.22	0.352	0.583	0.082	41,842	272,632	0	5.24
Burbank, CA	519,488	1,075	3.66	11.22	0.007	0.612	0.115	44,897	103,286	0.7	5.11
Cambridge, MA	447,387	1,254	1.75	5.94	0.090	0.787	0.066	58,530	101,388	0.9	17.64
Cape Coral, FL	135,645	767	4.48	15.51	0.029	0.643	0.109	42,777	156,981	1.7	1.84
Chandler, AZ	150,292	871	4.07	10.93	0.039	0.633	0.087	37,190	246,399	1	1.40
Charlotte, NC	187,139	683	3.65	11.17	0.316	0.610	0.106	38,758	671,588	1.5	2.41
Chattanooga, TN	160,659	528	3.37	7.81	0.326	0.589	0.082	35,991	169,884	0.8	5.78
Chesapeake, VA	205,176	804	3.42	11.25	0.264	0.601	0.073	43,179	219,154	0.4	4.24
Chicago, IL	254,069	758	3.14	12.00	0.335	0.612	0.099	46,279	2,836,658	0.2	3.39
Chula Vista, CA	213,096	889	3.52	10.27	0.034	0.537	0.103	48,260	217,478	1.1	1.23
Cincinnati, OH	135,895	499	3.06	8.11	0.386	0.631	0.089	41,591	332,458	0.3	3.98
Cleveland, OH	105,077	453	3.87	7.09	0.494	0.557	0.074	42,964	438,042	-0.3	2.93
Columbia, SC	164,859	523	1.71	3.28	0.416	0.677	0.091	36,032	124,818	0.9	2.06
Columbus, GA	114,700	545	3.23	4.15	0.410	0.599	0.098	38,883	187,046	2.1	2.03
Corona, CA	241,595	975	3.62	12.95	0.060	0.554	0.130	31,218	150,308	1.3	1.96
Corpus Christi,	154,412	631	3.30	9.49	0.037	0.618	0.082	39,319	285,507	0.7	1.77
Costa Mesa, CA	497,245	1,134	2.97	12.34	0.012	0.596	0.115	44,897	108,978	0.7	1.00
Dayton, OH	66,423	418	2.10	4.67	0.389	0.641	0.094	38,710	155,461	0.1	2.35
Denver, CO	287,257	712	3.44	8.80	0.085	0.656	0.082	48,897	588,349	1.8	4.86
Des Moines, IA	107,959	623	2.88	10.01	0.107	0.615	0.055	45,004	196,998	1.5	2.11
Detroit, MI	62,767	483	3.96	8.87	0.794	0.551	0.114	40,776	916,952	-0.1	3.11
Downey, CA	336,870	977	2.96	11.57	0.043	0.536	0.115	44,897	108,109	0.7	0.91

