Forced Sales and Housing Prices

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Abstract

This paper uses data on house transactions in the state of Massachusetts over the last 20 years to show that houses sold after foreclosure, or close in time to the death or bankruptcy of at least one seller, are sold at lower prices than other houses. Foreclosure discounts are particularly large on average at 28% of the value of a house. The pattern of death-related discounts suggests that they may result from poor home maintenance by older sellers, while foreclosure discounts appear to be related to the threat of vandalism in low-priced neighborhoods. After aggregating to the zipcode level and controlling for regional price trends, the prices of forced sales are mean-reverting, while the prices of unforced sales are close to a random walk. At the zipcode level, this suggests that unforced sales take place at approximately efficient prices, while forced-sales prices reflect time-varying illiquidity in neighborhood housing markets. At a more local level, however, we find that foreclosures that take place within a quarter of a mile, and particularly within a tenth of a mile, of a house lower the price at which it is sold. Our preferred estimate of this effect is that a foreclosure at a distance of 0.05 miles lowers the price of a house by about 1%.

1 Introduction

The market for housing differs in several important ways from the textbook model of a liquid asset market with exogenous fundamentals. This implies that the price at which a house is sold can be influenced not only by general supply and demand conditions, but also by idiosyncratic factors including the urgency of the sale and the effects of the ownership transfer on the physical quality of the house.

First, houses are productive only when people are living in them. Owning an empty house is equivalent to throwing away the dividend on a financial asset. Second, houses are fragile assets that need maintenance, and are vulnerable to vandalism. Unoccupied houses are particularly vulnerable and expensive to protect. Third, short-term rental contracts involve high transactions costs, resulting from the moving costs of renters and the need of homeowners to protect their property against damage. Fourth, houses are expensive, indivisible, and heterogeneous assets. Each house has certain unique characteristics which are likely to appeal to certain potential buyers and not to others, so selling a house requires matching it with an appropriate buyer. Because of the high costs of intermediation in housing, this task is normally undertaken by a real estate broker rather than a dealer. Fifth, most homeowners must finance their purchases using mortgages, collateralized debt contracts that transfer home ownership to the mortgage lender through a foreclosure process if the homeowner defaults.

The expansion of mortgage credit earlier this decade and the recent decline in house prices have led to an unprecedented increase in foreclosures since 2006. Foreclosures transfer houses to financial institutions who must maintain and protect them until they can be sold. Foreclosed houses are likely to sell at low prices, both because they may have been physically damaged during the foreclosure process, and because financial institutions have an incentive to sell them quickly. In a liquid market, an asset can be sold rapidly with a minimal impact on its price, but the characteristics of housing discussed above make the market for residential real estate a classic example of an illiquid market, in which urgent sales lower prices.[2]

There is widespread concern that foreclosures may also lower the prices of nearby houses, either through direct physical effects on neighborhoods or by creating an

[2] Mayer (1995) presents a theoretical model of this effect, assuming that an urgent sale is implemented using an auction.

imbalance of demand and supply in an illiquid neighborhood housing market. If such spillover effects on prices are important, they might stimulate further foreclosures because homeowners are more likely to default when their houses are worth less than the face value of their mortgages. See for example the motivation for the Obama Administration's *Making Home Affordable* plan, as described on the US Treasury website: "In the absence of decisive action, we risk an intensifying spiral in which lenders foreclose, pushing area home prices still lower, reducing the value of household savings, and making it harder for all families to refinance. In some studies, foreclosure on a home has been found to reduce the prices of nearby homes by as much as 9%." (US Treasury 2009.)

In this paper we seek to understand the illiquidity of the housing market, and specifically the effects of foreclosures on the prices of foreclosed houses and other houses in the same neighborhood. We use a comprehensive dataset on individual house transactions in Massachusetts over the period from 1987 through the first quarter of 2008. Importantly, Massachusetts experienced a significant decline in house prices and wave of foreclosures during the early 1990's, which gives us a historical precedent that can be used to shed light on the current condition of the housing market.

We study several categories of sales which plausibly are more urgent than normal. We first link data on house transactions in the state of Massachusetts, over the period 1987 to March 2008, to information on deaths and bankruptcies of individuals. By matching names and addresses across datasets, we are able to identify transactions as forced sales if they occur close in time to the death or bankruptcy of at least one seller. We use hedonic regressions with neighborhood fixed effects, standard in the real estate literature, to control for heterogeneity in the characteristics of houses. We find that forced sales take place at price discounts of about 3-7%, and these discounts increase when a house has one seller rather than two.

