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The Effect of Foreclosures on Nearby Housing Prices: Supply or Disamenity?

by Daniel Hartley

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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 measure separate effects for different types of foreclosed properties and use these estimates to 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 disamenity stemming from deferred maintenance or vacancy. I estimate that each extra unit of supply decreases prices within 0.05 miles by about 2 percent while the disamenity stemming from a foreclosed property is near zero. This result is driven by low-vacancy-rate census tracts, where the supply effect is even stronger. In high-vacancy-rate census tracts the supply, effect is roughly zero.

Key words: foreclosure, housing prices, neighborhood effects.

JEL codes: H23, R20, R30.

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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]

This strategy may have implications for the property values of homes that are near the bank-owned properties. As an owner of a nearby property or as a local public official concerned about tax revenue from properties near foreclosed homes would one rather have the bank "meter out" the properties to meet demand or sell them quickly to minimize the time that they sit vacant?

The answer to this questions hinges upon the mechanisms through which foreclosures decrease nearby property values and the relative size of each effect. 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: segmentation and integration. In the segmentation case, I assume that foreclosure of a nearby single-family home

[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. See also Apgar et al. [2005].

affects the property values of single-family homes through both the supply and dis-amenity mechanisms. This is because foreclosure of a single-family home adds a unit of supply to the single-family market and creates the potential for a poorly maintained or vacant property. However, foreclosure of a nearby renter-occupied multi-family building affects the property values of single-family homes only through the dis-amenity mechanism. This is because, in the segmentation case, potential buyers of single-family homes do not view multi-family buildings as substitutes; so no supply is added to the single-family home market. In this case, renter-occupied multi-family building foreclosures may still affect single-family home prices but only through potential lack of up-keep and vacancy. In the 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 foreclosures that occurred during the prior year and on the log price of single-family homes within 0.05 miles. In addition to the universe of other residential foreclosures, I control for a large number of property characteristics that could affect home prices. I include month of year effects to control for seasonality of the real estate market. I also include either year, community area-year, or census tract-year effects to control for local shocks, and a local home price index to control for spatial and temporal variation in housing prices. 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. To deal with the reverse causality problem I use the time and spatial differencing developed in Campbell et al. [2010].

I find that each foreclosure filing occurring in the previous year and within a 0.05 mile radius is associated with a reduction in the price of a single-family home of about 1%.

However, I focus on comparing the effects of single-family foreclosures and multi-family renter-occupied foreclosures on nearby property values. I find that each single-family home foreclosure filing within a 0.05 mile radius occurring in the past year is associated with a reduction in the price of a single-family home of about 1.5%.[4] Multi-family foreclosure filings in the past year within a 0.05 mile radius are not associated with a reduction in the price of a single-family home. Subtracting the multi-family effect from the single-family effect I estimate that the supply effect is around -2%, whereas the dis-amenity effect is about zero.[5] However, there is some evidence that these effects vary depending on whether the foreclosure occurs in a low vacancy rate census tract or a high vacancy rate census tract. The supply effect appears to be more negative in low vacancy rate census tracts than in high vacancy rate tracts. This 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. On the other hand, the dis-amenity effect appears to be about zero in low and high vacancy rate census tracts.

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

[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. The New York City housing market was booming during their sample, whereas my sample includes the subsequent bust as well. 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. [2010] also find a spillover effect of about -1% per foreclosure within about 250 feet. Lin et al. [2007] find much larger effects using data from 2003 and 2006 from Chicago, but their results may be biased by not having a complete listing of all foreclosures. See also Calomiris et al. [2008].

[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.

