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# The Role of Proximity in Foreclosure Externalities: Evidence from Condominiums

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**Abstract:**
We explore several different explanations of the effect of foreclosures on neighboring properties using a dataset of transactions in Boston, for which we have rich data on the size and location of condominium associations. There is compelling evidence against a supply effect—nearby condo foreclosures in different associations, and even those within the same association but at different physical addresses, have little impact on condo sale prices. However, condos transact at average discounts of 2.4 percent when a foreclosure shares the same physical address. We view the results as indicating that investment externalities drive foreclosures' impacts on neighboring house prices.

**JEL Classifications: G21, K11, R31**

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Starting with Immergluck and Smith (2006), researchers have documented that properties that sell near foreclosures transact at a discount relative to otherwise identical properties that have no foreclosures nearby. We extend this literature by focusing on a sample of Boston condominiums that allows us to identify the precise mechanism that generates these price effects. In particular, we aim to distinguish between two popular theories, the first being that foreclosures cause price declines through a "supply effect," resulting from the fact that a foreclosed property is a close substitute for nearby properties. An alternative and not mutually exclusive explanation is that an owner has no incentive to invest in his property during the foreclosure process, and so the property deteriorates, generating a physical externality. Our results have important implications for policy. If foreclosures affect prices merely by increasing the supply on the market, then the effect of foreclosures on nearby properties is a pecuniary externality, implying that the market outcome is not necessarily inefficient and that government intervention risks choosing winners and losers rather than increasing overall welfare. In contrast, a physical externality always allows for welfare-improving policy interventions.

In this paper we shed light on these different explanations of the effect of foreclosures on neighboring properties using a dataset of condominium transactions in Boston over the years 1987 to 2012, for which we have rich data on the size and location of condo associations. As shown in Figure 1, foreclosures of condos have occurred in virtually every neighborhood of Boston, often in neighborhoods with a mix of single-family, multifamily, and condo properties. Citywide, about 3,400 foreclosures of single-family, 2–3 family, and condo properties were completed between 2007 and 2011. About 42 percent of these were foreclosures on condos. In the previous wave of foreclosures in Massachusetts in 1991–1994, approximately 5,400 foreclosures were completed, 52 percent of which involved condos. Condo associations in Boston come in all sizes, ranging from a single converted duplex to a set of large multifamily buildings, comprising hundreds of units. The effects of foreclosures on neighboring condos are exceptionally strong in Boston. For some properties in our sample, we show that each nearby foreclosure reduces the sale price by more than 6 percent as compared with another property in the same census tract that sells without a foreclosure nearby. Previous researchers, who have generally focused on single-family homes, have found much smaller effects, typically 1 percent or less.

But the reason this dataset is particularly useful is that it includes information on the condo associations to which individual units belong, enabling us to distinguish between units within a foreclosed property's association and those that are neighbors in other associations. Specifically, our data allow us to divide our sample of condo pairs into three groups: same-association, same-address (SASA); same-association, different-address (SADA); and different-association, different-address (DADA) units. To explain why this is useful, consider some alternative hypotheses. If foreclosures drive down prices because of the supply effect, we would expect association to matter more than location and the effect of SASA and SADA foreclosures to be roughly equivalent, assuming that units within the same association are closer substitutes for one another than for units in neighboring associations. If the externality works through the association itself—for example, without the dues income, the association may have trouble maintaining the common spaces—we would also expect to see SASA and SADA having similar-sized effects. But if the externality is related purely to the physical condition of the distressed property, we would expect the effects of SASA foreclosures to matter the most, and we might expect SADA foreclosures to be comparable to DADA foreclosures in their effects of exerting downward pressures on house prices.

We also pay special attention to the fact that the owner of a condo in mortgage foreclosure has little incentive to make association payments. Failure to pay these fees will result in the association's draining its reserves or deferring maintenance while attempting to recover the fees, either scenario potentially making the building and association less desirable to prospective buyers. High rates of vacancy, nonowner occupancy, and unpaid condo association fees can trigger the loss of a property's eligibility for Federal Housing Administration (FHA) financing or securitization with Fannie Mae or Freddie Mac, potentially making it difficult for an owner to sell to a buyer who needs to use mortgage financing. Overall the comparison of SADA and DADA condominiums suggests that these association effects are not that important.[1]

A major concern about regressing prices on foreclosures is that, since falling house prices reduce borrowers' equity and lead to foreclosures, our estimated effects could unwittingly reflect the impacts of prices on foreclosure, rather than the damaging effect of foreclosures on nearby properties' sale prices. Following Gerardi et al. (2012) and others, we address this problem by adopting a repeat sales methodology and using census tract controls for neighborhoods and comparability controls for property characteristics, meaning that our estimation strategy amounts to comparing two observably identical properties in the same census tract that were bought in the same year and sold in the same year and that differ only in the number of foreclosures nearby. Since a census tract is small—typically containing about 4,000 inhabitants—we can rule out explanations for any estimated effects that rely on differences across neighborhoods or markets. To offer an alternative explanation for why we observe a price discount near a foreclosed property, one must explain why properties in one part of a census tract appreciate at different rates than properties in another part of the tract. Given the small size of tracts, this is usually challenging. For example, buyers shopping for a house will typically not restrict their search to just one part of a census tract.

Our headline finding is that the effect of SASA foreclosures is much stronger than the effect of either a SADA foreclosure or a DADA foreclosure, neither of which has a statistically or economically significant impact on neighboring house prices. All else being equal, an additional SASA foreclosure reduces the sale price of a condominium by an average of 2.4 percent, whereas an additional SADA foreclosure reduces the price by 0.5 percent, and an additional DADA foreclosure reduces the price by 0.2 percent, with only the SASA effect being statistically significant. The SADA foreclosures are almost all in associations

[1] Another potential mechanism is that foreclosures could reduce area house prices by providing low-priced "comparables" in appraisals (Lee 2008). While appraisers may use foreclosures as comparable sales in the valuation process, they are directed to account for the forced sale discount and to adjust their calculations accordingly (Ellen, Madar, and Weselcouch 2012).

with more than 12 units, and our results hold even when we focus only on large associations.