Table 2.1: Summary Statistics by City continued

City	Housing value ($)	Rent	# of Rooms	Property Tax	% black	% with HS degree	Unemployment rate	per capita income	population	% change in population	Revenue per capita
El Monte, CA	243,947	797	2.43	8.18	0.016	0.406	0.115	44,897	122,272	0.7	0.79
Elizabeth, NJ	261,897	711	3.05	13.30	0.217	0.528	0.086	56,872	124,862	0.7	2.06
Erie, PA	81,415	471	2.49	6.33	0.145	0.647	0.082	36,247	103,650	0.1	1.33
Evansville, IN	79,351	504	3.14	5.39	0.098	0.624	0.079	39,257	116,253	0.3	1.70
Fayetteville, NC	124,289	569	3.66	9.01	0.458	0.611	0.105	43,484	171,853	1.5	2.47
Fontana, CA	209,654	614	3.42	13.59	0.081	0.465	0.130	31,218	183,502	1.3	1.47
Flint, MI	72,669	386	3.26	8.03	0.515	0.533	0.115	31,568	114,662	-0.8	4.96
Fort Collins, CO	196,827	794	2.85	7.08	0.011	0.694	0.071	40,259	133,899	1.5	2.45
Fort Wayne, IN	99,241	436	3.87	5.02	0.185	0.600	0.092	35,684	251,247	0.7	1.16
Fresno, CA	181,220	676	3.00	7.35	0.079	0.494	0.165	33,321	470,508	0.9	2.30
Fullerton, CA	368,534	993	2.44	8.48	0.018	0.594	0.115	44,897	132,066	0.7	1.27
Garden Grove, CA	306,604	992	3.26	11.41	0.009	0.520	0.115	44,897	165,610	0.7	1.21
Garland, TX	105,180	660	4.75	15.87	0.138	0.526	0.076	44,450	218,792	1.8	2.27
Gary, IN	97,103	428	4.47	10.54	0.843	0.541	0.099	46,279	96,429	0.2	1.82
Glendale, CA	536,031	1,007	3.33	11.23	0.014	0.607	0.115	44,897	196,979	0.7	2.79
Grand Rapids, MI	120,581	575	2.67	7.95	0.197	0.597	0.084	36,151	193,627	0.7	2.39
Green Bay, WI	134,250	484	2.72	10.96	0.041	0.582	0.075	40,611	100,781	0.6	1.47
Greensboro, NC	141,795	516	3.19	9.41	0.397	0.635	0.102	36,023	247,183	0.5	1.71
Hampton, VA	208,120	726	3.48	11.14	0.500	0.633	0.073	43,179	146,439	0.4	3.58
Hartford, CT	242,824	538	2.07	4.64	0.383	0.479	0.088	52,180	124,563	0.2	7.61
Henderson, NV	163,183	789	4.71	14.38	0.061	0.654	0.133	35,927	249,386	0.7	1.66
Houston, TX	189,020	754	3.62	10.78	0.225	0.554	0.078	48,364	2,208,180	1.8	2.22
Huntington Beach	574,073	1,270	4.19	20.01	0.009	0.664	0.115	44,897	192,885	0.7	1.36
Huntsville, AL	140,007	589	3.66	5.10	0.286	0.665	0.084	41,054	171,327	1.4	5.02
Independence, MO	101,727	602	4.26	10.71	0.069	0.659	0.078	43,199	110,704	0.6	2.51
Indianapolis, IN	124,101	599	3.94	8.38	0.243	0.605	0.087	40,354	795,458	0.9	3.93
Inglewood, CA	266,094	847	3.28	12.63	0.441	0.492	0.115	44,897	113,376	0.7	1.52
Irvine, CA	541,686	1,332	2.13	9.97	0.016	0.668	0.115	44,897	201,160	0.7	1.08
Irving, TX	142,683	670	3.99	13.02	0.108	0.545	0.076	44,450	199,505	1.8	1.76
Jackson, MS	100,054	436	3.50	4.68	0.780	0.553	0.084	37,577	175,710	1	1.37
Jersey City, NJ	331,768	931	3.08	16.16	0.259	0.667	0.086	56,872	242,389	0.7	2.78
Kansas City, MO	125,072	587	3.99	10.09	0.292	0.603	0.078	43,199	450,375	0.6	3.16
Knoxville, TN	137,212	487	3.44	6.95	0.168	0.655	0.079	36,586	183,546	0.5	5.94
Lafayette, LA	148,682	590	3.09	5.86	0.313	0.647	0.066	40,754	113,544	0.6	5.40
Lancaster, CA	223,860	659	1.63	4.36	0.197	0.536	0.115	44,897	143,616	0.7	1.11
Lansing, MI	83,491	501	4.24	14.24	0.173	0.625	0.084	34,874	114,947	0.3	4.87
Laredo, TX	87,524	455	2.34	6.39	0.003	0.386	0.074	25,856	217,506	1.5	1.67
Las Vegas, NV	158,495	669	4.05	11.19	0.106	0.557	0.133	35,927	558,880	0.7	1.55
Lexington-Fayett	161,254	551	3.00	7.45	0.135	0.661	0.073	38,833	279,044	1.1	2.06
Lincoln, NE	119,475	544	2.33	7.78	0.028	0.654	0.040	39,999	248,744	1.2	1.98
Little Rock, AR	121,903	589	3.69	7.08	0.417	0.654	0.072	40,301	187,452	1.2	1.86
Livonia, MI	124,226	858	4.23	20.67	0.036	0.681	0.114	40,776	93,931	-0.1	1.79
Long Beach, CA	418,040	923	3.03	11.26	0.128	0.564	0.115	44,897	466,520	0.7	4.10
Los Angeles, CA	535,659	995	2.76	9.30	0.089	0.555	0.115	44,897	3,834,340	0.7	4.32
Lowell, MA	224,851	645	2.45	8.49	0.043	0.574	0.066	58,530	103,512	0.9	4.15