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. The first two sections present data regarding the number of single-family (SFR), renter-occupied multi-family (RO MF), owner-occupied multi-family (OO MF), and condominium foreclosure filings that occurred within the past year within 0.05 miles or 0.1 miles of a non foreclosure-related single-family residence property transaction. The third section presents data regarding the sales price and 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. For the properties for which an auction is observed the mean time from filing to auction is eleven months, the median is about eight months, the first percentile is 3 months, and the 99th percentile is about four years. Since there is likely to be a considerable amount of selection in regard to which filings proceed to auction, I focus on estimating the effect of foreclosure filing events. In the end, the preferred sample that I use for estimation includes roughly all single family residential property transactions in the City of Chicago from 1999 through 2008 and counts of the number of initial foreclosure filings within the past year and within 0.05 miles or within 0.1 miles 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. The mean number of units per multi-family building is 2.6 and the standard deviation is 2.7. Figure 1 shows a map of Chicago. Census tracts in which at least one owner-occupied single-family foreclosure and at least one renter-occupied multi-family building foreclosure occurred between 1998 and 2008 are indicated with gray shaded cross-hatching. The dark lines shown in Figure 1 represent

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

community area boundaries. In this paper, I refer to two types of geographical subdivisions of 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 that the single-family and multi-family housing markets are 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 effect of deferred maintenance or vacancy on the nearby properties. Let β_{SF} represent the effect of a single-family home foreclosure on nearby single-family home values and β_{MF} represent the per-unit effect of an N unit multi-family building on nearby single-family home values, then under the assumption of segmentation the impact of a single family home foreclosure and an N unit multi-family building foreclosure on nearby single family home values can be expressed as,

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

[7] I use the terms neighborhood and community area interchangeably throughout this paper. See `http://en.wikipedia.org/wiki/Community_areas_of_Chicago` for a discussion of Chicago community areas.

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 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 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 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 a 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 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.

The second assumption is that both single-family home foreclosures and multi-family apartment building foreclosures create dis-amenities for neighboring single-family homes be-

[8] Chris Young, Sales Associate, Coldwell Banker, Cambridge, MA says, "Rarely have crossover [between] 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."

cause 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 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.

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

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.

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 building foreclosures on nearby property values. To achieve this I analyze the prices of non-foreclosure-related single-family home sales in Chicago between 1999 and 2008. I compute the number of single-family, renter-occupied multi-family, owner-occupied multi-family, and condominium foreclosures in distance-based rings surrounding each transaction. The specification that I use is quite similar to the specification used in Campbell et al. [2010]. I estimate a number

[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.

of different variations of the following specification,

$$\ln P_{i,j,c,t} = \beta F_{i,j,c,t} + \Gamma X_i + \delta C_{j,t} + \xi N_{i,t} + \varepsilon_{i,j,c,t} \tag{5}$$

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 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 in the past year and the number of renter-occupied multi-family housing units scheduled for foreclosure 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. $C_{j,t}$ includes a vector of month indicator variables and either a vector of year indicators, a vector of community area indicators interacted with year indicators, or a vector of census tract indicators interacted with year indicators. Finally, $N_{i,t}$ is an index of of nearby home-prices.

4 Results

In this section I present estimates of the effect of foreclosures on nearby property values using a number of different specifications. Most specifications shown in Tables 3 and 4 include census tract - year effects to control for local economic shocks that might affect prices at a relatively fine level of geography. All specifications include month indicators to control for seasonality of the housing market. All specifications also include structure characteristics to control for differences in single family home prices that are driven by size, number of bedrooms, and amenities such as garages, attics, and basements.[12] All standard errors are clustered at the census tract-year level.

Table 3 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 non-foreclosure single-family home transactions from 1999 through 2008. For each transaction, variables containing counts of the number of initial foreclosure filings in the year prior to the transaction are computed for the area within 0.05 miles of the transacted home,

[12] A detailed list of the structure characteristics included can be found in the notes for Table 3.

and the number within 0.1 miles of the transacted home. By including both the number of foreclosures in the inner ring (0-0.05 miles) and the total number within 0.1 miles, the specification is employing a spatial differencing technique, effectively measuring the effect of a foreclosure on prices within 0.05 miles relative to those within 0.1 miles. [13]