We also find that the effects of SASA foreclosure are much stronger in small associations than in large associations. We estimate that an additional foreclosure in an association with 12 or fewer units lowers the price by 6.1 percent. The effect of SADA foreclosures in small associations is not statistically significant, because such foreclosures are rare, and so our results lack statistical power.

We view the results in our paper as evidence that the main source of the effects of foreclosures on the prices of neighboring properties is the physical externality. The reason we take this view, as suggested above, is that both the supply effect and the association effect would suggest that same-association foreclosures should have much stronger effects than different-association foreclosures. In particular, we would expect same-association, different-address properties to be very close substitutes, so if the supply effect were powerful, we would expect these foreclosures to depress prices. However, the effect we measure is neither economically nor statistically significant. In small associations, however, where same-association foreclosures are usually located at the same address, we cannot disentangle the physical externality from the association effects so easily, and we believe both may be depressing house prices.

Our results are consistent with earlier work. Campbell, Giglio, and Pathak (2011) use the same dataset that we do and, indeed, find evidence of foreclosure externalities only for condominiums and not for single-family or small multifamily properties. For their entire sample, Anenberg and Kung (2013) find that foreclosures exert an effect on prices only after the properties become bank owned and are listed for sale, a finding they argue is evidence against a maintenance externality. But for their "high-density" subsample, which most closely corresponds to our sample, they find strong effects prior to the foreclosure auction sale, which they attribute, as we do, to a maintenance externality. We provide a more thorough review of the literature in Section 1.

Ours is not the first research to draw significant conclusions from the Boston condominium market. Genesove and Mayer (1997) and Genesove and

Mayer (2001) used data from the same Boston condominium properties to argue for the role of loss aversion and leverage, respectively, in homeowners' sale decisions. As mentioned above, Campbell, Giglio, and Pathak (2011) use the same dataset we do, and although their regressions include all properties in Massachusetts, their main findings relate to condominiums, a large share of which are located in Boston.

In the following sections, we discuss some of the literature on foreclosure spillovers, explain our data and modeling procedures, and discuss the possible implications of our findings.

# 1 Model

To measure the external effects of foreclosures, nearly all researchers to date have used some version of the following spatial externality regression:

$$\log(P_{it}) = \alpha + \beta X_{it} + \gamma NF_{it} + \varepsilon_{it}, \tag{1}$$

where $P_{it}$ is the sale price of property $i$ in period $t$, $X_{it}$ is a vector of property characteristics, and $NF_{it}$ is the number of foreclosures within a certain geographic radius of the property occurring in a particular time window around the sale.[2] Prominent examples of research along these lines include Immergluck and Smith (2006); Schuetz, Been, and Ellen (2008); Harding, Rosenblatt, and Yao (2009); Campbell, Giglio, and Pathak (2011); and Gerardi et al. (2012).[3]

There are several issues in estimating equation (1), and although we largely follow the methodology of and direct the reader to Gerardi et al. (2012), we provide some detail here. The first significant choice we make is to estimate a repeat-sales version of equation (1) rather than a hedonic model, because the former deals better with the problem of unobserved heterogeneity across

[2]For a thorough discussion of the literature on strategies for modeling foreclosure spillovers on house prices, see Gerardi et al. (2012) and Frame (2010).

[3]Rossi-Hansberg, Sarte, and Owens III (2010) is one of the few papers in the literature on spatial externalities that uses a different approach, calculating a price function for all properties regardless of whether a transaction occurs.

properties.

Next, we address the problem that arises from the causal relationship between $P$ and $NF$—negative equity causes foreclosure—which leads to a negative value for $\gamma$ even when there is no spatial effect of foreclosures on prices. To see why, imagine that a demand shock hits one neighborhood in a metropolitan statistical area (MSA), and the shock leads to a fall in prices relative to other MSAs and a consequent relative increase in foreclosures and higher relative density of foreclosures. Higher foreclosure density, in turn, implies that foreclosures are more likely in *any* geographic radius in the neighborhood in question, meaning that in an MSA-level regression we will find a correlation between price declines and nearby foreclosures regardless of whether there actually is a causal relationship. Our approach to the problem is to include a full set of time-space fixed effects, namely census tract $\times$ calendar year of each transaction in the repeat-sales pair. This means that $\gamma$ in our models reflects a comparison of two properties in the same tract that were bought in the same year and sold in the same year and that differ with respect to the number of foreclosures that occur nearby.[4] In other words, since we are not comparing properties in different census tracts, our identification would only be confounded if some shock generated different *within census-tract* trends in house prices and foreclosures.

Gerardi et al. (2012) show that the presence of nearby distressed properties is associated with lower sale prices, starting when the borrower becomes seriously delinquent and ending a year after the sale of the property out of REO. Since we do not have detailed delinquency information in our dataset, we approximate such information by considering a foreclosure to be "active" during a window of time that starts one year prior to the foreclosure auction (to accommodate the period when the borrower is seriously delinquent) and ends two years after (to account for the time the property is marketed and sold by the lender, as well as the time when it is initially held by a third-party

[4]Our data allow us to use much finer geographic controls—down to the census block—but Gerardi et al. (2012) show that the benefits of going below the tract level are minimal, while the costs of reduced power are, in our case, substantial.

owner after exiting REO.[5]

