The Effect of Foreclosures on Owner-Occupied Housing Prices: Supply or Dis-Amenity?

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Abstract

Several studies have measured negative price effects of foreclosed residential properties on nearby property sales. However, these studies do not address which mechanism is responsible for these effects. I decompose the effects of foreclosures on nearby home prices into a component that is due to additional available housing supply and a component that is due to dis-amenity stemming from deferred maintenance or vacancy. I find measurable effects on home prices within 250 feet of a foreclosure auction that occurred within the past year. In census tracts with low vacancy rates, the supply effect is roughly -1.5% per foreclosure and the dis-amenity effect is roughly -0.075% per foreclosure. In census tracts with high vacancy rates, the supply effect falls to about zero, while the dis-amenity effect remains near -0.075% per foreclosure. Finally, I consider optimal liquidation strategies for lenders with foreclosed properties within 250 feet of one another, and under what conditions Pareto-improving policies might exist.

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1 Introduction

As housing prices have fallen and foreclosure rates have risen over the past few years, lenders have been put in the position of having to liquidate ever larger inventories of foreclosed homes. Recently, a number of articles in the popular press have cited a "shadow inventory" of homes, part of which is made up of homes that have been repossessed by lenders but have not been listed for sale. In a July 7, 2009 segment on National Public Radio, Yuki Noguchi reports,

> "I do know that banks are holding onto inventory, and what they're doing is they're metering them out at an appropriate level to what the market will bear," says Pat Lashinsky, chief executive of online brokerage site ZipRealty.[1]

Such a strategy raises a number of questions. What factors determine the optimal rate at which an individual lender should release inventory into the market? If each lender pursues its own optimal strategy, will the outcome be socially efficient, or could everyone be made better off through government intervention?

The answers to these questions hinge upon the mechanisms through which foreclosures decrease nearby property values and the relative size of these effects. There are two primary mechanisms which are theoretically plausible ways by which a foreclosure may lower the value of other properties nearby. The first mechanism is by way of increasing the supply of homes on the market.[2] The second mechanism operates through the dis-amenity imposed on nearby properties if a foreclosed property is not properly maintained or if it falls victim to crime or vandalism, possibly while vacant.[3] This paper attempts to measure the effect of foreclosure on nearby property values and to decompose this effect into portions attributable to the aforementioned supply and dis-amenity mechanisms.

I pursue an empirical strategy under which identification of separate supply and dis-amenity effects depends upon the degree of segmentation between the single-family and multi-family housing markets. Specifically, I consider two cases: full segmentation and full integration. In the full segmentation case, I assume that foreclosure of a nearby single-family home affects the property values of single-family homes through both the supply

[1] The full segment can be found at `http://www.npr.org/templates/story/story.php?storyId=106113137`.
[2] Wheaton [1990] shows that prices fall as vacancies rise in a housing market search and matching model.
[3] Immergluck and Smith [2006b] investigate the connection between foreclosures and crime.

and dis-amenity mechanisms, whereas foreclosure of a nearby renter-occupied multi-family building affects the property values of single-family homes only through the dis-amenity mechanism. In the full integration case, the foreclosure of a nearby multi-family building will also affect property values of single-family homes through the supply mechanism. Under either assumption, identification of separate supply and dis-amenity effects hinges upon estimation of both the effect of single-family home foreclosures and the effect of renter-occupied multi-family building foreclosures on nearby single-family home prices.

I estimate the effects of single-family home and renter-occupied multi-family foreclosures on the universe of single-family home sales in Chicago between 1998 and 2008. Using a hedonic framework, I estimate the effect of single-family and multi-family foreclosure sales that occurred during the prior year and within 500 feet on the log price of single-family homes. In addition to the universe of other residential foreclosures, I control for a large number of property characteristics that could affect home prices. I also include census tract effects to control for persistent differences in prices across the city. A central concern of all studies that examine the effect of foreclosures on property values is that they may be affected by reverse causality. The issue is that falling property values may provide an impetus for home-owners to default on their mortgages; thus foreclosures could be concentrated precisely in the places prices have fallen the most, yet the lower prices would not have been caused by the foreclosures. If prices fall at different rates in different neighborhoods, then the inclusion of community area * year effects may be necessary to avoid bias due to reverse causality. I control for trends in housing prices over the sample period using year effects to control for city-wide price trends or community area * year effects to control for neighborhood-level price trends.

I find that each scheduled single-family home foreclosure auction within a 250 foot radius and in the past year is associated with a reduction in the price of a single-family home that ranges from about 0.4% in high vacancy census tracts to about 2.1% in low vacancy census tracts.[4] In contrast, multi-family foreclosure auctions in the past year within a 250 foot

[4]This finding is in line with the findings of several other recent studies. Immergluck and Smith [2006a] find about a 1% reduction in the price of single-family homes in Chicago in 1999 for each foreclosure within one eighth of a mile. Schuetz et al. [2008] find a smaller effect, about a 0.2% reduction in price, in New York City between 2000 and 2005 in a 250 foot radius. It is not surprising that I find a larger effect for two reasons. The first reason is that the New York City housing market was booming during their sample, whereas my sample includes the subsequent bust as well. The second reason is that they study the effect of foreclosure filings whereas I focus on foreclosures that have proceeded to the point where an auction has been scheduled. As opposed to the hedonic framework used by the two aforementioned studies, Harding et al. [2009] use a repeat sales framework and find effects of a similar magnitude in several MSAs. Using data from Massachusetts, Campbell et al. [2009] also find a spillover effect of about -1% per foreclosure within about 250 feet. Lin et al. [2007] find much larger effects using

radius are associated with about a 0.75% (per unit of foreclosed building) reduction in the price of a single-family home irrespective of the census tract vacancy rate. I interpret these findings as evidence that the supply effect ranges from about a 1.5% price reduction in low vacancy census tracts to about zero in high vacancy census tracts, whereas the dis-amenity effect is consistently near a 0.75% price reduction.[5] The supply effect result is consistent with the theoretical prediction from the search and matching model of housing presented in Wheaton [1990] in that marginal increases in the vacancy rate have diminishing effects on prices as the vacancy rate rises. I find evidence that the supply and dis-amenity effects vary over time depending upon whether city-wide housing prices are rising or falling. In low vacancy rate census tracts, the supply effect dominates when city-wide prices are rising, while the dis-amenity effect dominates when city-wide prices are falling. I also find that in low vacancy census tracts the marginal supply effect of an additional foreclosure is increasing in the number of foreclosures, while the marginal dis-amenity effect of an additional foreclosure is close to constant in the number of foreclosures.

Using the estimates of the supply and dis-amenity effects reported above, I consider optimal liquidation strategies for lenders with two or more foreclosed properties within 250 feet of each other. I consider cases in which policy has the potential for Pareto-improvement. Since I am focusing on the effect of foreclosures on home prices, I assume that, absent any foreclosures, homes simply sell at a constant intrinsic value. Under this assumption, it will always be optimal for lenders to sell all homes that are in high vacancy rate census tracts in the first period, since the supply effect is zero in high-vacancy rate census tracts. However, in low vacancy rate census tracts there may be cases in which it is optimal not to sell all the foreclosed homes in the first period. I consider the case of a monopolist lender with many foreclosed properties in a 250 foot radius circle. I find that it is optimal for a lender with 10 foreclosed properties in such an area to hold at least one property until the second period as long as the interest rate plus the depreciation rate (the cost-of-carry) is less than about 15%.

data from 2003 and 2006 from Chicago, but their results may be biased by not having a complete listing of all foreclosures.

[5] Using data from Columbus, OH in 2006, Mikelbank [2008] finds an effect of about -2.4% for each foreclosure within 250 feet and an effect of about -4.0% for each vacant and abandoned building within 250 feet. While both of these effects are larger than the effects that I measure, it may be due to the fact that he does not control for differences in price between different areas of the city, except through the use of several neighborhood characteristic variables.

2 Data

I use data from several sources. Residential property sales data come from the Cook County Recorder of Deeds and the Chicago Tribune. Foreclosure data for Cook County are from a private data provision company named Record Information Services. Property characteristic data and homeowner tax exemption claim data come from the Cook County Tax Assessor's Office.