Table 3 contains estimates of five different specifications, each with increasingly finer controls for local economic shocks. The fifth column presents a specification that is very similar to the preferred specification in Campbell et al. [2010]. Column (1) presents a specification with no local price. A vector of indicator year variables are included to control economic shocks at the city-level. Column (2) replaces the year indicators with community area-year, thus controlling for shocks that might affect housing prices at a finer level of geography. Column (3) uses census tract-years indicators, an even finer level of geography. Column (4) introduces a distance-weighted index of the log price of any homes that have transacted during the previous year within 0.25 miles of i. As in Campbell et al. [2010], I use a linear weighting scheme that gives a weight of 0.25 minus the distance to the house divided by the sum of the weights. If no transactions occurred within 0.25 miles in the past year the index is set equal to zero. A dummy variable that indicates whether no transactions occurred within 0.25 miles in the past year is also included. Finally, Column (5) introduces another way to control for time-varying home prices; by estimating the effect of foreclosures that occur in the year following a single-family home transaction, and then subtracting that from the estimated effect of a foreclosure in the previous year. Column (5) also adds a weighted local price index and a no transaction indicator for the year following transaction i.

Column (1) of Table 3 presents a specification that estimates the effects of foreclosure filings. The estimate of the "Far" coefficient, presented in the second row of Column (1) implies that, on average each additional foreclosure within 0.1 miles that occurred in the past year is associated with about a 9.1% drop in home prices. Of course, since I am not controlling for differences in housing prices across the city, it is likely that this coefficient simply reflects the fact that foreclosures are more likely to occur in lower-priced neighborhoods. In contrast, the coefficient on "Close" indicates that each additional foreclosure within 0.05 miles within

[13] This is in contrast to Campbell et al. [2010] who include a variable that counts the number of foreclosures within 0.25 miles of the transacted home and a linearly weighted function of the number of foreclosures within 0.1 miles, where the weighting starts at 1 if the foreclosure is zero miles away and dies off to zero at 0.1 miles away. I find my shorter distance specification to be preferable in the context of Chicago which is much denser than the entire state of Massachusetts, which is used in Campbell et al. [2010].

the past year depresses prices by an additional amount of about 1.4%. Column (2) switches from year indicators to community area-year indicators. The first thing that stands out is that the coefficient on "Far" has switched from -0.091 in Column (1) to 0.019 in Column (2). This indicates that within a community area each additional foreclosure within 0.1 miles in the past year is associated with about 2% higher housing prices. Although foreclosures tend to occur in lower priced neighborhoods, they tend to occur in places within the neighborhood where prices are higher, on average. This is also the case within census tracts, as revealed by the 0.035 coefficient on "Far" in Column (3), which is the same as Column (2) except that the community area-year indicators are replaced by the finer census tract-year indicators. The positive sign of these estimates may reflect a situation where foreclosures occur in places within a community area or census tract where home prices rose and then fell leaving recent home-buyers with little equity. It is also worth noting that moving from controlling for shocks to home prices at the city level in Column (1) to the community area level in Column (2) reduces the magnitude of the point estimate on "Close" from -0.014 to -0.011 but it also lowers the standard error from 0.007 to 0.005. However, moving from community area-year controls in Column (2) to census tract-year controls in Column (3) does not have much of an impact on the point estimate or the standard error for "Close". The point estimate on "Close" in Column (3) implies that each additional foreclosure with 0.05 miles in the past year is associated with about 1% lower house prices. The specification in Column (4) is the same as that in Column (3) except that I have added the distance weighted index of local prices and the no transaction dummy variable described above. Adding the local price index has almost no effect on the point estimates or standard errors on "Close" and "Far". This may be due to the fact that the census tract-year indicators are already controlling for differences in house prices across the city and throughout time in a relatively fine manner.

One problem with the specifications presented in Columns (1) - (4) of Table 3 is that if foreclosures tend to occur in areas (within a city, community area, or census tract) where property values have recently switched from rising to falling, then there is a potential that the recent drop in price may be causing the foreclosure rather than the foreclosure causing the drop in price. To get a better estimate of the true change in prices from the period just before to the period just after the foreclosure, the specification in column (5) adds controls for the number of foreclosure filings in the year following the observed single-family home

sale. This strategy is employed by Campbell et al. [2010] and can be viewed as a kind of time-differencing.[14]