With some notable exceptions, all researchers in this literature have limited their attention to single-family residential (SFR) properties. The logic for focusing on SFRs is that these are the most common type of housing, particularly outside large cities, and that both condominiums and multifamily properties pose complications for modeling prices. Methodologically, the much higher density of condominiums as compared with single-family properties presents problems for the spatial externality regression. Institutionally, condominiums have explicit legal connections to nearby properties through their ownership governance, which links the experiences of property owners in additional ways, above and beyond simple proximity. Campbell, Giglio, and Pathak (2011) make the most prominent break with this tradition by including not only SFRs but also condominiums and small multifamily properties in their main sample. In addition, they estimate separate regression models for different subsamples of sales, but they still include all types of foreclosures. In other words, their condominium regression has the sale prices of condominiums on the left-hand side of the equation and the sum of all condo, SFR, and multifamily foreclosures in a 0.1-mile radius on the right-hand side, meaning that Campbell, Giglio, and Pathak (2011) do not explicitly model the effect of condominium foreclosures, for example, on the price of nearby condominiums.[6] As mentioned in our introduction, Campbell, Giglio, and Pathak (2011) find that the condo sample is the only one in which foreclosure externalities play an economically or statistically meaningful role.[7]

[5]Campbell, Giglio, and Pathak (2011) use the difference between the sale prices of properties that sell in the year after versus the year before the arm's-length sale, but Gerardi et al. (2012) argue that the CGP approach biases researchers against finding an effect of foreclosures on prices.

[6]Hartley (2011) distinguishes between the impacts of single-family and multifamily foreclosures on single-family house prices as a means for disentangling the causal mechanisms of foreclosure spillovers. He does not examine the effect of foreclosures on multifamily or condo prices. In effect, his study takes the opposite approach to that of Campbell, Giglio, and Pathak (2011). In this paper, we control for the structure type of both the foreclosed properties and the property sold at arm's length, the price of which is on the left-hand side and is our focus.

[7]For details on this result, see Table A.19 of Campbell, Giglio, and Pathak's online appendix, available at `http://www.aeaweb.org/aer/data/aug2011/20090375_app.pdf`.

## 2 Data

The principal source of data for the analysis in this paper is a dataset of public records and assessors' files compiled for the properties in Boston by the Warren Group, a local firm. The public records data contain, in principle, all sale and mortgage deeds recorded since 1987 for every residential property, and the assessors' files contain a contemporary snapshot of the characteristics of all properties. Researchers have used the Warren Group dataset extensively in the past, most notably to study foreclosure externalities in Campbell, Giglio, and Pathak (2011), although Foote, Gerardi, and Willen (2008) and Fisher and Lambie-Hanson (2012) use it to estimate foreclosure and sale hazards. For the bulk of our analysis, we follow the procedures used by Campbell, Giglio, and Pathak (2011) to clean the data.[8] In total, our dataset includes approximately 2 million sales of single-family, small multifamily (2–3 units), and condo properties in Massachusetts between January 1987 and June 2012, with about 215,000 of these occurring in Boston.

Our definition of repeat sales includes only what we consider true arm's-length sales. Foreclosure auctions are excluded, as well as sales of the lender-owned foreclosed properties known as "real-estate owned" (or REO) in the industry. In addition, we attempt to exclude short sales, transactions in which the lender allows the borrower to sell for less than the amount owed on the mortgage rather than complete a foreclosure. We exclude likely short sales by removing transactions in which the sale price is less than 75 percent of the combined origination amounts of mortgages taken out when the owner purchased the property.[9] We also exclude intrafamily transactions, sales in which the seller held the property for fewer than 7 days, and sales with prices below $10,000 or over $10 million.

We successfully geocoded 96 percent of the property locations using the ArcGIS 10 North American geocoding tool, achieving rooftop-level precision for a large proportion of our sample. After geocoding, we measured the

[8] See `http://www.aeaweb.org/aer/data/aug2011/20090375_app.pdf`.

[9] When we include short sales, we find even stronger evidence that same-association foreclosures drive estimates of foreclosure spillovers. Results available upon request.

distance between each property and its neighbors within 0.1 mile, using the Vincenty ellipsoidal distance formula. Figure 2 displays the scale of the 0.1-mile buffers, which typically amounts to a couple of city blocks in Boston.[10]

For the most part, researchers measuring foreclosure externalities have looked at similarly limited geographic areas. Immergluck and Smith (2006) examine data from Chicago; Schuetz, Been, and Ellen (2008) have data from New York City; and Campbell, Giglio, and Pathak (2011) use the same dataset we do, which covers Massachusetts. Harding, Rosenblatt, and Yao (2009) and Gerardi et al. (2012) use datasets with fairly broad national coverage. The disadvantage of our sample is that the results might not generalize to other locations, but the advantage is that we can explicitly identify units located in the same condo associations, something that no one has been able to do yet with a national dataset.

## 2.1 Identifying condo associations

In Boston, units in the same condo association share the same first seven digits of the assessors' parcel number, making it possible to identify a unit's association in over 95 percent of our condo sample. Foreclosures in the same association are not uncommon. Table 1 shows that there was a foreclosure within 0.1 mile of 41 percent of our sample of condominiums, with 38 percent located near a foreclosure of another condo unit. It is not uncommon for neighboring condo foreclosures to be located in the same association, particularly among large associations. About 16 percent of large-association sellers shared an association with a property in foreclosure, while nearly 3 percent of sellers in small associations (12 or fewer units) had foreclosures in their association. Our data allow us to decompose the same-association foreclosures further into those that occurred on units that were located at the same street address and those that were located at different addresses. Not surprisingly, most of the same-association foreclosures in small associations are located at the same street address, but only about two-thirds of foreclosures within large

[10] We estimate our main regression models using neighbors within 0.1 mile, but as a robustness check, we also examine neighbors 0.25 mile away. Results available upon request.

associations are located at the same address. Not only are large associations more likely to span multiple addresses, but the units at different addresses are also located farther apart (on average, 0.032 mile in large associations, as opposed to an average of 0.008 mile within small associations). We draw the reader's attention to the last row in Table 1, which shows that condo foreclosures in neighboring, *different* associations are located about equally far away from their neighbors, on average, in large and small associations.

To our knowledge, assessors in the rest of the state do not follow Boston's convention of linking parcel IDs and associations, making it impossible for us to identify associations anywhere except in Boston. As Table 1 illustrates, defining associations by address would lead to a substantial understatement of the extent of same-association foreclosures, particularly in large associations. In Boston, there were about half as many condominiums with foreclosures in the same association but a different address as condos with foreclosures at the same address.