Property identification numbers allow the foreclosure and sales data to be linked to the property characteristic and tax exemption data. After geocoding the addresses, I calculate the distance between every sale and every foreclosure. Since I am interested in the effect of foreclosures on nearby properties but not on the foreclosed properties themselves, I drop any sale that is for the same property identification number and occurs less than two years before or after a foreclosure. Table 1 presents descriptive statistics for single-family residential property transactions in the City of Chicago from 1999 through 2008 that are within 1000 feet of a foreclosure auction that occurred within the past year or will occur within the next year. The first section presents data regarding the number of single-family (SFR), renter-occupied multi-family (RO MF), owner-occupied multi-family (OO MF), and condominium foreclosure auctions that occurred within the past year within 250 feet or between 250 feet and 500 feet of a single-family residence property transaction. The middle section presents data regarding the structural characteristics of these properties.[6] Here and throughout the rest of the paper, I limit my sample to single-family homes because detailed data on the structural characteristics of these properties are available from the Cook County Tax Assessor's office. In contrast, the only structural characteristic that is available for condominium units is the age of the building. The final section presents data regarding the year 2000 demographics of the census tracts in which the properties are located.

The foreclosure data contain entries for two types of events. These events are the initial filing of the foreclosure and the auction date of the foreclosure if an auction is ever scheduled. I include both types of events in my sample. In the end, the preferred sample that I use for estimation includes roughly all residential property transactions in the City of Chicago from 1999 through 2008 that are within 1000 feet of a foreclosure and counts of the number of initial foreclosure filings and foreclosure auctions within the past year and within 250

[6] Throughout this paper all prices are in terms of real year 2000 dollars.

feet or 500 feet for each of the following categories: Single-family home foreclosure, renter-occupied multi-family building foreclosure, owner-occupied multi-family building foreclosure, and condominium foreclosure. Figure 1 plots the number of foreclosure auctions of each property type that were scheduled each year from 1998 through 2008. Single family homes experience the largest number of foreclosure, but there are also a significant number of renter-occupied multi-family buildings that come up for auction due to foreclosure. The number of units in the renter-occupied multi-family buildings brought to auction due to foreclosure ranges from 2 to 180. The mean number of units i2 2.6 and the standard deviation is 2.7. Figure 2 shows a map of all owner-occupied single-family foreclosures (in blue) and all renter-occupied multi-family building foreclosures (in red) that occurred from 1999 through 2008. The dark lines shown in Figure 2 represent community area boundaries. In this paper, I refer to two types of geographical subdivisions of the the city of Chicago. The finer divisions are census tracts. As of the 2000 Census, Chicago contained 873 census tracts with an average population of 3,376. The coarser divisions are community areas. Community areas are made up of a number of census tracts and have an average population of 38,277.[7]

3 Empirical Methodology

My goals are to estimate the effect of residential foreclosures on the price of nearby property and to separate this estimate into a component due to excess supply induced by foreclosures and a component due to the dis-amenity of nearby foreclosures stemming from deferred maintenance or vacancy. Basically, my strategy is to separately estimate the effect of a single-family home foreclosure on nearby single-family home property values and the effect of a multi-family apartment building foreclosure on nearby single-family home property values. Then, with a few assumptions outlined below, I interpret the effect of a single-family home foreclosure as representing the combined effect of putting an additional single-family-home on the market and the dis-amenity effect of deferred maintenance or vacancy on the nearby properties. In comparison, under the assumption the single-family and multi-family housing markets are fully segmented, I interpret the effect of a multi-family apartment building foreclosure on nearby single-family home property values as being due only to the dis-amenity

[7] I use the terms neighborhood and community area interchangeably throughout this paper. Chicago community area boundaries were drawn by social scientists at The University of Chicago in the 1920's. Venkatesh [2001] provides a detailed account.

effect of deferred maintenance or vacancy on the nearby properties. If β_{SF} represents the effect of a single-family home foreclosure on nearby single-family home values and β_{MF} represents the per-unit effect of an N unit multi-family building on nearby single-family home values, then under the assumption of full segmentation the impact of a single family home foreclosure or an N unit multi-family building foreclosure on nearby single family home values can be expressed as,

$$\beta_{SF} = S + D$$

and

$$N\beta_{MF} = N * D,$$

where S represents the supply effect per unit of housing in foreclosure and D represents the dis-amenity effect per unit of housing in foreclosure. Thus,

$$S = \beta_{SF} - \beta_{MF} \tag{1}$$

and

$$D = \beta_{MF}. \tag{2}$$

Finally, under the assumption that single-family and multi-family housing markets are fully integrated, I interpret the effect of a multi-family apartment building foreclosure on nearby single-family home property values as being due to a composite effect of one additional unit of supply (the unit that could potentially become the new owner's home) and a dis-amenity effect of deferred maintenance or vacancy that is proportional to the number of units in the building. In the full integration case,

$$\beta_{SF} = S + D$$

and

$$N\beta_{MF} = S + ND.$$

Thus,

$$S = \frac{N}{N-1}(\beta_{SF} - \beta_{MF}) \tag{3}$$

and

$$D = \frac{N}{N-1}\beta_{MF} - \frac{1}{N-1}\beta_{SF}. \tag{4}$$

Several assumptions are necessary in order to interpret my results in this manner. Under full segmentation, the first assumption is that multi-family apartment building foreclosures do not add to the supply of single-family homes for sale. This assumption requires that potential buyers of single-family homes do not regard multi-family apartment buildings as substitutes and that sellers cannot quickly convert multi-family apartment buildings to condominiums and sell the units individually. Anecdotal evidence from real estate brokers that I spoke with suggests that these assumptions hold in practice.[8] While it is difficult to directly measure the degree to which potential buyers view multi-family apartment buildings as a potential substitute for a single-family home, it is possible to assess the frequency with which multi-family apartment building foreclosures result in a renter-occupied building becoming owner-occupied. Data from the Cook County Tax Assessor on claims of the owner-occupied tax exemption for the years 2004 - 2007 reveal that only about 3.3% of multi-family buildings that experienced a foreclosure in one year or the following year did not file an owner-occupied exemption in the first year but did file an owner-occupied exemption in the second year. This suggests that entirely renter-occupied multi-family apartment buildings do not frequently become owner-occupied following a foreclosure. While I do not have direct evidence regarding the degree to which potential home-buyers regard currently owner-occupied multi-family apartment buildings as substitutes for single-family homes, it is clear that renter-occupied multi-family buildings in foreclosure are not commonly used as a substitute for a buyer in the market for a single-family home. Otherwise, the new owner-occupier would claim the tax exemption, and the transition rate of renter-occupied to owner-occupied foreclosed multi-family apartment buildings would be higher than 3.3%. Finally, I also consider the case of full integration of single-family and multi-family housing markets. In this case, the assumption is that potential buyers of single-family homes do regard multi-family apartment buildings as substitutes, but only one household of owner occupiers can live in a multi-family building and, again, that multi-family apartment buildings cannot be quickly converted to condominiums and sold as individual units.

[8] Chris Young, Sales Associate, Coldwell Banker, Cambridge, MA says, "Rarely have crossover b/w owner-occupied MF and SF/Condo. During property searches, the parameters are separated Condo/SF/MF. Sometimes I get a buyer who's looking SF & Condo, but for the most part they stick with one type. Once they have one type in their head, they stay locked in."

The second assumption is that both single-family home foreclosures and multi-family apartment building foreclosures create dis-amenities for neighboring single-family homes because of deferred maintenance or vacancy. While it is difficult to obtain historical vacancy status data for particular properties, the United States Postal Service has aggregated a number of measures of stocks and flows of vacancy by census tract at a quarterly frequency.[9] Table 2 presents estimates of the association between the number of different types of residential foreclosures and the number of residential addresses that have become vacant in the past three months. These estimates come from a regression of the number of newly vacant addresses in a census tract-quarter on the number of condominium foreclosures, single-family foreclosures, and multi-family foreclosures in the same census tract-quarter. Quarter effects are included to account for time trends in the number of new vacancies, and community area effects are included to account for differences in the number of new vacancies across neighborhoods. The data are for all census tracts in the City of Chicago and cover the four quarters in 2008. The foreclosure data are counts of the number of units of each type of residential housing that are scheduled to be sold at a foreclosure auction in a particular census tract-quarter.