In Column (5) the estimates reported for "Close" and "Far" are calculated by subtracting the estimate on the count of foreclosures in the following year from the estimate on the count of foreclosures in the previous year for the relevant distance range. The first thing to note in Column (5) is that the point estimate for "Far" is much closer to zero than in the other specifications, and is statistically indistinguishable from zero. This provides some degree of assurance that the time-differencing is helping to remove the possibly spurious correlation between house prices and number of foreclosures within 0.1 miles that was giving rise to statistically significant positive point estimates on "Far" in Columns (2) - (4). Even more reassuring is the fact that the point estimate on "Close" is practically unchanged. Using either the spatial differencing technique implicit in controlling for the number of foreclosures within 0.1 miles or both the spatial and time-differencing techniques, it appears that each foreclosure within 0.05 miles is associated with about a 1% reduction in housing prices. As might be expected, adding the time differencing increases the standard errors slightly. It is also interesting to note that the near zero coefficient on "Far" in Column (5) implies that the negative effects of foreclosures are very local. The effect can be detected at from 0 to 0.05 miles (or 264 feet) but appears to be zero at distances greater than 0.05 miles. This estimate of -0.011 is quite similar to the -0.013 implied by the preferred specification of Campbell et al. [2010].[15]

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

Table 4 presents estimates of the effect of single family residence (SFR) and renter-occupied multi-family (RO MF) foreclosure filings on the price of nearby single-family homes. The estimates presented are from a specification similar to that of column (5) in Table 3 except that variables are included for each type of foreclosed property: single-family residence, renter-occupied multi-family, owner-occupied multi-family, and condominium.

[14] Campbell et al. [2010] attribute the inspiration for this strategy to Linden and Rockoff [2008].

[15] Campbell et al. [2010] use a linear distance-weighted count of foreclosures from 0 to 0.1 miles. The -0.013 that I report above comes from multiplying their "close" estimate of -0.017 in Column (4) of Table 5 by (0.1 - 0.025) / 0.1 since 0.025 is the midpoint of my "Close" ring which extends to 0.05 miles.

Column (1) of Table 4 presents the baseline specification. Column (2) presents a robustness specification restricted to census tracts which contain at least one single-family residence foreclosure and at least one renter-occupied multi-family foreclosure. These census tracts are marked by cross-hatching in Figure 1. Column (3) restricts the sample to census tracts that have residential vacancy rates below the median and Column (4) restricts the sample to census tracts with vacancy rates above the median tract. Figure 2 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.

Column (1) of Table 4 indicates that each single family foreclosure filing within 0.05 miles is associated with a discount of about 1.5%, while multi-family foreclosure filings within 0.05 miles are associated with a 0.7% premium which is statistically indistinguishable from zero.

The bottom panel of Table 4 presents estimates of the segmented market supply and dis-amenity effects. As shown in Equation 1, the supply effect is calculated by subtracting the estimated per-unit effect of a renter-occupied multi-family foreclosure from the effect of a single family residence foreclosure. Thus, the supply effect shown in the row labeled "Supply Close" is calculated by subtracting the multi family effect from the single family effect shown in the upper part of the table. Each extra unit of supply within 0.05 miles is associated with a discount of about 2.2%, while there is roughly zero discount for an additional unit of supply in the 0.05 - 0.1 mile range. As shown in Equation 2, the dis-amenity effect is simply the estimated per-unit effect of renter-occupied multi-family foreclosures. Each foreclosure filing is associated with a dis-amenity effect of about +0.7%, which is statistically indistinguishable from zero. Restricting the sample to census tracts which contain at least one single-family residence foreclosure and at least one renter-occupied multi-family foreclosure has almost no impact on the estimates, as seen by the similarity of point estimates and standard errors in Column (1) and Column(2).

4.2 Interpreting Results Assuming 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

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 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. With this assumption, Equations 3 and 4 can be used to calculate the supply and dis-amenity effects. In this case, the supply effect would be about -3.7% within 0.05 miles (marginally statistically significant at the 5% level), and the dis-amenity effect is about +2.2% (not statistically significant at the 5% level) within 0.05 miles. In summary, switching from an assumption of segmentation to integration of the single-family and multi-family housing markets changes my estimate of the supply effect from about -2.2% to about -3.7% and changes my estimate of the dis-amenity effect from about +0.7% to about +2.2%. Either way the dis-amenity effect may be interpreted as a zero since it is not statistically distinguishable from zero. Since I find the segmentation assumption more plausible, the rest of the results presented in the paper assume segmentation.