# 3 Condo foreclosures and prices of nearby properties

In our first set of regressions, we put the price of the property sold in the arm's-length sale on the left-hand side. As introduced above, we regress the property's growth in price on a series of controls and on the number of nearby foreclosures. We first provide some descriptive statistics and explain the model in greater detail, and then turn to the results.

Table 2 presents summary statistics for our sample of repeat sales of properties in Boston. We include transactions of all property types for comparison with our condo sample. Although the Warren Group data include transactions from 1987 to the present, we limit our sample to properties that transacted between the first quarter of 1989 and the second quarter of 2011 in order to accommodate our foreclosure window, which, as explained in Section 1, extends one year prior to the foreclosure sale and two years after. Overall, we have

54,424 arm's-length transactions, of which 68 percent involve condominiums, almost exactly half of which are part of small associations with fewer than 13 units. As Coulson and Fisher (2012) show, condo associations of 12 or fewer units are different from larger associations, particularly in that they are much less likely to be professionally managed, a distinction we explore later in this paper.

We draw the reader's attention to a few facts about the condominium data relevant for the analysis that follows. First, condominiums are in much denser neighborhoods than either single-family or multifamily properties. There are almost three times as many properties within 0.1 mile of the typical condo (data not shown in table). The differing density across structure type could confound our results if the number of foreclosures relative to the size of the housing stock is the source of the externality. So, to address this problem, we control for density in all our regression models.

The second notable fact, returning to Table 1, is that sales with foreclosures nearby are quite common in our data, accounting for 41 percent of our repeat-sale condo sample. The issue is particularly acute for small associations, where 43 percent have a nearby foreclosure, in contrast with single-family properties, where the comparable figure is 31 percent. For multifamily and condo properties, most of the foreclosures nearby are of the same structure type, with 38 percent of condo repeat sales occurring with a condo foreclosure nearby, as compared with fewer than 8 percent occurring with a single-family foreclosure nearby. Conditional on having at least one foreclosure of any type nearby, there were, on average, about three foreclosures located within 0.1 mile.

Finally, there is substantial heterogeneity in the size of condominium associations. Roughly half of all condo transactions are in small associations with a median size of four units, while half are in large associations with a median size of 53 units. One would imagine (and we find) that the size of the association impacts the effect a foreclosure has on prices, so we distinguish between large and small associations in our results below.

# 4 Results

Following the discussion in Section 1, our estimated regression equation is:

$$\log(P_{isT}/P_{ist}) = \alpha_{istT} + \beta X_{iT} + \gamma NF_{iT} + \varepsilon_i, \quad (2)$$

where $P_{ist}$ is the sale price of property $i$ in tract $s$ at time $t$, and the subsequent sale occurs at time $T$. $\alpha_{istT}$ is a set of census tract-purchase year-sale year effects, $X_{it}$ is a vector of property characteristics, and $NF_{it}$ is a measure of the change in the number of "active" foreclosures, defined above, within 0.1 mile of property $i$ between time $t$ and $T$. Based on this specification, $\beta \cdot 100$ and $\gamma \cdot 100$ can be interpreted as roughly the percentage change in price from a unit change in $X_{it}$ and $NF_{it}$, respectively.[11]

We estimate two sets of regression models. In the first, displayed in Column 1 of Table 3, we show that the effect of condo foreclosures on the prices of nearby condo properties is statistically significant but economically small. However, it is important to disentangle location from association effects. Column 2 shows that when we divide the sample into condos in the same association versus condos in different associations, the effect of same associations is both statistically significant and more economically meaningful (about 1 percent per same-association foreclosure, similar to other literature on foreclosures' price spillovers). To understand how the effect of an additional same-association foreclosure may vary with association size, in Column 3 we interact the same-association dummy with small associations. By doing so, we find that an additional foreclosure in a small association lowers the price of sale in that association by over 6 percent, an effect that is certainly economically meaningful. Column 4 illustrates the importance of including census tract controls in the model, as omitting them roughly doubles the estimated effect of same-association foreclosures.

In comparing the effect of foreclosures in large and small associations, one might conclude that foreclosures in large associations do not depress other

[11] More precisely, the percentage change in sales price is captured by $100(e^{\beta}$-1) and $100(e^{\gamma}$-1).

units' prices by much (no more than 1 percent). A single foreclosure in a large association may not have much effect because, relative to the size of the association, it is unimportant. For large associations, the issue may be the share of properties in foreclosure. To test this, we change our specification from the *number* of properties in foreclosure in the same association to the *percentage* of properties in foreclosure in the same association. In Column 5 of Table 3 we replicate Column 2 but include a linear term of the *percentage* of properties in foreclosure, rather than the *number* of properties in foreclosure. In Column 6 we use a quadratic term of the percentage of foreclosures. Columns 5 and 6 show us that foreclosures no longer appear to damage sale prices in large associations by less than in small associations, once we consider the *share of the association* in foreclosure, rather than the number of units. In fact, the pattern is just the opposite, as we demonstrate next.