The estimate presented in the first row of Table 2 indicates that each additional condominium unit scheduled for foreclosure auction is associated with 1.76 newly vacant units. The fact that this estimate is larger than one implies that the estimate is picking up more than just the vacancies due to condominium foreclosures; otherwise the estimate could not exceed one. The estimator uses differences in foreclosures between census tracts within a particular community area to explain differences in the number of newly vacant addresses between these census tracts. While the estimate for the effect of condominium foreclosures on the number of newly vacant addresses implies that there are omitted factors that influence the number of new vacancies and are correlated with the number of condominium foreclosures, it is still important to note that at the census tract level of detail there is a positive correlation between foreclosure auctions and the number of newly vacant addresses. Furthermore, the coefficients on the number of single-family units being auctioned due to foreclosure and the number of multi-family renter-occupied units being foreclosed due to auction are 0.93 and 0.77, respectively and are not statistically different from each other. This implies

[9]The data are available through the HUDuser website: `http://www.huduser.org/portal/datasets/usps.html`

that single-family home foreclosures and multi-family apartment building foreclosures are associated with a similar number of newly vacant addresses on a per unit basis.

While it may seem counter-intuitive that lenders who are foreclosing on multi-family apartment buildings would move to evict rent-paying tenants, the practice occurs sufficiently often that toward the end of 2008, the Cook County Sheriff, Thomas J. Dart, suspended all mortgage foreclosure evictions until more protections for tenants of foreclosed multi-family buildings were put into place.[10] The primary motivation for lenders to evict tenants from multi-family buildings that are in the process of foreclosure is that it resolves a potential informational problem faced by potential buyers. Knowing that a building is vacant may be more attractive to a buyer at a foreclosure auction who typically does not have a lot of information about the property and may not have enough time to examine lease contract terms and tenant credit history information. Furthermore, in the case that the lender's reservation price is not met at auction, ownership of the property will go to the lender, who may not have expertise in the property management business. Another possibility is that tenants may choose to move out if multi-family apartment buildings are not maintained properly during the foreclosure period.[11]

The final assumption is that the dis-amenity created by deferred maintenance or vacancy stemming from a multi-family building foreclosure is comparable to the dis-amenity created by deferred maintenance or vacancy stemming from a single-family foreclosure or that these two effects can be compared after controlling for the number of units in the multi-family apartment building. An implication of this assumption is that in areas where one would expect the effect of an additional unit for sale to be negligible, such as areas which already have a high vacancy rate, the magnitude of the effect of a single-family home foreclosure should be similar to the per unit magnitude of multi-family apartment building foreclosure since both are only capturing the dis-amenity stemming from deferred maintenance and vacancy.

Conditional on the assumptions outlined above, my analysis relies upon obtaining credible estimates of the effect of single-family home foreclosures and multi-family apartment

[10]The overhaul of Cook County's mortgage eviction process and the safeguards added to protect renters are described here: `http://www.cookcountysheriff.org/press_page/press_evictionSafeguards_10_16_08.html`. This action occurred right at the end of my sample period, so I do not believe that it has the potential to significantly impact my estimates; however, as more data are available, there is the potential that this policy change may have provided an exogenous change in foreclosure induced vacancies that could aid in estimating the dis-amenity effect of foreclosures on nearby property values.

[11]Been and Glashausser [2009] discuss the effect of foreclosures on tenants.

building foreclosures on nearby property values. To achieve this I analyze the prices of single-family home sales in Chicago between 1999 and 2008. I compute the number of single-family, condominium, owner-occupied multi-family, and renter-occupied multi-family homes in distance-based rings surrounding each transaction. I estimate a number of different variations of the following specification,

$$\ln P_{i,j,c,t} = \beta F_{i,j,c,t} + \Gamma X_i + \delta C_j + \xi N_{c,t} + \varepsilon_{i,j,c,t} \quad (5)$$

where $\ln P_{i,j,c,t}$ is the log transaction price of single-family home i, located in census tract j, in community area c, in year t. $F_{i,j,c,t}$ is a vector of variables indicating the number of initial foreclosure filings or foreclosure auctions within a certain time and distance of property i. Two of the variables contained in the vector $F_{i,j,c,t}$ are $f_{SF,i,j,c,t}$ and $f_{MF,i,j,c,t}$, the number of single-family housing units scheduled for foreclosure auction in the past year and the number of renter-occupied multi-family housing units scheduled for foreclosure auction in the past year, respectively. The coefficients corresponding to these two variables are β_{SF} and β_{MF} which are two components of the vector β. X_i is a vector of property specific characteristics, C_j is either a vector of census tract characteristics or a vector of census tract dummies, and $N_{c,t}$ is either a hedonic price index that varies by community area and year or community area * year dummies.

In my preferred specification, I control for all available structural characteristics of the properties. I include census tract effects to control for persistent differences in prices across space. Furthermore, I include either year effects or community * year area effects to control for either time trends in housing prices at the city level or community area level, respectively.

4 Results

In this section I present estimates of the effect of foreclosures on nearby property values using a number of different specifications. For the sake of comparison to estimates reported in Campbell et al. [2009] and Schuetz et al. [2008], Table 4 presents estimates of the effect of any type of foreclosure auction (single-family, multi-family, or condominium) on nearby single-family property values.

There are a number of differences between my specification and the specifications of Campbell et al. [2009] and Schuetz et al. [2008]. The first difference pertains to the sample.

I limit my sample to only those transactions for which at least one foreclosure has occurred in the past year or will occur in the next year within a radius of 1000 feet. This sample restriction can be thought of as a way to make the distance-based difference estimate more explicit. With this restriction, the estimated coefficients will represent the discount of a property within 250 feet of a foreclosure or between 250 and 500 feet of a foreclosure relative to any possible discount between 500 and 1,000 feet of a foreclosure. Since there is likely to be some spatial correlation in unobserved neighborhood characteristics that affect home prices, restricting my sample to homes sales that are within 1000 feet of a foreclosure, should help mitigate bias and increase the precision of my estimates. Thus, when I present estimates of the effect of foreclosures that occur between 0 and 250 feet and foreclosures that occur between 250 and 500 feet, they can be thought of as difference estimators between the those areas and the area from 500 to 1000 feet around the site of the foreclosure. In a similar manner, Campbell et al. [2009] take differences between estimates of the effect of foreclosures from 0 to 528 feet and estimates of the effect of foreclosures between 528 and 1320 feet and Schuetz et al. [2008] present a specification in which the sample is limited to zip codes where at least one sale is near one or more foreclosures and at least on sale is near no foreclosures. One concern is that the effect of a foreclosure may extend into the 500 - 1000 foot range, biasing my estimates toward zero. The fact that my estimates imply that the difference between prices within 250 - 500 feet of a foreclosure and prices within 500 - 1000 feet of a foreclosure are small suggests that the price depressing effects of foreclosures may not extend as far as the 500 - 1000 foot range.

Table 4 presents estimates of the effect of the foreclosure of any type of residence (single-family, condominium, or multi-family) on nearby property values. The sample includes all single-family home transactions from 1999 through 2008. For each transaction, variables containing counts of the number of initial foreclosure filings and the number of scheduled foreclosure auctions in the year prior to the transaction are computed for areas within 0 - 250 feet and 250 - 500 feet of the transacted home. In this and all subsequent tables, the estimates for the number of foreclosure auctions scheduled are presented. However, in all cases controls for the number of foreclosure filings are included. The estimate presented in the first row of column (1) of Table 4 implies that having a foreclosure between 0 and 250 feet in the previous year is associated with about a 4.1% reduction in the price of a single-family home. The estimate in the third row of column (1) indicates that each additional foreclosure between 250 and 500 feet of a single-family home that occurred in the past year is associated with about a 2.6% decrease in its sale price. Campbell et al. [2009] obtain estimates of about -6.6% (at 125 feet) and -1.7% (between 528 and 1320 feet) using a similar specification with data from Massachusetts. The difference between their estimates gives a discount of about 4.9% which is comparable the 4.1% discount that I measure.