Table 2.1: Summary Statistics by City continued

City	Housing value ($)	Rent	# of Rooms	Property Tax	% black	% with HS degree	Unemployment rate	per capita income	population	% change in population	Revenue per capita
Madison, WI	181,873	776	2.21	10.36	0.053	0.725	0.057	46,615	228,775	1.2	1.96
Manchester, NH	175,352	651	3.12	10.57	0.039	0.607	0.054	49,235	108,874	0.2	4.24
McAllen, TX	92,905	492	3.55	10.26	0.009	0.505	0.116	22,390	127,245	2	1.55
Memphis, TN	111,991	546	3.96	10.57	0.621	0.603	0.094	38,552	674,028	0.5	6.24
Mesa, AZ	127,823	670	3.88	8.29	0.031	0.602	0.087	37,190	452,933	1	1.50
Mesquite, TX	96,803	654	4.23	12.77	0.183	0.556	0.076	44,450	131,738	1.8	1.22
Miami, FL	223,496	658	2.45	7.39	0.223	0.495	0.096	43,405	85,036	1.9	6.75
Milwaukee, WI	123,732	575	2.91	10.93	0.347	0.571	0.081	45,420	602,191	0.3	3.06
Minneapolis, MN	206,465	682	2.45	9.43	0.161	0.665	0.063	48,815	377,392	1	2.90
Mobile, AL	141,266	522	3.87	5.40	0.500	0.620	0.108	32,622	191,411	-0.1	1.97
Modesto, CA	146,398	720	3.27	6.78	0.041	0.540	0.165	33,144	203,955	0.5	1.35
Montgomery, AL	128,020	499	3.67	3.60	0.524	0.596	0.095	37,189	204,086	0.7	1.47
Moreno Valley, C	157,313	713	3.75	11.94	0.146	0.474	0.130	31,218	188,936	1.3	0.95
Nashville-Davids	174,701	686	3.13	8.63	0.246	0.642	0.078	42,494	590,807	1.3	6.24
New Haven, CT	201,286	741	1.69	4.73	0.245	0.619	0.091	48,932	123,932	0	6.73
New York, NY	540,079	1,012	2.60	7.44	0.254	0.581	0.086	56,872	8,274,527	0.7	11.91
Newark, NJ	222,320	600	2.13	4.85	0.545	0.500	0.086	56,872	280,135	0.7	3.28
Newport News, VA	192,697	640	2.73	7.46	0.353	0.639	0.073	43,179	179,153	0.4	5.16
Norfolk, VA	221,424	678	2.74	6.78	0.402	0.639	0.073	43,179	235,747	0.4	5.42
North Las Vegas,	123,108	669	3.82	9.04	0.160	0.465	0.133	35,927	212,114	0.7	2.05
Norwalk, CA	254,750	627	2.07	7.14	0.056	0.494	0.115	44,897	103,720	0.7	0.95
Oakland, CA	411,946	913	3.56	14.24	0.258	0.604	0.091	62,701	401,489	1.2	3.15
Oklahoma City, O	121,342	561	3.53	7.85	0.132	0.603	0.050	41,673	547,274	1.5	1.93