Table 4 illustrates the effects of foreclosures on prices from our different specifications. The first two rows of results are based on Column 3 of Table 3 and show the effect of one additional foreclosure: lowering prices by 6.1 percent in small associations and by 1.0 percent in large associations. For the median-priced property in Boston in 2011, this amounts to about a $25,500 average discount in small associations and a $3,500 average discount in large associations. Based on the results in Column 6 of Table 3, we find that foreclosure of 20 percent of the units in an association lowers the price of a unit being sold much *less* in a small association—lowering the price by 8.3 percent as opposed to 14.9 percent in a large association.[12]

Tables 3 and 4 illustrate two key results. The first is that condo foreclosures

[12]These calculations are based on summing the relevant main effect of same-unit foreclosures and the interaction term between the foreclosure measure and the association size dummy on the log difference in the two prices in the repeat sales pair. To obtain the percentage change in house prices generated by a one unit change in foreclosures, we calculate $100(e^{(\beta_1(SAME-ASSOC.FORECLOSURES)+\beta_2(ASSOC.SIZExSAME-ASSOC.FORECLOSURES))}$-1). For the example of condos in 2–12 unit associations, the impact of having $x$ more nearby foreclosures in sale $T$ than $t$ is $100(e^{(-.0091x)+(-0.0534x)}$-1), based on the coefficients displayed in Table 3. As noted in Table 4, this amounts to a 6.1 percent reduction per additional foreclosure (that is, for each additional unit increase in $x$). To put a monetary value on this reduction, we multiply 6.1 percent by the median arm's-length sale price in 2011, $420,000.

in Boston generate economically significant effects. As mentioned in the introduction, previous researchers have generally found statistically significant but economically small effects. Campbell, Giglio, and Pathak (2011), for example, find effects on sales that occur before and after foreclosures of around 1 percent and, for their difference-in-differences estimator, the effect is much smaller than that. Arguably, the typical seller would be unlikely to notice such effects. By contrast, Table 4 shows economically large effects on sale prices of properties in the same condo association. Homeowners would definitely notice these effects! And the second key result from Table 3 is that foreclosures in the same association are the drivers of foreclosure externalities in the Boston condo market. As we discuss in the introduction, the same-association effect could represent many different phenomena, as properties in the same association are geographically close, connected via an association, and are close substitutes. So without further information, the same-association effect does not narrow down the possible mechanisms for the transmission of distress across properties.

To separate these theories, we turn to our data about associations and addresses. As discussed in Section 2.1, we can determine whether two properties are at the same address or not, and in fact, almost a third of our units in large associations that share an association with a foreclosure are actually located at different street addresses from the foreclosures. This can occur when the associations span multiple buildings (as in the case of townhouses), or in rarer cases, have multiple entryways with separate addresses. In Table 5, we show the results from exploiting this variation.

Our starting point is Column 2 of Table 3, reprised in Column 1 of Table 5, and showing that same-association foreclosures are the driver of the condominium foreclosure effect. In Column 2 of Table 5, we divide the same-association foreclosures into same-association, same-address (SASA) and same-association, different-address (SADA) foreclosures. Column 2 shows our headline finding that SASA foreclosures reduce the price of arm's-length sales by about 2.4 percent. The effect of same-association, same-address foreclosures (-2.4 percent) is more than twice the effect of same-association foreclosures in general (-1.1 percent, Column 1). The smaller, -0.5 percent, effect of SADA foreclosures is also displayed, although, to be clear, it is still much larger than the effect of *different*-association, different-address foreclosures, which only lower prices a statistically insignificant 0.2 percent. Taken literally, the results imply that the vast majority of the effect of same-association foreclosures comes from the fact that the foreclosure occurs at the same street address.

One possible explanation for the small effect of SADA foreclosures is that a disproportionately large number of SASA foreclosures occur in small associations, whereas most of the SADA foreclosures are in large associations. Given these facts, it may be that we are actually picking up a large versus small association effect. To check this, we re-estimate the model in Column 2, but we restrict our sample to large associations, meaning that we are comparing SASA foreclosures in large associations with SADA foreclosures also in large associations. The results in Column 3 show that although the SASA effect is somewhat weaker, the basic pattern remains. As with small associations, the large association effect is driven almost entirely by SASA foreclosures. An alternative way to identify this effect is displayed in Column 4, where we retain the small-association units in the sample, but we interact the coefficients on SASA and SADA foreclosures with association size. What Column 4 shows is that the effect of SASA foreclosures in large associations is still relatively large compared with SADA foreclosures, but it also shows how large the effects of SASA foreclosures are in small associations, with an estimated reduction in the sale price of 6.2 percent. The coefficient on SADA foreclosures in small associations is large but not statistically significant. Given the location of these foreclosures—Table 1 shows that they are typically less than 1/100 of a mile or 50 feet from the sale property—this result is not surprising.

While townhouses are one predictable case in which a seller could be impacted by a SADA foreclosure, we are confident that our results are not driven by townhouses alone. In fact, townhouses make up just 4 percent of both the small and large condo association subsamples, and when we restrict our models to nontownhouse developments, our results are highly robust.[13]

[13]Specifically, the coefficients and standard errors are nearly identical to the main model

## 5 Discussion

In the introduction, we motivated the paper by arguing that we could use our data to test different hypotheses about the nature of the discount that foreclosures impose on sale prices of nearby properties. What do the data tell us? First, our view is that the data suggest that the supply effect is not strong. In a sense, in the context of the supply theory, the goal of looking at nearby properties is that they are the closest substitutes for the property that sells. But choosing a radius of 0.1 mile is somewhat arbitrary, and it means we must believe that properties within 0.1 mile are closer substitutes than, say, properties between 0.1 mile and 0.25 mile. In contrast, it may be reasonable to view a property in an association as a closer substitute than a property in another association, even if the different-association property is geographically closer. Condominiums in the same association typically share similar characteristics—floor plans, finishes, appliances—that are unobservable to the econometrician and raise questions about identification in house price modeling. Thus, if the same-association effect documented in Table 3 reflected the fact that same-association units were close substitutes, we would expect the effect to be comparable when same-association properties are located at different addresses. But the data show that it clearly is not (Table 5). Same-association, different-address foreclosures have substantially smaller impacts on neighboring house prices.

On the issue of the association effect, the evidence is more nuanced. Clearly, the association effect is not paramount for larger associations. If it were, as with the supply effect, we would expect no difference between the SASA and SADA spillover estimates. On the other hand, the results show that the effect of SASA foreclosures depends dramatically on the size of the association. Even foreclosures of properties at the same address seem to matter less in large associations than in small associations. The association effect could explain this.

results displayed in Table 5. For this exercise, we identify a townhouse as a condo that does not share its street address with any other properties in the association.