4.3 Variation in Effect by Vacancy Rate

In order to determine how the marginal effect of a foreclosure on nearby property values varies with the tightness of the housing market, this sub-section splits the sample into low and high vacancy rate sub-samples. Columns (3) and (4) of Table 4 present estimates for the same specifications as those in Column (1) but use a sub-sample of low vacancy rate census tracts and a sub-sample of high vacancy rate census tracts. Assuming market segmentation, the estimates in Column (3) imply a statistically significant supply effect of -3.8% and a dis-amenity effect of about 1.6% which is not statistically distinguishable from zero within 0.05 miles in low vacancy rate census tracts. In contrast, the estimates in Column (2) show that neither the supply nor the dis-amenity effect is statistically significant. Both point estimates are relatively small in magnitude. The supply effect is about -0.9% per unit of foreclosure within 0.05 miles and the dis-amenity effect is about +0.4% per unit of foreclosure. Consistent with the theoretical results illustrated in Wheaton [1990], the supply effect appears to be more pronounced in a tight housing market.

5 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. [2010] 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. In low vacancy rate census tracts, the supply effect is about -3.8% per foreclosure. However, in high vacancy rate census tracts, there is little evidence of a supply effect. The dis-amenity effect is never statistically distinguishable from zero.

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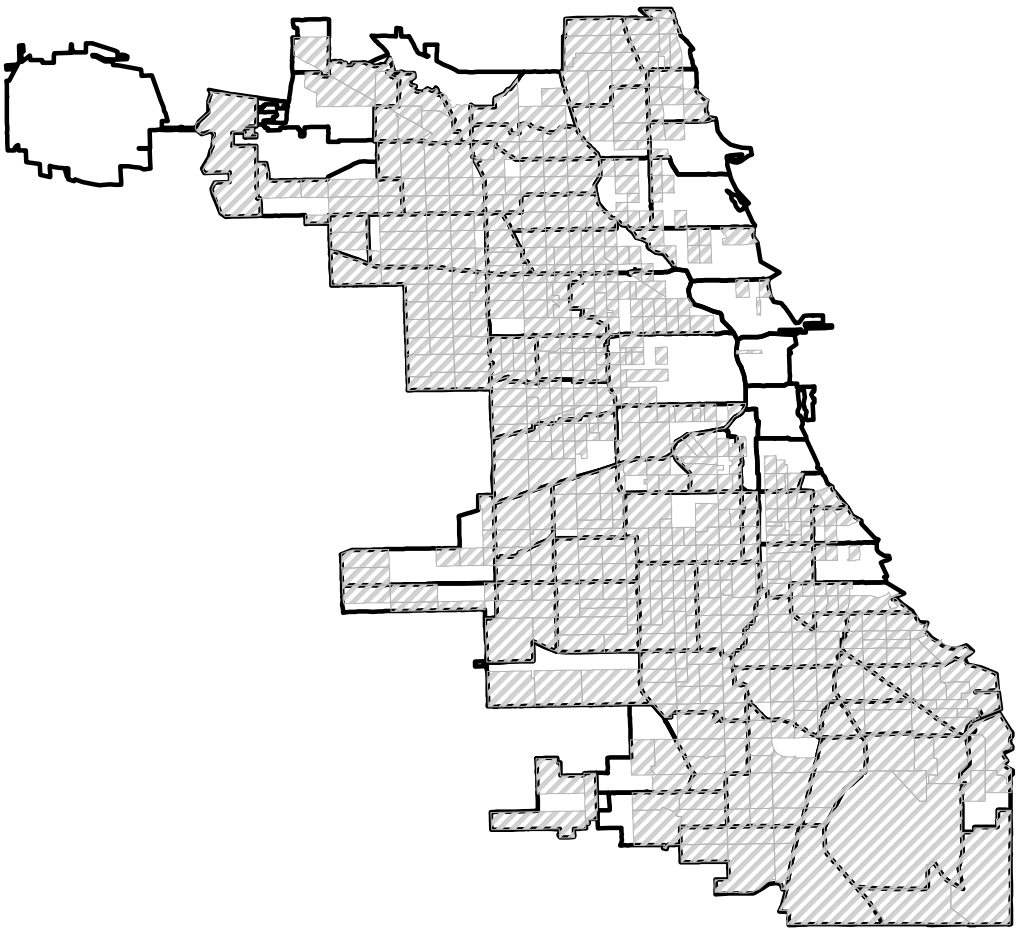