Ontario, CA	160,556	881	3.44	9.73	0.045	0.473	0.130	31,218	170,936	1.3	1.90
Orange, CA	442,280	1,245	1.90	8.90	0.009	0.599	0.115	44,897	134,299	0.7	1.21
Oxnard, CA	335,000	799	3.41	11.41	0.032	0.408	0.102	47,463	184,725	0.6	1.74
Palmdale, CA	143,014	820	4.42	15.29	0.124	0.470	0.115	44,897	140,882	0.7	1.02
Pasadena, CA	564,448	1,118	3.00	13.94	0.077	0.636	0.115	44,897	146,518	0.7	1.19
Pasadena, TX	88,108	599	3.76	7.63	0.026	0.500	0.078	48,364	143,400	1.8	4.37
Paterson, NJ	263,316	607	2.38	6.68	0.332	0.457	0.086	56,872	146,545	0.7	1.71
Pembroke Pines,	147,129	1,093	4.11	16.81	0.164	0.603	0.096	43,405	146,828	1.9	1.71
Peoria, AZ	134,153	890	3.62	11.08	0.034	0.659	0.087	37,190	146,743	1	1.59
Peoria, IL	99,506	534	3.18	9.12	0.261	0.632	0.086	44,320	113,546	0.2	1.61
Philadelphia, PA	150,805	687	2.96	6.87	0.400	0.619	0.085	49,906	1,449,634	0.4	5.54
Phoenix, AZ	162,278	635	3.67	9.69	0.057	0.550	0.087	37,190	1,552,259	1	2.38
Pittsburgh, PA	110,003	560	2.66	6.01	0.258	0.701	0.074	46,108	311,218	0.1	2.06
Plano, TX	191,916	820	4.75	18.70	0.063	0.639	0.076	44,450	260,796	1.8	1.57
Pomona, CA	260,854	974	1.79	7.15	0.079	0.475	0.115	44,897	152,631	0.7	1.49
Portland, OR	272,314	749	3.23	13.31	0.058	0.674	0.089	41,168	550,396	1.3	2.36
Providence, RI	243,599	625	1.87	6.09	0.139	0.590	0.107	44,063	172,459	-0.1	4.78
Provo, UT	180,867	590	1.17	2.60	0.015	0.653	0.063	26,520	117,592	2	1.03
Raleigh, NC	226,598	703	2.48	6.81	0.263	0.657	0.082	41,016	375,806	2.3	1.51
Rancho Cucamonga	289,767	1,105	2.31	10.02	0.062	0.615	0.130	31,218	170,266	1.3	1.56
Reno, NV	169,287	650	3.50	8.61	0.027	0.626	0.127	42,622	214,853	0.7	1.32
Richmond, VA	230,090	666	3.27	10.06	0.463	0.660	0.073	43,728	200,123	0.8	6.82
Riverside, CA	254,128	734	2.49	6.82	0.055	0.537	0.130	31,218	294,437	1.3	2.63
Rochester, NY	98,438	519	2.91	8.11	0.395	0.532	0.077	43,901	206,759	0.6	5.54
Rockford, IL	111,831	518	3.71	14.70	0.161	0.581	0.119	35,214	156,596	-0.4	1.62