For small associations, which are usually contained within one structure (in other words, all units share the same address), we cannot distinguish between the relative importance of the association effect and the proximity to poorly maintained or vacant units. We can think of several reasons these associations are most severely affected.

Since 1993, Massachusetts has had a so-called superlien law that provides condo association liens priority over a first mortgagee. In particular, our conversations with industry professionals indicate that small associations generally lack the legal and management resources to exercise the superlien protection prior to a foreclosure sale, by pursuing a lender for the payment of overdue association fees owed by a delinquent borrower. So these small associations are fragile, subject to losing a large share of their fee revenue when only a single unit becomes distressed. This could explain the larger effect we observe for small associations. The impacts of within-association foreclosures may also be more dramatic in jurisdictions that do not provide superlien priority to associations of condominium owners.

Another possibility is that having information about co-owners may be of greater importance for prospective buyers in small associations. Barzel and Sass (1990) point out that a prospective buyer′s valuation will depend not only on the current value of a condo, but also on her expectations about future maintenance of the building and the costliness of participating in its governance. In small associations, more maintenance and management is self performed, so the characteristics of neighbors may matter more to a prospective buyer than in a large association. In addition, decision-making within small associations may operate on the basis of owner consensus, and the prospect of a stalemate or personal tension among owners may make it desirable to screen neighbors for compatibility.[14] If buyer screening of other owners is important in small associations, then delinquency and foreclosure—which generate uncertainty about future co-owners—may increase buyer discounts due to

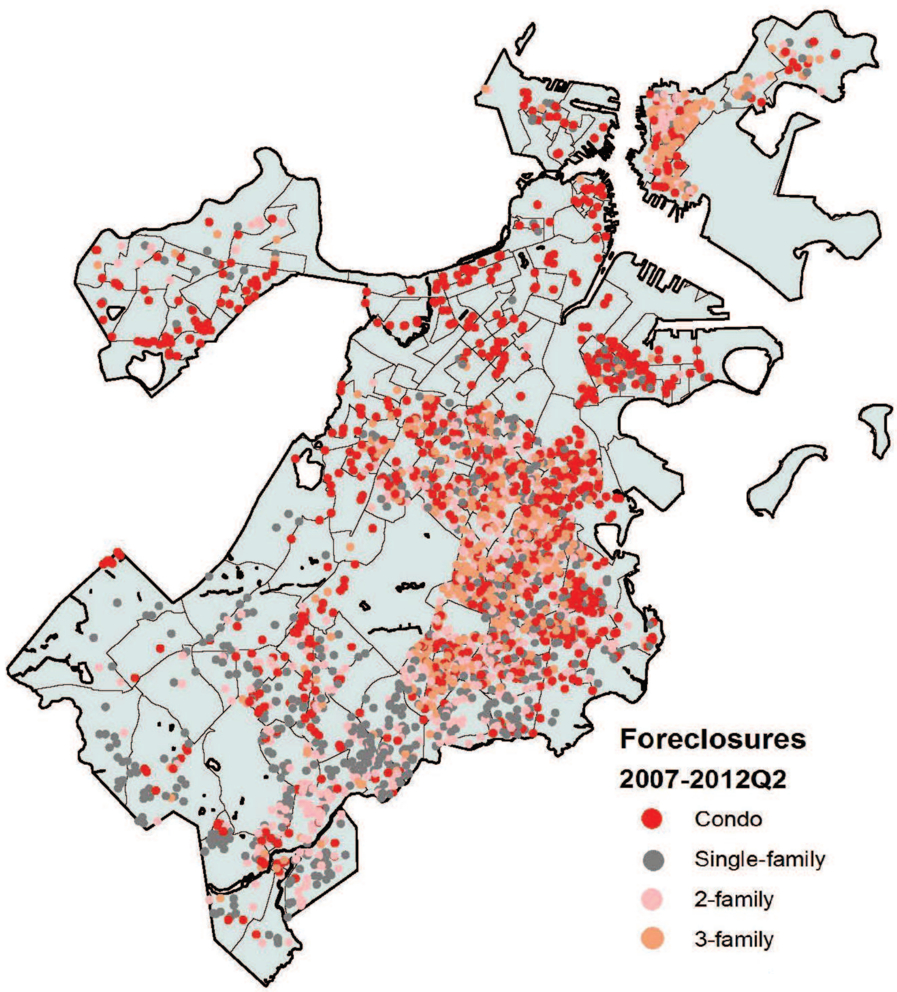
[14]Hansmann (1991) argues that this is one virtue of the cooperative style of multifamily ownership as compared with condos; existing coop owners are able to screen prospective buyers.

the concomitant uncertainty about *future* maintenance decisions and decision-making costs. This effect may serve to exacerbate the *current* maintenance externality that we identify.