One concern about this finding is that it might reflect unobserved effects of death or bankruptcy on the quality of a house, in particular deferred maintenance by homeowners with health or financial problems. In order to explore this issue, we examine how discounts vary with the timing of sales in relation to the seller's death or bankruptcy, we separate the deaths of younger and older sellers, we distinguish housing types, and we relate discounts to the various components of a property's value. We find that death-related discounts are not closely related to the timing of a sale in relation to death, are larger for older sellers, smaller for condominiums, and larger for houses whose structures account for a larger fraction of their value. This evidence suggests that death-related discounts reflect poor maintenance of houses by older sellers, while bankruptcy-related discounts appear more closely related to the urgency of sale immediately after bankruptcy.

Our main interest is in foreclosures. We find large foreclosure discounts, about 28% on average. These discounts are not highly sensitive to the type of housing, but they are larger for houses with low-priced characteristics in low-priced neighborhoods. This suggests that the foreclosure discount is related to vandalism, through two possible channels. First, foreclosed houses may have been damaged before they can be sold. Second, mortgage lenders must protect foreclosed houses while they are vacant; the threat of vandalism may be greater in bad neighborhoods, and costs of protection likely account for a larger fraction of the value of a low-priced house. The costs of protection induce mortage lenders to sell foreclosed houses urgently, leading to discounts in illiquid housing markets.

The incidence of foreclosure sales is highly variable over time and space, but in some areas at some times foreclosures account for a large fraction of total sales. This allows us to study the relations between forced sales prices and the subsequent transactions prices of other houses in the same neighborhood.

We contrast two extreme views of the relation between forced and unforced sales prices for houses. The first view is that unforced transactions take place at efficient prices, which evolve following a random walk, while forced sales take place at lower prices. If the housing market were a dealer market with a bid-ask spread, we could think of unforced transactions as revealing the efficient price at the midpoint of the spread, while forced transactions reveal the lower bid price. If the bid-ask spread is variable over time, then large discounts of forced from unforced sales prices should predict increases in forced sales prices, but should have no implications for future prices of unforced transactions. That is, bid-ask bounce (Roll 1984) affects the prices of forced sales but not those of unforced sales.

The opposite extreme view is that forced sales convey information about the future prices of unforced transactions. There are several reasons why this might be the case. First, forced sales may perform the function of price discovery, revealing the prices at which buyers are willing to enter the market. Particularly in down markets, homeowners without urgent motives to sell may set unrealistically high prices, perhaps because their expectations lag the market or because they use their purchase price as a reference price (Genesove and Mayer 2001). In this situation, unforced transactions may take place only when particularly enthusiastic buyers appear. If the housing market had a bid-ask spread, we could think of forced transactions as revealing the efficient price at the midpoint of the spread, while unforced transactions reveal the higher ask price. If the bid-ask spread varies over time, a large discount of forced from unforced prices would predict declines in unforced sales prices.

There could also be causal effects of forced sales on the general level of house prices. Forced sales could absorb demand, reducing the prices of those houses that come to market later. Forced sales could affect the reference prices that buyers and sellers use as "comparables" when they negotiate prices. In the case of foreclosures, there is widespread concern that there may be direct negative effects of foreclosures on neighborhoods. Foreclosures typically involve periods during which houses stand empty, reducing the visual appeal and social cohesion of the neighborhood and encouraging crime (Apgar, Duda, and Gorey 2005, Immergluck and Smith 2005, 2006).

Despite the plausibility of these concerns, we find that at the zipcode level, the prices of forced sales have relatively little predictive power for the prices of other transactions in the housing market. The discount between urgent sales prices and other sales prices is stationary, so when it widens, it normally narrows again. But this primarily occurs through an increase in the prices of forced sales, not through a decrease in the prices at which other transactions occur.

In order to detect spillover effects from forced sales to unforced sales, we look at foreclosures that take place within a quarter of a mile, and within a tenth of a mile, of each transaction in our dataset. At this highly local level, we do see evidence that foreclosures lower house prices, and the effect is economically significant during foreclosure waves. The extremely localized nature of these spillover effects is consistent with results reported by Harding, Rosenblatt, and Yao (2008) for foreclosures, and by Rossi-Hansberg, Sarte, and Owens (2008) for urban revitalization expenditures. The spillover effects of foreclosures are persistent and, like the discounts on foreclosed houses, they are larger in low-priced neighborhoods. Both results suggest that spillovers may reflect physical damage to neighborhoods.