Table 2.1: Summary Statistics by City continued

City	Housing value ($)	Rent	# of Rooms	Property Tax	% black	% with HS degree	Unemployment rate	per capita income	population	% change in population	Revenue per capita
Sacramento, CA	209,380	784	3.65	9.94	0.113	0.547	0.118	43,302	460,242	1	2.22
Saint Louis, MO	147,086	520	3.06	6.35	0.457	0.645	0.085	42,895	350,759	0.1	3.12
Saint Paul, MN	192,159	612	2.38	7.53	0.104	0.602	0.063	48,815	277,251	1	1.95
Salinas, CA	266,531	824	2.52	6.49	0.022	0.408	0.127	41,958	143,517	1.2	0.81
Salt Lake City,	237,861	607	3.47	9.05	0.016	0.632	0.066	38,893	180,651	1.5	3.00
San Antonio, TX	117,824	594	3.09	9.11	0.072	0.538	0.071	38,250	1,328,984	1.8	2.70
San Bernardino,	131,720	583	2.55	4.89	0.119	0.463	0.130	31,218	199,285	1.3	1.45
San Buenaventura	365,227	1,120	3.78	10.90	0.015	0.622	0.102	47,463	103,219	0.6	1.41
San Francisco, C	818,190	1,231	2.81	10.60	0.049	0.682	0.091	62,701	764,976	1.2	11.53
Santa Ana, CA	334,288	981	2.54	8.23	0.011	0.369	0.115	44,897	339,555	0.7	1.36
Santa Clarita, C	298,106	1,077	3.84	20.81	0.025	0.583	0.115	44,897	169,951	0.7	1.04
Savannah, GA	216,423	668	3.25	6.78	0.497	0.616	0.098	40,535	130,331	2	2.75
Seattle, WA	406,285	892	2.69	10.63	0.056	0.696	0.087	51,350	594,210	1.4	4.80
Simi Valley, CA	346,470	1,158	4.09	21.13	0.009	0.602	0.102	47,463	120,464	0.6	1.19
Sioux Falls, SD	120,103	583	1.95	5.10	0.047	0.647	0.043	45,685	151,505	1.5	1.99
South Bend, IN	80,495	490	3.74	6.84	0.230	0.573	0.101	36,386	104,069	0.1	2.27
Spokane, WA	148,550	526	3.26	8.17	0.018	0.627	0.098	36,047	85,013	0.3	0.68
Springfield, IL	100,985	518	3.51	10.15	0.177	0.636	0.074	41,246	117,090	0.5	3.57
Springfield, MA	136,693	417	2.68	9.58	0.194	0.522	0.084	41,129	149,938	0.4	4.07
Springfield, MO	101,920	533	2.51	4.32	0.036	0.690	0.077	32,913	154,777	0.6	4.18
Stamford, CT	447,446	1,230	3.58	23.49	0.114	0.636	0.085	78,708	118,475	0.9	5.47
Sterling Heights	119,318	684	4.16	17.65	0.044	0.648	0.114	40,776	127,349	-0.1	1.26
Stockton, CA	225,877	672	3.08	7.67	0.104	0.483	0.162	32,300	287,245	1.1	1.27
Sunnyvale, CA	489,685	1,295	3.47	14.01	0.012	0.631	0.094	61,498	131,140	1.4	2.02
Syracuse, NY	92,952	532	2.24	5.73	0.276	0.596	0.083	40,492	139,079	-0.1	5.36
Tacoma, WA	204,296	727	3.19	11.90	0.080	0.621	0.087	51,350	196,520	1.4	5.31
Tempe, AZ	177,228	787	2.71	6.76	0.045	0.704	0.087	37,190	174,091	1	2.31
Thousand Oaks, C	434,486	1,329	3.71	18.90	0.012	0.643	0.102	47,463	123,349	0.6	1.29
Toledo, OH	82,887	420	3.79	9.60	0.241	0.610	0.095	36,721	295,029	-0.1	1.51
Torrance, CA	527,870	1,119	3.51	14.98	0.025	0.648	0.115	44,897	141,420	0.7	1.97
Tulsa, OK	121,930	541	3.71	8.04	0.151	0.586	0.063	43,223	384,037	0.6	2.07
Vancouver, WA	172,476	698	3.51	10.32	0.028	0.638	0.089	41,168	161,436	1.3	1.42
Virginia Beach,	290,015	875	3.87	13.61	0.156	0.638	0.073	43,179	434,743	0.4	3.93
Warren, MI	84,087	671	4.17	18.97	0.088	0.619	0.114	40,776	134,223	-0.1	1.72
Washington, DC	444,709	1,075	2.72	8.50	0.490	0.682	0.061	60,547	588,292	1.9	16.75
West Covina, CA	297,333	1,187	3.36	12.19	0.047	0.585	0.115	44,897	106,388	0.7	0.87
Wichita, KS	102,099	506	3.81	9.04	0.097	0.615	0.077	40,014	361,420	0.2	2.29
Winston-Salem, N	148,250	609	3.35	8.20	0.354	0.625	0.102	36,023	215,348	0.5	1.85
Worcester, MA	193,653	642	2.15	6.73	0.122	0.622	0.078	45,476	173,966	0.3	4.51
Yonkers, NY	296,278	905	3.08	13.69	0.169	0.595	0.086	56,872	199,244	0.7	4.71
Total	267,371	775	3.07	9.07	0.229	0.603	0.089	45,587	1,658,054	0.8654107	4.74