The specification presented in column (2) of Table 4 adds an annual hedonic price index calculated for each community area. Controlling for local shocks that may affect both prices and foreclosures in this manner reduces the magnitude of the estimated coefficient on both foreclosure variables. The specification presented in column (3) adds variables that contain counts of the number of foreclosures that occur in the year after the single-family home transaction (within each distance band). The difference between the estimates for these before and after variables is a kind of difference-in-differences estimator that compares single family home prices near to and far from foreclosures and before-and-after foreclosures. The difference between the estimate presented in rows one and two implies that a foreclosure between 0 and 250 feet away is associated with about a $3.9\% - 1.2\% = 2.7\%$ reduction in single-family home prices. Campbell et al. [2009] find about a 1% reduction using a similar specification. Finally, column (4) adds a control for neighborhood home prices. The difference between the coefficients in rows one and two indicates about a 0.9% reduction in prices, very similar to the 1% reduction implied by a similar specification in Campbell et al. [2009].[12]

In column (5) I control for trends in neighborhood home prices in a less parametric fashion. Instead of including the neighborhood hedonic price index, I include neighborhood community area * year dummies. In this specification, the estimated price reduction per foreclosure within 250 feet drops in magnitude to about 1.9% - 1.0% = 0.9%. Finally, column (6) includes both census tract effects (to control for persistent differences between housing prices at a fairly fine level of geography) and community area * year effects (to control for neighborhood-level trends in prices over time). The estimates in rows one and

[12]Campbell et al. [2009] use a linear distance-weighted count of foreclosures for forclosure from 0 to 528 feet, and a simple count for foreclosures from 528 to 1320 feet. Since my sample is limited to transactions within 1000 feet of a foreclosure, my estimate of the coefficient on the number of foreclosures between 0 and 250 feet, is comparable to their distance weighted coefficient (labelled "close" in their paper) evaluated at 125 feet minus their estimate of the effect of foreclosures from 528 to 1320 feet (labelled "far" in their paper). The comparisons that I report above, come from multiplying their "close" estimate by (528-125)/528 and subtracting their "far" estimate.

two of column (6) imply that a discount of about 1.4% - 0.5% = 0.9% is associated with each foreclosure within 250 feet of a transaction in the past year. It is important to note that the estimate for the effect of a foreclosure that occurs after a transaction is now very close to zero. This implies that once adequate controls for non-foreclosure induced variation in single-family home prices have been included, time-differencing may no longer be necessary. In the analysis that follows, I only estimate the effects of foreclosure filings and auctions that occurred in the year prior to the transaction.

4.1 Interpreting Results Assuming Full Segmentation of Single-Family and Multi-Family Markets

Table 5 presents estimates of the effect of several types of residential housing foreclosures that occurred over the past year on the price of nearby single-family homes. Each specification presented in Table 5 contains controls for a vector of structural characteristics such as the logs of land and building square-footage, a quartic in the age of the structure, and indicator variables for: the number of bathrooms, the type of construction (frame, masonry, or mixed), whether the structure has an attic or basement (and whether they are full and/or finished), air conditioning, fire place, garage (number of cars and whether it is attached to the home). All specifications also contain census tract effects to control for persistent differences in factors that affect home prices. Examples of such factors include persistent differences in amenity levels across the city, such as proximity to train stations or to Lake Michigan.

Each specification also includes either year effects or community area * year effects to control for time-trends in home prices. The specifications in columns (1), (3), and (5) include year effects which control for the large increases and subsequent decreases in Chicago home prices during the sample period from 1999 through 2008. With this large set of structure, place, and time-specific controls, my hope is that any omitted variable is not correlated with the number of nearby foreclosures over the past year. This assumption could, potentially, be violated if variation in the number of foreclosures over time is driven by community area-level changes in prices. Such reverse-causality bias could be a problem if a drop in home prices in one community area is particularly large compared to another community area, and this drop leads to more foreclosures in the first community area. If this were the case, then an estimator that does not control for community area * year effects might overstate the effect of foreclosures on home prices. The specifications presented in columns (2), (4), and (6) include community area * year effects to control for time-trends in home prices at the community area-level which will help to avoid potential reverse causality bias.

The estimate presented in the first row of column (1) of Table 5 indicates that each additional single-family home foreclosure within 250 feet lowers the selling price of a single-family home by about 2.3%. The estimate in the second row of column (1) indicates that each additional single-family home foreclosure that is between 250 and 500 feet away is associated with about a 0.6% reduction in the sale price of a single-family home. The estimate presented in the third row of column (1) implies that each unit of a renter-occupied multi-family apartment building foreclosure within 250 feet is associated with about a 1.4% drop in the sale price of a single-family home. The estimate in row four of column (1) reveals that foreclosures of renter-occupied multi-family apartment buildings between 250 feet and 500 feet away are associated with about a 0.8% price reduction. Rows five through eight of column (1) present similar estimates for owner-occupied multi-family apartment building foreclosures and for condominium foreclosures. I do not focus on these estimates, but have included them in case the reader is interested. All estimates are calculated on a per-unit basis, and can thus be interpreted as the price reduction of a single-family home associated with an additional unit of foreclosure of a particular type of housing in each distance-based band. All specifications include controls for the number of initial foreclosure filings.

Column (2) of Table 5 presents estimates from the specification which includes community area * year effects. The reduction in the magnitude of estimates from column (1) to column (2) is consistent with the story that reverse causality may be biasing estimates that do not control for community area-specific price trends.

Interpreting the estimate in the first row as the combined supply and dis-amenity effect of foreclosure on nearby single-family home prices and the third row as the dis-amenity effect alone results in a decomposition which attributes a 0.9% decline in price to the supply effect and a 1.4% decline in price to the dis-amenity effect for the estimates in column (1). Similarly, the estimates in column (2) attribute a 0.6% drop in single-family home prices to the supply effect and a 0.9% drop in prices to the dis-amenity effect.

4.2 Interpreting Results Assuming Full Integration of Single-Family and Multi-Family Markets

Although I find it reasonable to assume that the single-family and multi-family housing markets are segmented, it is informative to consider the case in which these markets are fully integrated in order to consider the impact that this would have on my estimates. The average number of units in a foreclosed multi-family building in Chicago during my sample is 2.6. If the single-family and multi-family markets were fully integrated, but multi-family buildings could not be converted to condominiums in the short run, then the effect of a multi-family building foreclosure would be to add one additional unit of supply to the combined single-family / owner-occupied multi-family market. Assuming the dis-amenity effect is still proportional to the number of units, then the estimate in row one of column (2) of Table 5 can again be interpreted as the combined supply and dis-amenity effect of foreclosure on nearby single-family home prices; however, the estimate in the third row must now be interpreted as the sum of the dis-amenity effect and a fraction of the supply effect as shown in Equations 3 and 4. In this case, the supply effect would be about -0.8%. This implies that the dis-amenity effect is about -0.6%. In summary, switching from an assumption of full segmentation to full integration of the single-family and multi-family housing markets changes my estimate of the supply effect from about -0.6% to about -0.8% and changes my estimate of the dis-amenity effect from about -0.9% to about -0.6%.

4.3 Variation in Effect by Vacancy Rate

Columns (3) through (6) of Table 5 present estimates for the same specifications as those in columns (1) and (2) but for a sub-sample of low vacancy rate census tracts and a sub-sample of high vacancy rate census tracts. Figure 3 shows a map classifying Chicago census tracts by whether their vacancy rate is above or below the median census tract vacancy rate of 5.17%. Census tract vacancy rates are calculated from USPS data from 2005 - 2008. Returning to the assumption of full segmentation, the estimates from columns (3) and (4) imply a supply effect of -2.1% and -1.5% per unit of foreclosure within 250 feet, respectively. The estimates from columns (3) and (4) imply a dis-amenity effect of -0.7% and -0.6% per unit of foreclosure within 250 feet, respectively. Consistent with the theoretical results illustrated in Wheaton [1990], the supply effect is more pronounced in a tight housing market. Columns (5) and

(6) present the similar estimates for the sub-sample of high-vacancy rate census tracts. The supply effects implied by these estimates are a 0.3% decrease in price and a 0.4% increase in price per unit of foreclosure within 250 feet, although none of the estimates are statistically distinguishable from zero. The dis-amenity effects implied are -1.0% and -0.8% per unit of foreclosure within 250 feet.