The forced sale discounts we report in this paper are consistent with earlier findings of illiquidity in the housing market. There is evidence that certain seller characteristics influence selling price and time on the market in opposite directions, as would be expected if an urgent desire to sell lowers the price that a house fetches. Genesove and Mayer (1997) show that homeowners with larger mortgages relative to their home values set higher asking prices, realize higher prices if they sell, but keep their homes on the market longer than homeowners with smaller mortgages. More precisely, they find that a house with a loan-to-value ratio of 100% sells for 4% more but stays on the market 15% longer than a house with a loan-to-value ratio of 80%. Levitt and Syverson (2008) show that realtors selling their own houses get higher prices and keep their homes on the market longer than their clients do. The price differential is about 4%, and the time on the market differential is about 10%, numbers which are roughly comparable to those reported by Genesove and Mayer. Mayer (1998) studies real estate auctions, which in the United States have been used primarily as a rapid sales mechanism by developers and banks, and finds discounts of up to 9% in Los Angeles during a real estate boom, and between 9% and 21% in Dallas during a real estate bust.

A related literature in corporate finance argues that assets with limited alternative uses appeal to relatively few buyers and are correspondingly less valuable when they must be urgently sold. This affects the debt contracts that can be used to finance such assets (Shleifer and Vishny 1992). Benmelech, Garmaise, and Moskowitz (2005) apply this insight to commercial real estate.

The organization of the paper is as follows. Section 2 describes our data and the procedures we have used to clean it. Section 3 presents our hedonic regression methodology and uses it to estimate the discounts of forced sales from unforced sales. This section also uses cross-sectional variation in discounts to distinguish alternative interpretations. Section 4 studies the ability of forced and unforced sales prices to predict future changes in house prices within the same zip codes, and more local spillover effects from foreclosures to house prices in the immediate neighborhood. Section 5 concludes.

2 House Price and Forced Sale Data

2.1 House prices

We begin with a dataset on changes in ownership of residential real estate, provided to us by the Warren Group. The data cover the period 1987 to March 2008, and are the entire state of Massachusetts. Figure 1, which shows the number of transactions by zip code, illustrates the geographical coverage of the data.

The Warren Group data record basic characteristics of the houses involved in each transaction. In almost all cases, the characteristics are measured as of August 2007; about 30,000 houses were added to the dataset after this date and have characteristics measured later. Unfortunately, we do not have a dynamic dataset tracking changes in house characteristics over time.

The Warren Group data also record the sales price of each house and the names of buyers and sellers. We have carefully cleaned the data to remove transactions that appear to be intra-family transfers of ownership rather than arms-length transactions, and duplicate transactions that reflect intermediation or corrections of public records. The online appendix to this paper (Campbell, Giglio, and Pathak 2009) describes our data cleaning procedures in detail.

We remove outliers from the Warren Group data in several steps. We exclude transactions in properties that cannot be classified as either single family, multifamily, or condominiums, and transactions that take place at extreme prices, below the 1st or above the 99th percentile of the distribution of raw prices. Where the dataset reports impossible property characteristics (for example, zero rooms), we treat these characteristics as missing. Finally, we winsorize reported square footage at the 1st and 99th percentiles and reported numbers of rooms at the 99th percentile.

The top panel of Table 1 reports summary statistics for the resulting dataset of 1,783,360 transactions. The median house, across all houses in all years, has 1,535 square feet of living area on a 9,452 square foot lot; it is 38 years old with 6 rooms, 3 bedrooms, and 2.0 bathrooms, and sells for a nominal price of $175,800. The means of these characteristics are slightly higher than the medians, indicating right skewness of the distribution, for all these characteristics except age.

In the bottom panel of Table 1 we match addresses to census tracts, and associate each house with the characteristics of its tract, as measured in the 2000 census. Then we report the distribution of these neighborhood characteristics across the transactions in our database. The median house is in a census tract with a median income of more than $55,000, with a population that is 2% Hispanic, 1% African-American, 24% under age 18, 13% over age 65, 4% in female-headed households, 20% with a college degree, 11% with a graduate degree, and 10% with no high school degree. However, these characteristics vary widely across neighborhoods.

2.2 Forced sales

In order to identify forced sales, we obtain data on deaths and bankruptcy filings from the Death Master File of the Social Security Administration and Lexis/Nexis, respectively. These data give us names, addresses, and dates which can be matched to the names and addresses of house sellers in the Warren Group data. Many houses have two joint sellers, and we classify the sale as forced if we can match the name of at least one of these sellers to a death or bankruptcy filing within three years of the house sale. The Death Master File also gives us the ages of sellers, information that is not available elsewhere in our dataset. Although our bankruptcy data include some corporate bankruptcy filings, only personal bankruptcies end up matched to house sales.