Table 2.2: Description of Financial Measures

Financial Measure	**Definition**	**Solvency Type**	**Comment**
STDebt-to-Cash	$\frac{short-term\ debt\ at\ end-of-year}{total\ cash\ and\ securities}$	Cash Solvency	
Debt-to-Cash	$\frac{total\ debt\ outstanding}{total\ cash\ and\ securities}$	Cash Solvency	
Revenue-to-STDebt	$\frac{generarevenue}{short-term\ debt\ at\ end-of-year}$	Cash Solvency	
Operating Ratio	$\frac{total\ revenues}{total\ expenditure}$	Budget Solvency	
LTLiability	$\frac{total\ long-term\ debt\ outstanding}{total\ interest\ on\ debt}$	Long-run Solvency	Long-term is anything due in more than one year
LTLiabilityperC	$\frac{total\ long-term\ debt\ outstanding}{population}$	Long-run Solvency	
Debt-to-Revenue	$\frac{total\ debt\ outstanding}{total\ revenue}$	Long-run Solvency	
TperC	$\frac{total\ tax}{population}$	Service Solvency	A higher ratio means a higher burden on residents and lower levels of service
EperC	$\frac{total\ expenditure}{population}$	Service Solvency	
RperC	$\frac{total\ revenue}{population}$	Service Solvency	a higher ratio means the city is more afluent
Revenue-to-CapOutlay	$\frac{total\ revenue}{totalcapitaloutlay}$	Service Solvency	a higher value indicates a higher service level

Table 2.3: Descriptive Statistics of Financial Ratios

Financial Ratio	Observations	Mean	Std. Dev.	Min	Max
STDebt-to-Cash	68,882	0.0233	0.0829	0.0000	0.7759
Debt-to-Cash	68,882	0.9899	0.1064	0.6556	1.4383
Operating Ratio	68,882	0.9899	0.1064	0.6556	1.4383
LTLiability	68,882	25.7930	8.4993	12.0867	78.2553
LTLiabilityperC	68,882	5.8993	4.1562	0.0984	16.8461
Debt-to-Revenue	68,882	1.4138	0.7217	0.1439	5.6842
TperC	68,882	1.6159	1.5668	0.2342	8.5498
EperC	68,882	4.8121	3.9256	0.6389	20.0939
RperC	68,882	4.7241	3.6867	0.6839	17.6360
Revenue-to-CapOutlay	68,882	7.3652	6.7715	1.7426	64.3478

Table 2.4: Name and Description of Variables

Variable Name	Description
Dependent Variable	
value	self-reported owner-estimated market value of unit
Unit Characteristics and Selected Costs	
rooms	Number of rooms in unit
bedrooms	Number of bedrooms
builtyr2	Age of structure, decade
structure	Indicator if unit is a single-family detached unit
propinsr	Annual property insurance cost
owncost	Selected monthly owner costs (includes all utilities etc.)
hhincome	Total household income (annual)
Owner Demographics	
male	Indicator if head of household is male
age	Age of household head married
Indicator if household type is 'married'	
black	Indicator if household head is black
educ	household head's years of schooling
educHS	Indicator if household head holds a HS degree
educBD	Indicator if household head holds a Bachelor's degree
'Community' Control Variables	
nvalueh	PUMA-level average housing value
nblack	PUMA-level fraction of population who is black
neducHS	PUMA level fraction of population with HS degree
neducBD	PUMA level fraction of population with Bachelor's degree
Economic Control Variables	
unemployment rate	MSA-level unemployment rate (2011)
nincome	MSA-level per capita income (2011)
population change	MSA-level percentage change in population from previous year (2011)
Geography	
state	State (FIPS code) the unit is located in
metro	indicator if unit is located in city center
MSA	Metropolitan area unit is located in
city	City the unit is located in
citypop	City population
puma	Public Use Microdata Area (geographic area of 100,000 inhabitants)
Financial Variables	
total revenue	City's total revenue (FYD 2010)
total taxes	City's total taxes collected (FYD 2010)
total expenditure	City's total expenditure (FYD 2010)
total capital outlay	City's total expenditure on capital (FYD 2010)
totalinterestondebt	City's total interest payments on debt for FYD 2010
totaldebtout	City's total debt outstanding (long=term and short-term)
stdebtendofyear	City's short-term debt (due within one year)
totallongtermdebt	City's long-term debt outstanding (due in more than one year)