On the whole, the evidence presented in Table 5 seems to imply a dis-amenity effect that appears to be present in both high and low vacancy rate areas and is consistently about -0.8%. The supply effect is only present in low vacancy areas and is about -1.5%.

4.4 Variation in Effect over Time

Table 6 presents estimates similar to those shown in columns (4) and (6) of Table 5 except that the samples have also been subdivided into years when the S&P Case-Shiller repeat sales home price index was rising for Chicago (1998 - 2006) and years when the index was falling (2007 - 2008). Column (1) shows estimates from the low vacancy rate sample during the boom years. There appears to be a supply effect of about -1.6% and a dis-amenity effect of about zero. Column (2) presents estimates from the low vacancy rate sample for the bust years. In this case, the coefficients on single-family and multi-family renter-occupied foreclosures with 250 feet are very similar, implying that the supply effect is negligible; however, the disamenity effect is much larger in magnitude, equal to about -3.5%. The estimates in column (3) are from the high vacancy rate census tracts during the boom years. The estimates of the effect of foreclosures within 250 feet are not statistically different from zero. I conclude that both supply and dis-amenity effects all small for this sample. Similarly, the estimates of the effect of foreclosures within 250 feet shown in column (4) for the sample of high vacancy rate census tracts during the bust years are not statistically different from zero. When the sample is split in this way, it appears that supply and dis-amenity effects are only discernable in low vacancy rate census tracts. Furthermore, the supply effect of a foreclosure is about -1.6% in low vacancy rate census tracts during boom years and about zero in low-vacancy rate tracts during bust years. On the other hand, the dis-amenity effect is about zero in low-vacancy rate census tracts during boom years and about -3.4% in the same census tracts during bust years.

4.5 Variation in Effect by Number of Nearby Foreclosures

Table 7 presents estimates of specifications which are similar to those presented in Table 5 except that for each distance-based band and each type of foreclosure a quadratic term is also included. To save space, only the estimates of the coefficients for single-family home and renter-occupied multi-family apartment building foreclosures are shown. These estimates provide empirical evidence regarding whether the marginal effect of an additional nearby foreclosure increases or decreases as the number of nearby foreclosures increases. The estimates presented in the first two rows of column (1) reveal that the marginal effect of a single-family home foreclosure within 250 feet is increasing in the number of such foreclosures. In comparison, rows five and six of column (1) reveal that the marginal effect of a multi-family building foreclosure remains constant as the number of these foreclosures increases (on a per unit basis). Columns (2) and (3) present the same specification as column (1), but estimated on the low and high vacancy rate sub-samples, respectively.

Figure 4 plots the supply and dis-amenity effects that are implied by the estimates in rows one, two, seven, and eight of column (2) as the number of foreclosures within 250 feet varies between zero and four. Over this range the dis-amenity effect is close to linear, while the supply effect becomes much more pronounced when considering the change between two and four foreclosures than it does when considering the change between zero and two foreclosures.

4.6 Price Elasticity of Demand for Owner-Occupied Housing

The results presented in Table 5 can be used to calculate a localized price elasticity of demand for owner-occupied housing. The estimates in column (4) imply that the supply effect associated with an additional single-family unit on the market due to foreclosure is about -1.5% in low vacancy rate census tracts. On average there are about 19 owner-occupied housing units within 250 feet of each single-family foreclosure in the sample. This means that an additional unit of available owner-occupied housing represents about a 5.3% increase in supply within a 250 foot radius of the foreclosure. These numbers imply a price elasticity of demand for housing of about -3.5. This estimate is much larger in absolute value than those found and reported in Hanushek and Quigley [1980], which fall between zero and negative one. It is interesting to note that the estimates of the price elasticity of demand for housing presented in Hanushek and Quigley [1980] come from observing changes in housing demand induced by quasi-experimental variation in housing prices, while my estimates come from observing the price changes induced by variation in quantities of homes available for purchase. Studies of labor markets using variations in prices (such as changes in the minimum wage) also tend to measure elasticities of demand which are smaller in magnitude than studies that use changes in quantities (such as immigration flows). Beaudry et al. [2010] discuss these studies and provide a possible resolution based upon a search and bargaining model. While it is beyond the scope of this paper, similar arguments may apply in the context of housing markets.

5 Welfare Implications

In this section I consider whether there are scenarios under which lenders, acting in their own best interests, impose externalities on other lenders or residents, and under what conditions Pareto-improving public policies exist.

5.1 Optimal Liquidation Strategy of a Monopolist Lender

Consider a monopolist lender with an inventory, S_t, of foreclosed single-family homes all within 250 feet of each other. Suppose that each sale within the same year affects the price of all homes sold that year through the supply effect, and each home kept in inventory until the next year affects price in the previous year through the dis-amenity effect. The monopolist seeks to maximize total revenue or,

$$\max_{q_t} \sum_{t=1}^{T} \left(\frac{1}{1+c} \right)^t R_t$$

where,

$$R_t = [p_0(1-s)^{q_t}(1-v)^{S_t - q_t}]q_t$$

subject to the constraints that year t sales, q_t, reduce next year's inventory and that sales are bounded by zero and the current inventory level.

$$S_{t+1} = S_t - q_t$$
$$0 \leq q_t \leq S_t$$

where p_0 is the sale price if no other homes were for sale in year t, s is the supply effect, v is the dis-amenity effect, q_t is the number of homes that the lender chooses to sell in year t, and c represents the "cost of carry" or the cost of holding a property in inventory, which will include the interest rate and depreciation or maintenance required to prevent depreciation.

Given the convexity of the problem, at an optimum the lender is indifferent between selling one more home in year t as opposed to year $t+1$. This condition gives rise to the following equation,

$$\begin{aligned} & p_0(1-v)^{S_t}\left(\frac{1-s}{1-v}\right)^{q_t} + q_t p_0(1-v)^{S_t}\left(\frac{1-s}{1-v}\right)^{q_t}\log\left(\frac{1-s}{1-v}\right) \\ = \; & \frac{1}{1+c}\left[p_0(1-v)^{S_t}\left(\frac{1-s}{1-v}\right)^{q_{t+1}} + q_{t+1}p_0(1-v)^{S_t}\left(\frac{1-s}{1-v}\right)^{q_{t+1}}\log\left(\frac{1-s}{1-v}\right)\right] \end{aligned}$$

I solve this model numerically and find that with $s = 0.013$, $v = 0.009$, and starting with an inventory of 10 homes that it will be optimal to postpone the sale of at least one home until the second period as long as $c \leq 0.15$. With $c = 0.05$, the optimal rate of sales is to sell six in the first period, three in the second period, and one in the third period.

5.2 Optimal Liquidation Strategy in Stackelberg Leadership Model

In the case where two lenders have properties that they wish to liquidate that are very close to each other, a Stackelberg leadership model may be appropriate if it is the case that there are small differences in the timing of foreclosures within a single period. Consider the case of two lenders, each with a single property to liquidate. In this case the lender for the property which forecloses first will find it optimal to put the property on the market immediately. The second lender will then be faced with the decision of whether to list their property during the first period or hold off until the second period. The second lender will choose to postpone listing the property until the second period if the revenue that they would receive in the second period, discounted by the cost-of-carry, exceeds the revenue that they would receive in the first period or,

$$\left(\frac{1}{1+c}\right)p_0(1-s) > p_0(1-s)^2 \tag{6}$$

Roughly, this condition will hold if the cost-of-carry is less than the supply effect.

5.3 Policy Implications

In the previous two examples, if the cost of holding a foreclosed property from one period to the next is low enough for the lender, then they may optimally choose to wait to sell a property so as not to flood the market. This action will impose a cost on residents that live near the foreclosed property which is equal to the dis-amenity effect. In cases where the dollar amount of this dis-amenity effect summed over all residents within 250 feet of the foreclosed property exceeds the gain that the lender realizes by holding off selling the property until the next period, a Pareto-improving policy exists. In this case, it could be welfare enhancing to offer the lender an incentive payment so that they would be in favor of selling their entire inventory of foreclosed homes in the first period rather than carrying any of them into the second period.