Figure 1: Chicago Community Areas and Tracts with both SFR and RO MF Foreclosures

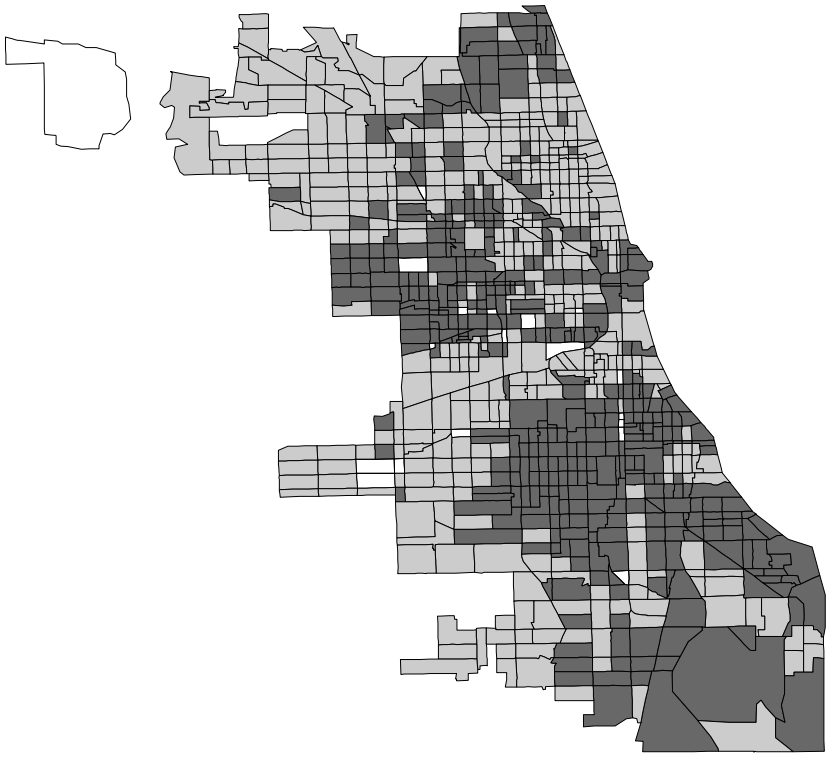

Figure 2: High and Low Vacancy Rate Census Tracts. Above Median Vacancy Rate (5.17%) Tracts in Dark Gray. Below Median Vacancy Rate Tracts in Light Gray.

Table 1: Descriptive Statistics of Nearby Foreclosures, Property Characteristics and Census Tract Characteristics for SFR Property Transactions (N = 89,964)

	Mean	S.D.	Min	Max
SFR Filings (past year) 0 - 0.05 miles	0.10	0.36	0	6
SFR Filings (past year) 0 - 0.1 miles	0.35	0.80	0	10
Units of RO MF Filings (past year) 0 - 0.05 miles	0.04	0.42	0	37
Units of RO MF Filings (past year) 0 - 0.1 miles	0.17	0.99	0	40
Units of OO MF Filings (past year) 0 - 0.05 miles	0.02	0.23	0	6
Units of OO MF Filings (past year) 0 - 0.1 miles	0.07	0.46	0	10
Condo Filings (past year) 0 - 0.05 miles	0.00	0.08	0	5
Condo Filings (past year) 0 - 0.1 miles	0.02	0.18	0	9
Price	208,030	164,934	11,512	1,694,531
Land Square Footage	3,927	1,564	460	122,465
Building Square Footage	1,330	589	400	27,270
2 Bathrooms	0.20	0.40	0	1
3+ Bathrooms	0.05	0.22	0	1
Masonry Exterior	0.54	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	0.28	0.45	0	1
Fireplace	0.14	0.34	0	1
Age of Structure	69	32	1	148
Tract Median Household Income in 2000	43,797	14,053	2,499	127,031
Tract Fraction African American in 2000	0.37	0.43	0	1
Tract Fraction Employed in 2000	0.54	0.10	0	1
Tract Fraction under 18 in 2000	0.27	0.07	0	0.63
Tract Fraction over 65 in 2000	0.12	0.05	0	1
Tract Fraction Female Head in 2000	0.15	0.05	0	0.41
Tract Fraction HS Grad in 2000	0.72	0.13	0.24	1
Tract Fraction College Grad in 2000	0.20	0.17	0	1
Tract Median Rent in 2000	637	121	99	2001