The algorithm we use for name matching is described in detail in the online appendix. We match based on last name, first name, and zip code. We then use sensible priority rules, based on match quality, middle initials, and event dates, to eliminate multiple matches.

We also identify forced sales related to foreclosures. Foreclosure proceedings typically begin after homeowners miss about three payments and are unable to negotiate a solution with their lenders. During this period, homeowners may be able to sell their property prior to actual foreclosure, but our data do not allow us to identify these cases. The Warren Group data report transfers of ownership that take place only through foreclosure by demarcating the source of the transaction deed as foreclosure-related.

Massachusetts has both judicial and non-judicial foreclosures. A judicial foreclosure is processed through the courts, beginning with lender filing and recording a notice which includes the amount of outstanding debt and reasons for foreclosure. Non-judicial foreclosures, in contrast, are processed without court intervention, and the foreclosure requirements are established by state statutes. In either case, with assistance from the local sheriff's office, the first attempt at selling the property is via an auction. The trustee or attorney handling the foreclosure sets the opening bid and this is usually advertised in the foreclosure notice. The typical opening bid is the balance of the mortgage plus penalties, unpaid interest, attorney fees, and other costs that the lender has incurred during the process. In Massachusetts, the deposit to participate in the auction is usually \$5,000 and homeowners are not obligated to allow bidders to investigate inside the property. The main item actually auctioned is the first mortgage, or senior lien, which gives the buyer the most control over the property.[3]

The property either is sold to the highest bidder or is turned over to a trustee to liquidate the property and pay the lender, or the auction is unsuccessful. Since Massachusetts does not have a redemption period where a homeowner retains the right to buy back the property by paying the full amount of the loan along with taxes, interest, and penalties, the transfer of ownership becomes complete at a closing following the foreclosure auction. The previous owners, if still present, are automatically converted to tenants, and the new owner must follow Massachusetts legal procedures for eviction.[4] Successful auctions represent 18% of our cases. We identify these as cases where the acquirer is an individual or realty trust, or takes out a mortgage to finance the purchase.

If nobody bids higher than the opening bid, control is handled over to the lender. In this case, the lender is responsible for the sale of the property, and usually transfers the property to its real estate owned (REO) department, which prepares it for sale typically on the open market. Occasionally, REOs negotiate sales directly with investors rather than place the property on the market, and can even offer purchasers packages of properties. For these 82% of cases in our dataset, we treat the subsequent sale of the property by the mortgage lender as an urgent or forced sale.

In cases where a sale is both foreclosure-related and linked to a death or bankruptcy, we retain the foreclosure classification. If a sale is linked to both a death and a bankruptcy, we use priority rules, based on match quality and event dates, to classify it as either death-related or bankruptcy-related.

The top panel of Table 2 reports the frequency of each type of forced sale for each year in our data set. The first column of the table shows the total number of housing transactions in the Warren Group data in each year. We have just over 22 years of data and a total of 1,783,360 transactions, for an average of just over 81,000 transactions per year. Of these, 5.6% are forced transactions: 3.1% related

[3] According to Massachusetts law, if the first mortgage forces the foreclosure, and there is no money left after the sale of the house to pay the second mortgage, the lender of the second mortgage still has a claim against the borrower, but cannot take the house anymore. However, if it is the second lender who is forcing the foreclosure, the property will be sold with a lien from the first mortgage.

[4] This can run anywhere from 6 weeks to 6 months, with the average about 10 weeks (http://www.lawlib.state.ma.us/foreclosure.html, "Foreclosure FAQ").

to foreclosures, 1.7% related to deaths, and 0.8% related to bankruptcies. The fraction of forced sales is highly variable over time. At the very end of the sample this is due to the fact that we cannot match sales to future deaths or bankruptcies. More generally, it reflects a gradual increase in death-related sales over time, and an upward shift in the incidence of bankruptcy in the late 1990s and early 2000s before bankruptcy reform increased the cost of personal bankruptcy in 2005.[5] However the most important time-variation is driven by two waves of foreclosures during the housing downturns of the early 1990s and 2007-08. The incidence of foreclosure-related forced sales was negligible in 1987, rose to 9.7% in 1993, then receded to under 1% in the mid-2000's before rising again to reach a record level of 12.7% in the first quarter of 2008.