Table 2.5: Cash Solvency and Budget Solvency Regression

	Model 1	Model 2	Model 3	Model 4
Housing and Household Characteristics				
rooms	0.0348***	0.0349***	0.0349***	0.0348***
	(0.0036)	(0.0036)	(0.0036)	(0.0036)
bedrooms	0.0675***	0.0675***	0.0674***	0.0674***
	(0.0075)	(0.0075)	(0.0075)	(0.0075)
owncost	0.0001***	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
hhincome	8.43E-07***	8.41E-07***	8.41E-07***	8.43E-07***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Community Controls				
educBD	0.1040***	0.1040***	0.1040***	0.1040***
	(0.0093)	(0.0093)	(0.0093)	(0.0093)
nceducBD	0.6770***	0.5980***	0.6050***	0.6720***
	(0.1950)	(0.1900)	(0.1910)	(0.1940)
ncblack	−0.5050***	−0.5370***	−0.5320***	−0.5090***
	(0.1060)	(0.1030)	(0.1050)	(0.1080)
nvalueh	1.08E-06***	1.07E-06***	1.07E-06***	1.08E-06***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
population	7.11E-05***	6.91E-05***	6.93E-05***	7.16E-05***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
populationpercentchange	−0.0024	−0.0039	−0.0039	−0.0024
	(0.0271)	(0.0265)	(0.0264)	(0.0268)
percapitapersonalincome	9.07E-06***	9.75E-06***	9.71E-06***	9.24e-06***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
unemploymentrate	1.6000	1.6660	1.6790	1.6520
	(1.3260)	(1.2900)	(1.2870)	(1.3700)
Financial Ratios				
debt-to-cash	0.0002		0.0035	
	(0.0037)		(0.0026)	
stdebt-to-cash		−0.3190***	−0.3340***	
		(0.0969)	(0.0976)	
operating ratio				−0.0500
				(0.1040)
Observations	30,727	30,727	30,727	30,727
R-squared	0.599	0.599	0.599	0.599

Robust standard errors in parentheses
Significant at 1% level ***, 5% level **, 10% level *

Table 2.6: Service Solvency Regression

	Model 5	Model 6	Model 7	Model 8	Model 9
Housing and Household Characteristics					
rooms	0.0350***	0.0349***	0.0349***	0.0347***	0.0349***
	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)
bedrooms	0.0679***	0.0676***	0.0676***	0.0673***	0.0677***
	(0.0075)	(0.0075)	(0.0075)	(0.0076)	(0.0075)
owncost	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Community Characteristics					
hhincome	8.51E-07***	8.47E-07***	8.48E-07***	8.44E-07***	8.49E-07***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
educBD	0.105***	0.104***	0.104***	0.104***	0.105***
	(0.0093)	(0.0093)	(0.0093)	(0.0093)	(0.0093)
nbeducBD	0.533***	0.629***	0.618***	0.678***	0.568***
	(0.1830)	(0.1970)	(0.1950)	(0.1900)	(0.1890)
ncblack	−0.505***	−0.522***	−0.528***	−0.507***	−0.480***
	(0.0979)	(0.1060)	(0.1080)	(0.1050)	(0.0965)
nvalueh	1.04E-06***	1.06E-06***	1.06E-06***	1.07E-06***	1.04E-06***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
population	5.42E-05***	6.69E-05***	6.57E-05***	6.93E-05***	5.50E-05***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
populationpercentchange	−0.0215	−0.0072	−0.0085	−0.0069	−0.0228
	(0.0247)	(0.0273)	(0.0270)	(0.0262)	(0.0246)
percapitapersonalincome	5.38E-06*	8.82E-06***	8.87E-06***	9.31E-06***	5.04E-06*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
unemploymentrate	0.6170	1.6300	1.6590	1.5390	0.2920
	(1.1980)	(1.3240)	(1.3250)	(1.3010)	(1.1280)
Financial Ratios					
TperC	0.0786**				0.0951***
	(0.0340)				(0.0320)
RperC		0.0077			
		(0.0087)			
EperC			0.0096		−0.0105
			(0.0093)		(0.0104)
rev-to-cap				-0.00263*	−0.0023
				(0.0015)	(0.0016)
Observations	30,727	30,727	30,727	30,727	30,727
R-squared	0.599	0.599	0.599	0.599	0.599