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 (N = 89,964)

	(1)	(2)	(3)	(4)	(5)
Close (0-0.05 miles)	-0.014**	-0.011**	-0.010*	-0.010*	-0.011
	(0.007)	(0.005)	(0.005)	(0.005)	(0.008)
Far (0-0.1 miles)	-0.091***	0.019***	0.035***	0.034***	0.003
	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)
Price Index, Year Before				0.053***	0.038***
				(0.012)	(0.012)
Price Index, Year After					0.044***
					(0.012)
No Transactions Indicator, Year Before				0.505***	0.430***
				(0.141)	(0.143)
No Transactions Indicator, Year After					0.424***
					(0.158)
Additional Controls	Year Indicators	Community Area-Year Indicators	Census Tract-Year Indicators	Census Tract-Year Indicators	Census Tract-Year Indicators

Note: Eicker-White standard errors clustered at the census tract-year level are reported in parentheses. All specifications include month of year indicators and structure characteristics. 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 Foreclosure Types on log Prices by Type

	(1)	(2)	(3)	(4)
Close SFR (0-0.05 miles)	-0.015*	-0.014	-0.022***	-0.005
	(0.009)	(0.010)	(0.008)	(0.016)
Far SFR (0-0.1 miles)	0.003	0.002	0.005	0.002
	(0.005)	(0.005)	(0.005)	(0.008)
Close MF RO (0-0.05 miles)	0.007	0.007	0.016	0.004
	(0.008)	(0.008)	(0.011)	(0.010)
Far MF RO (0-0.1 miles)	-0.004	-0.004	-0.010	-0.002
	(0.003)	(0.003)	(0.007)	(0.004)
Sample Restricted to Tracts with both types of Foreclosures	No	Yes	No	No
N	89,946	67,790	58,263	31,679
Segmented Markets				
Supply Close (0-0.05 miles)	-0.022*	-0.021	-0.038***	-0.009
	(0.012)	(0.013)	(0.014)	(0.019)
Supply Far (0-0.1 miles)	0.007	0.006	0.015*	0.004
	(0.006)	(0.007)	(0.008)	(0.010)
Disamenity Close (0-0.05 miles)	0.007	0.007	0.016	0.004
	(0.008)	(0.008)	(0.011)	(0.010)
Disamenity Far (0-0.1 miles)	-0.004	-0.004	-0.010	-0.002
	(0.003)	(0.003)	(0.007)	(0.004)
Integrated Markets				
Supply Close (0-0.05 miles)	-0.037*			
	(0.019)			
Supply Far (0-0.1 miles)	0.011			
	(0.010)			
Disamenity Close (0-0.05 miles)	0.022			
	(0.014)			
Disamenity Far (0-0.1 miles)	-0.008			
	(0.006)			

Note: Eicker-White standard errors clustered at the census tract-year level are reported in parentheses. All specifications include controls for the number of foreclosure filings for condo and multi-family owner-occupied properties. All specifications include census tract-year indicators, month of year indicators, structure characteristics, and weighted indices of nearby prices in the past year and future year as well as indicators for weather no transactions occurred in the past year or future year within 0.25 miles. See text for details on the local price indices. See Table 3 note for description of structure characteristics. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.