6 Conclusion

In the face of falling housing prices and rising foreclosure rates, researchers have sought to determine the size and geographical extent of spillover effects from residential mortgage foreclosures. The main contribution of this paper is to decompose foreclosure spillover effects into effects that are operating through two distinct mechanisms: a supply shock mechanism and a dis-amenity mechanism.

Before decomposing the spillover effects of foreclosures, I replicate the results of two recent studies: Campbell et al. [2009] and Schuetz et al. [2008]. I find very similar results to the former study, which uses data from Massachusetts and a similar sample period. I find that foreclosures are associated with larger discounts in the price of nearby properties than did the latter study, but this may be due to the fact that it uses data from New York City during the peak of its recent housing boom.

After decomposing the supply and dis-amenity effects, I find that the supply effect varies with the vacancy rate of the census tract, while the dis-amenity effect is fairly constant across high and low vacancy rate census tracts. In low vacancy rate census tracts, I find that the supply effect is about -1.5%, while the dis-amenity effect is about half of that. However, in high vacancy rate census tracts, the supply effect is about zero. Furthermore, the supply effect appears to be close to zero even in low-vacancy rate census tracts when city-wide housing prices are falling. On the other hand, the dis-amenity effect is negligible when city-wide prices are rising, but it is quite pronounced (-3.5%) in low-vacancy rate neighborhoods when city-wide prices are falling.

I then use my estimates to consider optimal liquidation strategies for lenders that are in the position of having to liquidate a number of foreclosed homes in close proximity.

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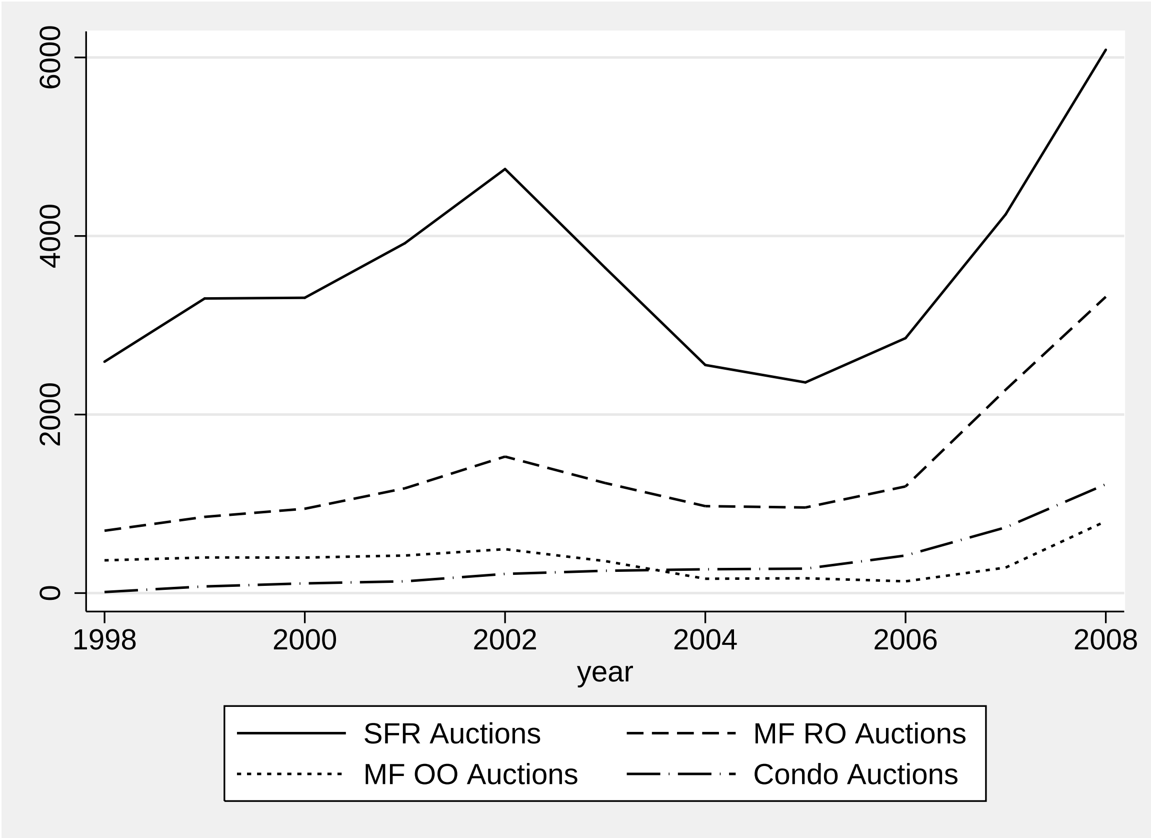