# 6 Conclusions

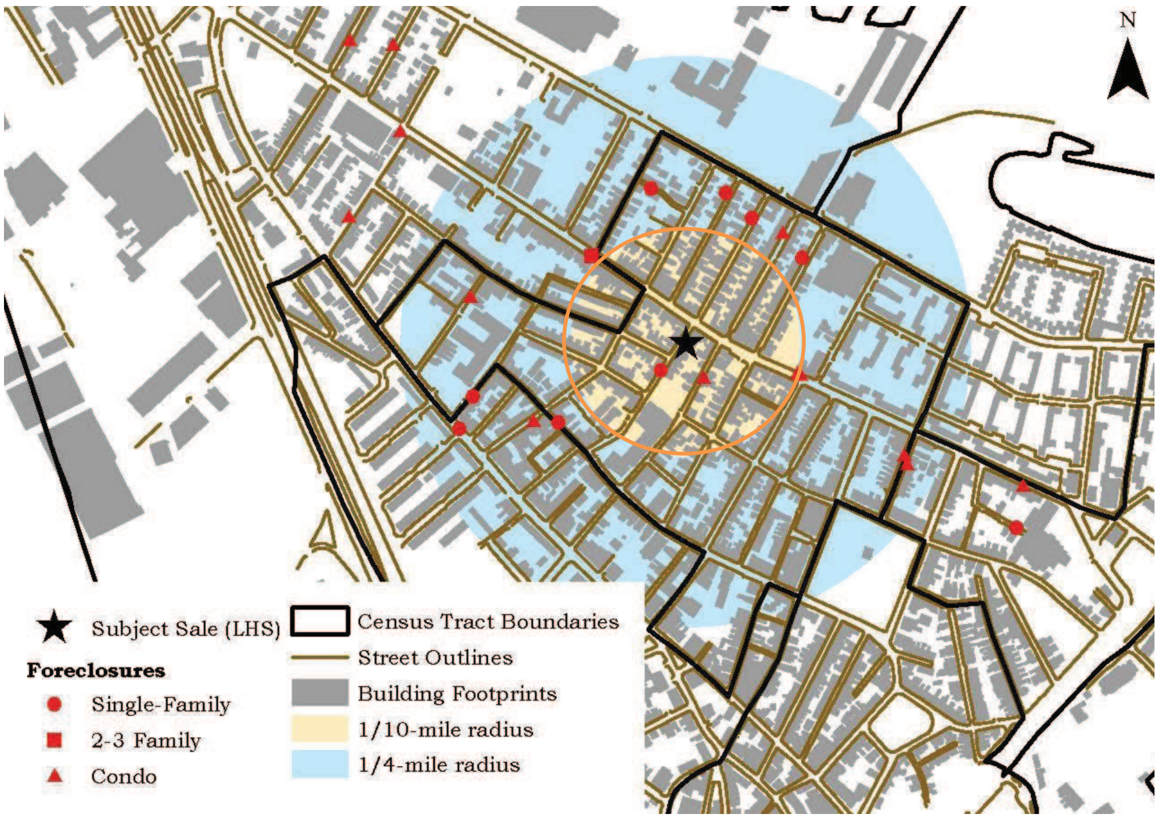
In this paper we shed light on possible explanations of price discounts resulting from nearby foreclosures by focusing on condominiums. We think the predominant channel through which foreclosures impact neighbors appears to be by affecting conditions in the building itself—either through vacancy or through under-maintenance, which influences same-address units but not units very nearby but in other buildings. Our data provide compelling evidence against a supply effect. The largest foreclosure-related discounts for neighbors' sale prices occur in small associations of 12 or fewer units, and while we have provided some plausible stories, we are unable to provide evidence about the mechanism by which this occurs. Among large associations, however, we clearly do not observe an association effect.

Figure 1: LOCATIONS OF RECENT FORECLOSURES IN BOSTON.




*Source:* Authors' analysis of Warren Group data.
*Note:* Figure shows foreclosure deeds filed between January 2007 and June 2012 on single-family, two-family, three-family, and condominium properties in the city of Boston.

Figure 2: Applying 1/10th and 1/4-mile buffers around arm's-length sales.




*Source:* Authors' analysis of Warren Group data.
*Note:* This example shows 1/10th-mile and 1/4-mile buffers drawn around an arm's-length sale (star). Nearby foreclosures, streets, census tract boundaries, and building footprints are also displayed.

Table 1: Foreclosures near condominiums sold in Boston, 1987–2011.

| | # of Repeat Sales | | Share of Total | | |
|---|---|---|---|---|---|
| | 2 to 12 units | 13+ units | 2 to 12 units | 13+ units | All units |
| All Condos | 18,743 | 18,493 | 100% | 100% | 100% |
| Condos with > 0 foreclosures within 0.1 mile | 8,008 | 7,358 | 43% | 40% | 41% |
| Condos with > 0 condo foreclosures within 0.1 mile | 6,942 | 7,049 | 37% | 38% | 38% |
| ...within same association | 476 | 2,900 | 3% | 16% | 9% |
| ......and at same address | 408 | 1,995 | 2% | 11% | 6% |
| ......and at different address | 76 | 1,141 | 0.4% | 6% | 3% |
| *mean distance (miles)* | *0.008* | *0.032* | | | |
| ...in different association | 6,767 | 5,498 | 36% | 30% | 33% |
| *mean distance (miles)* | *0.062* | *0.064* | | | |

*Source:* Authors' calculations of Warren Group and City of Boston Assessing Department data. Note that the sum of same-association, same-address foreclosures and same-association, different-address foreclosures exceeds the number of same association foreclosures because some repeat sales have both within $\leq 0.1$ mile. Only the second sale in each repeat-sales pair is included.

Table 2: SUMMARY STATISTICS FOR BOSTON REPEAT SALES SAMPLE, 1989:Q1 TO 2011:Q2.

| | | Condos, by association size (units) | |
|---|---|---|---|
| | All (Condo, SFR, MFR) | 2 to 12 | 13+ |
| Number of repeat sales pairs | 54,424 | 18,743 | 18,493 |
| *Median* | | | |
| Price (second sale) | $325,000 | $343,000 | $282,000 |
| Price (initial sale) | $204,000 | $253,500 | $189,900 |
| Properties $\leq$ 0.1 mile away | 320 | 505 | 406 |
| Full baths | 1 | 1 | 1 |
| Half baths | 0 | 0 | 0 |
| Living area in sq. ft. | 1100 | 945 | 817 |
| *Year Built (%)* | | | |
| pre 1900 | 31 | 50 | 19 |
| 1900–1939 | 45 | 40 | 36 |
| 1940–1970 | 11 | 1 | 17 |
| 1971–1990 | 9 | 4 | 21 |
| post 1990 | 5 | 5 | 7 |
| *Mean # of foreclosures $\leq$0.1 mile away, conditional on $> 0$* | | | |
| All structure types | 3.07 | 2.93 | 3.21 |
| Single-family | 0.31 | 0.26 | 0.09 |
| Multifamily | 0.58 | 0.27 | 0.13 |
| Condo | 2.19 | 2.40 | 2.98 |
| Same-association | n.a. | 0.08 | 0.84 |
| Neighboring-association | n.a. | 2.32 | 2.14 |
| *Condo characteristics* | | | |
| Median condo units in association | — | 4 | 53 |
| Townhouses (%) | — | 4 | 4 |

*Sources:* Authors' calculations of Warren Group and City of Boston Assessing Department data.