The bottom panel of Table 2 categorizes forced sales according to the date of the death, bankruptcy, or foreclosure in relation to the house sale. In the case of death, we find that house sales within one year of the death of a seller are more common than house sales two or three years before or after the death of a seller; however sales are almost equally common the year before a seller's death and the year after. In the case of bankruptcy, we find that house sales are relatively rare during the three years before a bankruptcy filing, but the sales incidence spikes up the year after the filing and then gradually declines. The scarcity of sales before bankruptcy presumably reflects the fact that bankruptcy filing protects all but the most expensive primary residences from creditors through the homestead exemption (White 2008). Foreclosure-related sales cannot occur before the underlying foreclosure, and tend to take place rapidly thereafter. Of the 3.1% of foreclosure-related sales in our dataset, 2.6% occur within one year, 0.3% in the second year, 0.1% in the third year, and the remainder with a longer lag.

Table 3 shows how our transactions are divided among single family houses, multifamily houses, and condominiums, and what fraction of them take place in the city of Boston as opposed to the rest of the state. We find that in the complete dataset, 64% of transactions are in single family houses, 11% in multifamily houses, and 25% in condominiums. Among forced sales, however, multifamily houses are more common (20%) and condominiums are less common (18%). The paper reports results both for the entire dataset, and for separate subsamples for each housing type.

[5] Morgan, Iverson, and Botsch (2008) suggest that the bankruptcy reform of 2005 contributed to the subsequent increase in subprime mortgage defaults by making it harder for borrowers to achieve relief from unsecured debt obligations.

The city of Boston accounts for 8% of all sales and almost 10% of forced sales. Boston's modestly greater share of forced sales is entirely caused by a higher incidence of foreclosures in Boston (13% of foreclosures are in the city). Death- and bankruptcy-related sales are actually less common in Boston than elsewhere. Figure 2 gives a richer picture of the geographic distribution of forced sales, plotting by zip code the share of forced sales in total sales. The paper reports an analysis of the entire dataset, but we have verified that the results are qualitatively similar when we run separate analyses for eastern and western Massachusetts.

Table 4 summarizes the distribution of house characteristics for forced sales. The top panel of the table has exactly the same format as Table 1, and the bottom panel reports the ratio of each number in the top panel to the corresponding number in Table 1. The median forced sale takes place at a price of $116,000, only two thirds of the median sales price reported in Table 1. This is true despite the fact that the median forced sale is of a similarly sized house on a lot 80% of the size of the median sale.

At first sight, the lower median price for forced sales suggests that these transactions take place at a large price discount. However, one cannot reach this conclusion on the basis of Table 4 alone. The incidence of forced sales was much greater in the early 1990's, when the overall level of prices was depressed; and forced sales are more likely to take place in low-income minority neighborhoods, where prices are likely to be lower for any given size of house. The next step in our analysis is to control for these effects by using a hedonic regression.

3 The Forced Sale Discount

3.1 Static hedonic regression

Hedonic regression is a standard approach for estimating the relationship between the prices of houses and their characteristics. Tables 5 and 6 report the results of regressing the log of each transactions price onto control variables for the overall level of local prices, the effects of measured house characteristics, and dummies indicating forced sales. We include a separate dummy for each zipcode-year, thus controlling for all house price variation over time at the zipcode level. We also include a rich set of house characteristics including interior area, lot area, numbers of rooms, bedrooms, and bathrooms, the age of the house and its square, recent renovation, a dummy for condominiums, and dummies for winsorization of these characteristics. To control for neighborhood characteristics within zipcodes, we include data on the census tracts where each house is located, including median income and the population shares of Hispanics, African-Americans, minors, seniors, female-headed households, and groups with different levels of education. The coefficients on these control variables, reported in Table 5, have the expected signs and plausible magnitudes. Further controls, not reported in Table 5, include dummy variables for the type of heating and style of house. The entire list of controls is presented in the Appendix.

Table 6 reports the coefficients on our forced sale dummies. The first column reports results for our full sample including all housing types. When we use a single dummy for all categories of forced sales, we find a large and precisely estimated coefficient of -0.199, corresponding to a price discount of $1 - \exp(-0.199) = 18\%$.

This effect is primarily driven by foreclosure-related sales. When we include separate dummies for death-related sales by young (under age 70) and old (age 70 or above) sellers, bankruptcy-related sales, and foreclosure-related sales, we find coefficients of -0.051, -0.068, -0.032, and -0.323, respectively. The coefficient for foreclosure implies a large price discount of 28%.