Figure 1: Chicago Foreclosure Auctions by Property Type

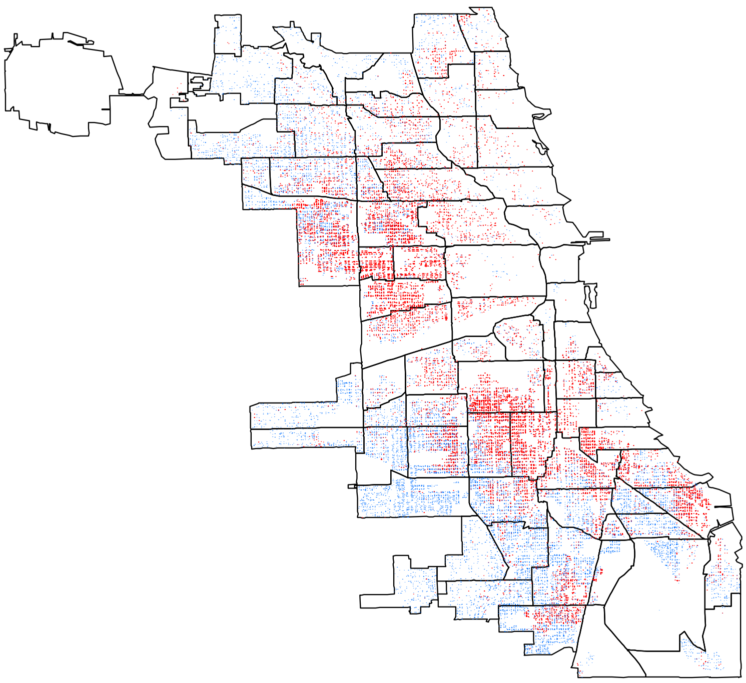

Figure 2: Single Family (Blue) and Multi-family (Red) Foreclosures

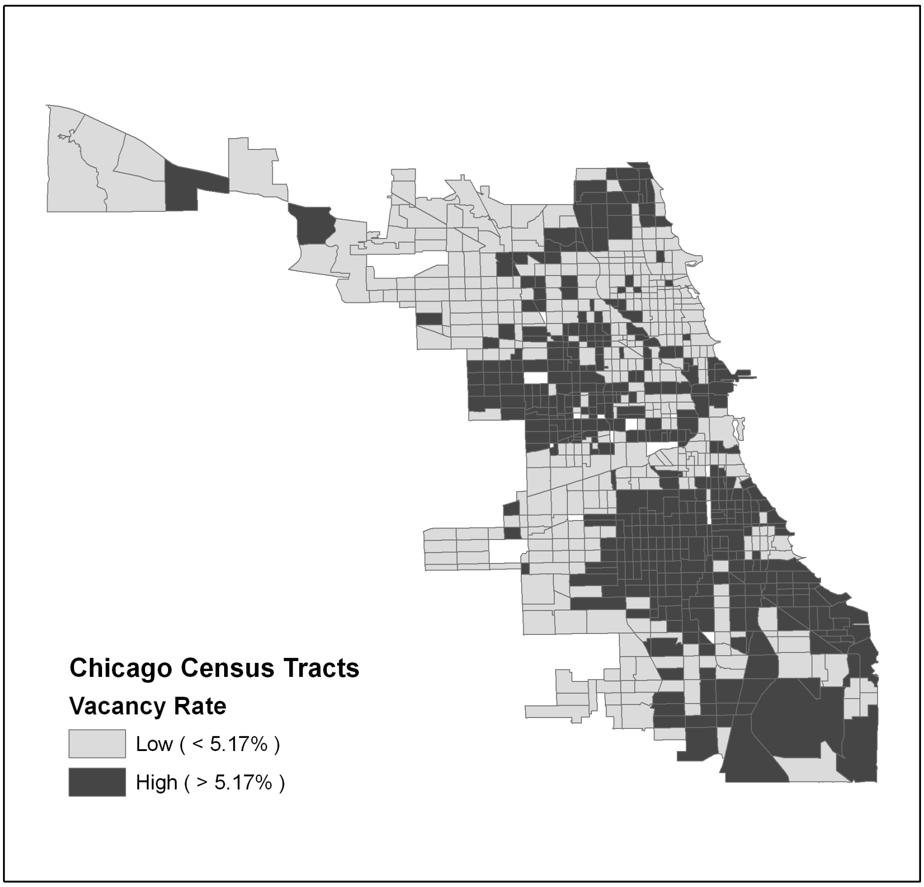

Figure 3: High and Low Vacancy Rate Census Tracts

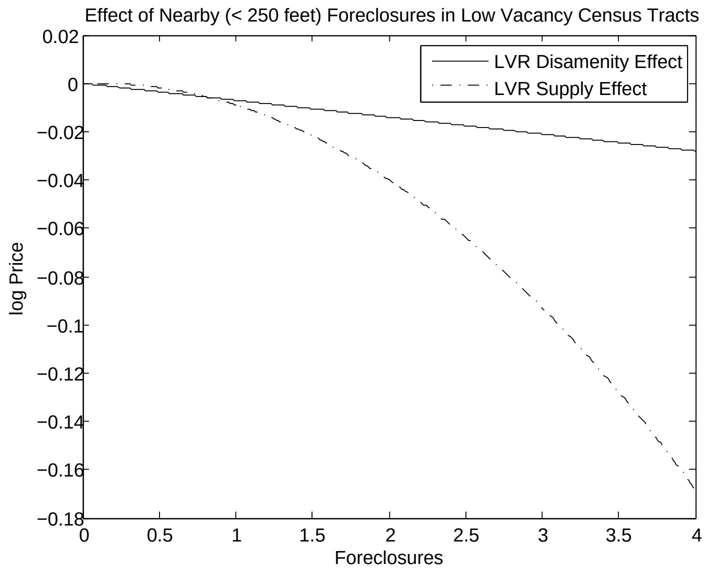

Figure 4: High and Low Vacancy Rate Census Tracts

Table 1: Descriptive Statistics of Nearby Foreclosures, Property Characteristics and Census Tract Characteristics for SFR Condo Transactions within 1000 feet of a Foreclosure

	Mean	S.D.	Min	Max
SFR Forcs $0-250$ ft.	0.13	0.40	0	5
SFR Forcs $250-500$ ft.	0.30	0.69	0	9
Units RO MF Forcs $0-250$ ft.	0.06	0.56	0	37
Units RO MF Forcs $250-500$ ft.	0.17	0.97	0	40
Units OO MF Forcs $0-250$ ft.	0.02	0.21	0	8
Units OO MF Forcs $250-500$ ft.	0.04	0.34	0	8
Condo Forcs $0-250$ ft.	0.00	0.07	0	5
Condo Forcs $250-500$ ft.	0.01	0.13	0	8
Price	209,147	163,617	7,675	1,655,599
Land Square Footage	3,942	1,575	460	122,465
Building Square Footage	1,302	568	400	27,270
2 Bathrooms	0.20	0.40	0	1
3+ Bathrooms	0.04	0.20	0	1
Masonry Exterior	0.55	0.50	0	1
Frame / Masonry	0.09	0.29	0	1
Basement	0.82	0.39	0	1
Attic	0.43	0.49	0	1
Garage	0.75	0.43	0	1
Central Air	0.26	0.44	0	1
Fireplace	0.12	0.32	0	1
Age of Structure	68.9	30.4	1	148
Tract Median Household Income in 2000	43,446	13,272	2,499	127,031
Tract Poverty Rate in 2000	0.15	0.11	0.0	0.78
Tract Fraction African American in 2000	0.38	0.43	0	1
Tract Fraction Employed in 2000	0.54	0.10	0.01	0.95

Table 2: Relationship Between Newly Vacant Addresses and Foreclosure Auctions

	# Newly Vacant Addresses in past 3 Months
Condo Units Scheduled for Auction	1.76**
	(0.77)
Single Family Houses Scheduled for Auction	0.93***
	(0.16)
Multi Family Units (Owner on Premises) Scheduled for Auction	0.49
	(0.39)
Multi Family Units (All Rental) Scheduled for Auction	0.77***
	(0.10)
R^2	0.30
N	2,401

Note: Unit of observation is census tract - quarter. All Chicago census tracts are included. The time period is the 4 quarters of 2008. Eicker-White standard errors are reported in parentheses. Community Area effects and Quarter effects are included. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 3: Effect of Any Type of Foreclosures on log Prices

	(1)	(2)	(3)	(4)	(5)	(6)
Any Forcs 0 – 250 ft. (before)	-0.041***	-0.031***	-0.039***	-0.029***	-0.019***	-0.014***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Any Forcs 0 – 250 ft. (after)			-0.012**	-0.013**	-0.010**	-0.005
			(0.005)	(0.004)	(0.004)	(0.004)
Any Forcs 250 – 500 ft. (before)	-0.026***	-0.003	-0.024***	-0.013***	-0.007**	-0.004
	(0.003)	(0.006)	(0.003)	(0.003)	(0.003)	(0.003)
Any Forcs 250 – 500 ft. (after)			-0.001	0.000	0.003	0.007***
			(0.003)	(0.002)	(0.003)	(0.003)
Neighborhood Price Index		0.67***		0.67***		
		(0.01)		(0.01)		
Structure Characteristics	X	X	X	X	X	X
Year Effects	X	X	X	X		
Census Tract Characteristics	X	X	X	X	X	
Year x Community Effects					X	X
Census Tract Effects						X
N	54,952	54,952	54,952	54,952	54,952	54,952
R^2	0.62	0.68	0.62	0.68	0.70	0.72

Note: Eicker-White standard errors are reported in parentheses. Sample limited to transactions within 1000 feet of a foreclosure filing or auction that occurred within the past year. Reported coefficients are for foreclosure auctions. Controls for foreclosure filings are also included. Census tract characteristics include the log of the median household income, fractions of the population that are: African-American, under 18, over 65, high-school graduates, college graduates, and the fraction of households that are female-headed. Structure characteristics include the log of land square-footage, the log of building square-footage, a quartic in building age, and indicator variables for the following characteristics: 2 bathrooms, 3 or more bathrooms, masonry exterior, frame and masonry exterior, basement, full basement, finished basement, attic, full attic, finished attic, garage, detached garage, 2 car or larger garage, air conditioning, fire place. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 4: Effect of Any Type of Foreclosures on log Prices by Type