Table 3: Results from Boston repeat-sales analysis: Condo results by association size and type of neighboring foreclosures.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Change in # of foreclosures within 0.1 mile... | | | | | | |
| Of single-family homes | -0.005 | -0.005 | -0.005 | -0.005 | -0.005 | -0.005 |
| | (0.008) | (0.008) | (0.008) | (0.005) | (0.008) | (0.008) |
| Of multifamily homes | 0.008 | 0.008 | 0.009 | -0.021** | 0.009 | 0.009 |
| | (0.007) | (0.007) | (0.007) | (0.005) | (0.007) | (0.007) |
| Of condos | -0.003** | | | | | |
| | (0.001) | | | | | |
| in different associations | | -0.002 | -0.002 | -0.005** | -0.001 | -0.002 |
| | | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| in the same association | | -0.011** | -0.009** | -0.013** | | |
| | | (0.003) | (0.003) | (0.002) | | |
| in the same association | | | -0.053** | -0.111** | | |
| interacted with 2 to 12-unit assoc. | | | (0.016) | (0.020) | | |
| Change in % of own condo association in foreclosure... | | | | | | |
| linear | | | | | -0.004** | -0.007** |
| | | | | | (0.001) | (0.002) |
| quadratic | | | | | | -3.821-05** |
| | | | | | | (1.45E-05) |
| Interacted with 2 to 12-unit assoc. | | | | | | 0.004~ |
| | | | | | | (0.002) |
| Controls | | | | | | |
| Total properties < .1 mile | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Census tract–time fixed effects | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Time fixed effects | | | | ✓ | | |
| Property characteristics | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Association size | | | ✓ | ✓ | | ✓ |
| Observations (repeat sales pairs) | | | 37,236 | | | |
| R-squared | 0.786 | 0.786 | 0.787 | 0.564 | 0.787 | 0.790 |

*Source:* Authors' calculations of Warren Group and City of Boston Assessing Department data. ***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. *Note:* Models include controls for property characteristics and number of neighboring parcels within 0.1 mile, as well as census tract X purchase year X sale year fixed effects. Model 1 demonstrates that there is a small but statistically significant negative spillover from each additional nearby condo foreclosure. Model 2 breaks these foreclosures down by those in the same association versus those that are located nearby but in different associations, indicating that same-association foreclosures drive the price spillovers. In Model 3, the same-association foreclosures are interacted with a dichotomous variable for small associations (2–12 units). Model 4 replicates the specification of Model 3 but omits census tract fixed effects. Models 5–6 carry out similar analyses as 2–3, but they examine the increase in the *share* (rather than *number*) of association units in foreclosure between the two sales in the repeat-sales pair.

Table 4: ESTIMATES OF FORECLOSURE SPILLOVER EFFECTS.

| | Condos, by Association Size (Units) | |
|---|---|---|
| Change in Foreclosures in the Association | 2 to12 | 13+ |
| + 1 unit in foreclosure | | |
| average % impact | -6.1% | -0.9% |
| average $ impact | -$25,460 | -$3,498 |
| + 20% of units in foreclosure | | |
| average % impact | -8.3% | -14.9% |
| average $ impact | -$34,869 | -$57,354 |

*Sources:* Authors' calculations of Warren Group and City of Boston Assessing Department data.
*Note:* Estimates are based on 2011 median house prices for each property type, assuming a two-bedroom unit with one full bath, of mean age and with mean number of neighbors and square feet of living area, as reported in Table 2.

Table 5: Comparing methods for identifying condo associations.

| Change in # of foreclosures, by type of foreclosure: | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Single-family | -0.005 | -0.005 | -0.032 | -0.005 |
| | (0.008) | (0.008) | (0.023) | (0.008) |
| Multifamily | 0.008 | 0.009 | 0.015 | 0.009 |
| | (0.007) | (0.007) | (0.010) | (0.007) |
| Condo | | | | |
| different association | -0.002 | -0.002 | -0.002 | -0.002 |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| same association | -0.011** | | | |
| | (0.003) | | | |
| same association, same address | | -0.024** | -0.016** | -0.019** |
| | | (0.005) | (0.006) | (0.005) |
| same association, different address | | -0.005 | -0.004 | -0.005 |
| | | (0.003) | (0.004) | (0.003) |
| same association, same address x 2 to 12-unit assoc. | | | | -0.043** |
| | | | | (0.017) |
| same association, different address x 2 to 12-unit assoc. | | | | -0.069 |
| | | | | (0.060) |
| Properties Included | | | | |
| Units in small associations (of 2–12 units) | ✓ | ✓ | | ✓ |
| Units in large associations (of 13+ units) | ✓ | ✓ | ✓ | ✓ |
| Controls | | | | |
| Total properties within .1 mile | ✓ | ✓ | ✓ | ✓ |
| Census tract–time fixed effects | ✓ | ✓ | ✓ | ✓ |
| Property characteristics | ✓ | ✓ | ✓ | ✓ |
| Association size | | | | ✓ |
| Observations (repeat sales pairs) | 37,236 | 37,236 | 18,493 | 37,236 |
| R-squared | 0.789 | 0.789 | 0.83 | 0.79 |

*Source:* Authors' calculations of Warren Group and City of Boston Assessing Department data. ***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. Model 1 of this table uses official information from the City of Boston Assessing Department to determine which condo units are located in the same associations. Model 2 combines with this the addresses of the units to determine which units are co-located in the same building. Model 3 restricts model 2 to large associations (those of more 12 units). Model 4 adds the interaction between the same-association foreclosures and the small (2–12 unit) associations.

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