Robust standard errors in parentheses
Significant at 1% level ***, 5% level **, 10% level *

Table 2.7: Long-Run Solvency Regression

	Model 10	Model 11	Model 12	Model 13
Housing and Household Characteristics				
rooms	0.0348***	0.0348***	0.0348***	0.0348***
	(0.0036)	(0.0036)	(0.0036)	(0.0036)
bedrooms	0.0677***	0.0675***	0.0675***	0.0678***
	(0.0075)	(0.0075)	(0.0075)	(0.0075)
owncost	0.0001***	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Community Characteristics				
hhincome	8.44E-07***	8.44E-07***	8.43E-07***	8.49E-07***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
educBD	0.1040***	0.1040***	0.1040***	0.1040***
	(0.0093)	(0.0093)	(0.0093)	(0.0093)
nceducBD	0.674***	0.672***	0.676***	0.659***
	(0.1940)	(0.1940)	(0.1950)	(0.1910)
ncblack	−0.495***	−0.512***	−0.506***	−0.510***
	(0.1050)	(0.1100)	(0.1060)	(0.1090)
nvalueh	1.07E-06***	1.07E-06***	1.08E-06***	1.06E-06***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
population	7.19E-05***	6.95E-05***	7.11E-05***	6.74E-05***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
populationpercentchange	−0.0030	−0.0043	−0.0023	−0.0094
	(0.0274)	(0.0270)	(0.0271)	(0.0286)
percapitapersonalincome	9.27E-06***	8.92E-06***	9.04E-06***	8.87E-06***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
unemploymentrate	1.5220	1.6400	1.5980	1.5950
	(1.3380)	(1.3570)	(1.3200)	(1.3470)
Financial Ratios				
deb-to-rev	−0.0137			−0.0234
	(0.0129)			(0.0173)
LTliabilityperC		0.0018		0.0057
		(0.0064)		(0.0086)
LTliability			−0.0002	−0.0002
			(0.0011)	(0.0011)
Observations	30,727	30,727	30,727	30,727
R-squared	0.599	0.599	0.599	0.599

Robust standard errors in parentheses
Significant at 1% level ***, 5% level **, 10% level *

Table 2.8: City Financial State Impact on Housing Value and Rent

	Model 14	Model 15
Housing and Household Characteristics		
rooms	0.0351***	0.00473
	(0.0036)	(0.0043)
bedrooms	0.0677***	0.0835***
	(0.0075)	(0.0114)
owncost	0.0001***	
	(0.0000)	
hhincome	8.49E-07***	4.17E-06***
	(0.0000)	(0.0000)
Community Controls		
educBD	0.104***	0.240***
	(0.0093)	(0.0135)
nceducBD	0.491***	0.483***
	(0.1810)	(0.1400)
ncblack	−0.529***	−0.309***
	(0.1010)	(0.0758)
nvalueh	1.04E-06***	4.48E-07***
	(0.0000)	(0.0000)
population	5.51E-05***	2.48E-05***
	(0.0000)	(0.0000)
populationpercentchange	−0.0205	0.0398*
	(0.0240)	(0.0207)
percapitapersonalincome	6.49E-06**	1.15E-05***
	(0.0000)	(0.0000)
unemploymentrate	0.827	3.973***
	(1.2420)	(1.0790)
Financial Ratios		
STdebt-to-cash	−0.231**	−0.105
	(0.0911)	(0.0940)
Operating Ratio	−0.0393	−0.189**
	(0.0975)	(0.0792)
Ltliability	0.0002	−0.0004
	(0.0011)	(0.0009)
TperC	0.0691**	−0.0622***
	(0.0334)	(0.0226)
Observations	30,727	38,155
R-squared	0.599	0.329

Robust standard errors in parentheses
Significant at 1% level ***, 5% level **, 10% level *

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