	(1)	(2)	(3)	(4)
SFR Forcs 0 − 250 ft. (before)	-0.018***	-0.015***	-0.005	-0.037***
	(0.005)	(0.005)	(0.005)	(0.011)
SFR Forcs 0 − 250 ft. (after)	-0.001	0.002	0.002	-0.000
	(0.005)	(0.005)	(0.005)	(0.009)
SFR Forcs 250 − 500 ft. (before)	-0.001	0.001	0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.007)
SFR Forcs 250 − 500 ft. (after)	0.006**	0.009***	0.006**	0.009
	(0.003)	(0.003)	(0.003)	(0.005)
Units RO MF Forcs <= 250 ft. (before)	-0.011*	-0.008	0.002	-0.019*
	(0.006)	(0.006)	(0.004)	(0.011)
Units RO MF Forcs <= 250 ft. (after)	-0.012***	-0.009**	-0.008	-0.014**
	(0.004)	(0.004)	(0.004)	(0.016)
Units RO MF Forcs 250 − 500 ft. (before)	-0.006**	-0.005*	0.000	-0.011**
	(0.003)	(0.002)	(0.003)	(0.005)
Units RO MF Forcs 250 − 500 ft. (after)	-0.003**	0.001	0.000	-0.003
	(0.002)	(0.002)	(0.002)	(0.004)
Structure Characteristics	Yes	Yes	Yes	Yes
Year x Community Effects	Yes	Yes	Yes	Yes
Census Tract Characteristics	Yes	No	Yes	Yes
Census Tract Effects	No	Yes	No	No
N	54,952	54,952	45,631	3,804
R^2	0.70	0.72	0.71	0.63
Segmented Markets: Supply <= 250 ft.	-0.018*	-0.017	-0.017*	-0.032
	(0.010)	(0.010)	(0.010)	(0.020)
Segmented Markets: Disamenity <= 250 ft.	0.001	0.001	0.010	-0.005
	(0.008)	(0.008)	(0.006)	(0.014)
Integrated Markets: Supply <= 250 ft.	-0.030*	-0.028	-0.028*	-0.052
	(0.017)	(0.017)	(0.016)	(0.033)
Integrated Markets: Disamenity <= 250 ft.	0.012	0.011	0.020	0.015
	(0.013)	(0.013)	(0.011)	(0.024)

Note: Eicker-White standard errors are reported in parentheses. Sample limited to transactions within 1000 feet of a foreclosure filing or auction that occurred within the past year. Reported coefficients are for foreclosure auctions. Controls for foreclosure filings are also included. Census tract characteristics include the log of the median household income, fractions of the population that are: African-American, under 18, over 65, high-school graduates, college graduates, and the fraction of households that are female-headed. Structure characteristics include the log of land square-footage, the log of building square-footage, a quartic in building age, and indicator variables for the following characteristics: 2 bathrooms, 3 or more bathrooms, masonry exterior, frame and masonry exterior, basement, full basement, finished basement, attic, full attic, finished attic, garage, detached garage, 2 car or larger garage, air conditioning, fire place. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table 5: Effect of Foreclosures on log Prices by Type and Vacancy Rate

	(1) all SFR	(2) all SFR	(3) Low Vac	(4) Low Vac	(5) High Vac	(6) High Vac
SFR Forcs 0 – 250 ft.	-0.023***	-0.014***	-0.028***	-0.021***	-0.013	-0.004
	(0.005)	(0.005)	(0.006)	(0.006)	(0.008)	(0.008)
SFR Forcs 250 – 500 ft.	-0.006*	0.002	-0.012***	-0.007*	0.001	0.012**
	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)	(0.006)
Units RO MF Forcs <= 250 ft.	-0.014**	-0.009	-0.007	-0.006	-0.010	-0.008
	(0.006)	(0.006)	(0.008)	(0.008)	(0.007)	(0.007)
Units RO MF Forcs 250 – 500 ft.	-0.008***	-0.005*	-0.000	0.000	-0.007**	-0.005*
	(0.003)	(0.002)	(0.004)	(0.006)	(0.003)	(0.003)
Units OO MF Forcs <= 250 ft.	0.004	0.013	-0.015	-0.010	0.025*	0.033**
	(0.009)	(0.009)	(0.012)	(0.011)	(0.015)	(0.014)
Units OO MF Forcs 250 – 500 ft.	-0.012**	-0.006	0.002	0.005	-0.019**	-0.013
	(0.006)	(0.006)	(0.006)	(0.006)	(0.009)	(0.009)
Condo Forcs 0 – 250 ft.	0.028	0.024	0.021	0.038	0.027	0.005
	(0.036)	(0.030)	(0.041)	(0.040)	(0.047)	(0.038)
Condo Forcs 250 – 500 ft.	-0.007	-0.016	-0.009	-0.003	-0.010	-0.022
	(0.015)	(0.015)	(0.024)	(0.024)	(0.019)	(0.019)
Structure Characteristics	X	X	X	X	X	X
Year Effects	X		X		X	
Year x Community Effects		X		X		X
Census Tract Effects	X	X	X	X	X	X
N	55,007	55,007	35,752	35,752	19,249	19,249
R^2	0.71	0.72	0.72	0.73	0.63	0.65

Note: Eicker-White standard errors are reported in parentheses. Sample limited to transactions within 1000 feet of a foreclosure filing or auction that occurred within the past year. Reported coefficients are for foreclosure auctions. Controls for foreclosure filings are also included. Structure characteristics include the log of land square-footage, the log of building square-footage, a quartic in building age, and indicator variables for the following characteristics: 2 bathrooms, 3 or more bathrooms, masonry exterior, frame and masonry exterior, basement, full basement, finished basement, attic, full attic, finished attic, garage, detached garage, 2 car or larger garage, air conditioning, fire place. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table 6: Effect of Foreclosures on log Prices by Period and Vacancy Rate

	(1) Low Vac 98-06	(2) Low Vac 07-08	(3) High Vac 98-06	(4) High Vac 07-08
SFR Forcs $0 - 250$ ft.	-0.016**	-0.034**	0.013	-0.020
	(0.007)	(0.015)	(0.008)	(0.017)
SFR Forcs $250 - 500$ ft.	-0.004	-0.011	0.016***	0.012
	(0.004)	(0.008)	(0.006)	(0.011)
Units RO MF Forcs <= 250 ft.	0.005	-0.039**	0.005	-0.013
	(0.006)	(0.019)	(0.005)	(0.013)
Units RO MF Forcs $250 - 500$ ft.	-0.010**	0.031***	0.003	-0.011*
	(0.005)	(0.011)	(0.003)	(0.006)
Structure Characteristics	X	X	X	X
Year x Community Effects	X	X	X	X
Census Tract Effects	X	X	X	X
N	29,783	5,568	15,445	3,804
R^2	0.73	0.74	0.67	0.63

Note: Eicker-White standard errors are reported in parentheses. Sample limited to transactions within 1000 feet of a foreclosure filing or auction that occurred within the past year. Reported coefficients are for foreclosure auctions. Controls for foreclosure filings are also included. Structure characteristics include the log of land square-footage, the log of building square-footage, a quartic in building age, and indicator variables for the following characteristics: 2 bathrooms, 3 or more bathrooms, masonry exterior, frame and masonry exterior, basement, full basement, finished basement, attic, full attic, finished attic, garage, detached garage, 2 car or larger garage, air conditioning, fire place. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table 7: Effect of Quadratic Foreclosures on log Prices by Vacancy Rate

	(1) all SFR	(2) Low Vac	(3) High Vac
SFR Forcs $0-250$ ft.	-0.001	-0.005	0.010
	(0.010)	(0.014)	(0.015)
(SFR Forcs $0-250$ ft.)^2	-0.007	-0.011	-0.007
	(0.006)	(0.010)	(0.007)
SFR Forcs $250-500$ ft.	0.008	-0.001	0.023**
	(0.007)	(0.006)	(0.011)
(SFR Forcs $250-500$ ft.)^2	-0.002	-0.003	-0.004
	(0.003)	(0.002)	(0.004)
Units RO MF Forcs <= 250 ft.	-0.007	-0.007	-0.006
	(0.008)	(0.013)	(0.009)
(Units RO MF Forcs <= 250 ft.)^2	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)
Units RO MF Forcs $250-500$ ft.	-0.004	0.004	-0.006
	(0.004)	(0.008)	(0.005)
(Units RO MF Forcs $250-500$ ft.)^2	0.000	-0.001	0.000
	(0.000)	(0.001)	(0.000)
Structure Characteristics	X	X	X
Year x Community Effects	X	X	X
Census Tract Effects	X	X	X
N	55,007	35,752	19,249
R^2	0.72	0.73	0.65

Note: Eicker-White standard errors are reported in parentheses. Sample limited to transactions within 1000 feet of a foreclosure filing or auction that occurred within the past year. Reported coefficients are for foreclosure auctions. Controls for foreclosure filings are also included. Structure characteristics include the log of land square-footage, the log of building square-footage, a quartic in building age, and indicator variables for the following characteristics: 2 bathrooms, 3 or more bathrooms, masonry exterior, frame and masonry exterior, basement, full basement, finished basement, attic, full attic, finished attic, garage, detached garage, 2 car or larger garage, air conditioning, fire place. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.