In Table 7 we look separately at houses with a single seller and with two sellers. Again, the first column reports results for all housing types. We find a much larger discount for death-related sales when the house has a single seller than when it has two sellers. In the former case the discount coefficients are -0.082 and -0.095 for young and old sellers respectively, while in the latter case they are -0.035 and -0.053. We also find a considerably larger discount for bankruptcy-related sales when there is only one seller (-0.061) than when there are two (-0.014).

3.2 Interpreting the forced sale discount

A key challenge is to understand whether lower prices for forced sales reflect illiquidity in the housing market, or unobserved variation in fundamental characteristics of houses. For example, deaths are more common among older sellers, whose houses may be poorly maintained or unfashionably decorated. The fact that the death-related discount is increasing in the age of the seller suggests the relevance of this point. Sellers in financial difficulty may also fail to maintain their houses properly, and houses that have been foreclosed may have been vandalized while standing empty, or even in some cases vandalized by their former owners.

To shed some light on this issue, we explore how the forced sale discount varies with the timing of a sale in relation to death or bankruptcy, across housing types, and across houses whose value is concentrated in the structure or the land.

Figure 3 shows that discounts for death-related sales are relatively insensitive to the timing of the death, from 3 years before to 2 years after the sale. In fact, when we include dummies for deaths more than three years before or after the sale (which would not be classified as forced sales), we find that these also enter the regression significantly. This confirms the suspicion that the estimated price effect is not directly related to the urgency of the sale, but results from unobserved poor maintenance.

The timing pattern for bankruptcy-related sales is more suggestive of a true forced-sale effect. The largest coefficient is for a sale that occurs within one year after a bankruptcy filing, and this coefficient, at -0.053, is more than twice as large as those estimated for the relatively infrequent sales that occur before bankruptcy.

In the case of foreclosures (not shown in the figure) the timing pattern is U-shaped. The coefficient is -0.315 for foreclosure-related sales within one year of foreclosure, -0.452 for sales 1 to 2 years after foreclosure, and -0.472 for sales 2 to 3 years after foreclosure. In the case of sales more than 3 years after foreclosure, the coefficient is -0.216. Since more than 80% of foreclosure-related sales occur within a year of foreclosure, the deeper price discounts for the relatively small number of sales that occur with a delay of a year or more may reflect difficult market conditions that reduce the ability of a lender to dispose of a foreclosed property in a timely manner.

The right hand columns of Table 6 show how forced-sale discounts vary with housing type. Overall and foreclosure-related discounts are larger for condominiums and multi-family houses, and smaller for single-family houses. However, death-related discounts are largest for single-family houses, smaller for multi-family houses, and very small for condominiums. Since a large part of the maintenance of condominiums is handled collectively through the condominium association, and tenants in multi-family housing enforce minimum maintenance standards, this pattern is also consistent with the view that death-related discounts are related to poor home maintenance by older sellers.

To the extent that a forced sale discount reflects poor maintenance of a house, then it should be larger when the structure accounts for a greater share of the value of a property, and smaller when the land and its associated building rights account for a greater share of value. In the extreme case where a small house is sold in an expensive neighborhood as a "tear-down", there should be no maintenance-related discount at all. Thus we can measure the importance of the maintenance effect by looking at variation in the forced sale discount across houses with different hedonic characteristics.

In order to do this in a parsimonious manner, we follow a two-stage procedure. In the first stage, we run the static hedonic regression of Table 5, omitting forced-sale indicators. We decompose the predicted log price of each house into components explained by the characteristics of the building, the size of the lot, the characteristics of the census tract, and the zipcode-year interaction. In the second stage, reported in Table 8, we regress the log price of each house on the levels of these components, forced-sale indicators, and interactions between each of the forced-sale indicators and each of the value components standardized to have zero mean and unit standard deviation.

The coefficients on forced-sale indicators in Table 8 are very similar to those reported earlier in Table 6. However there are some interesting interaction effects which imply larger or smaller discounts for forced sales of houses with atypical characteristics. For death-related sales the price discounts for all housing types, and for single-family houses, are larger when the building has greater value, consistent with the idea that older sellers maintain their houses poorly. For bankruptcy-related sales, the price discount is almost invariant to the value of the building, but is larger for houses in expensive zipcodes and census tracts. For foreclosures, the price discount is larger when the building is less valuable, and is also larger for houses in low-priced zipcodes and census tracts.

These results suggest the following interpretation of forced-sales discounts. Death-related discounts appear to result primarily from poor maintenance of single-family houses by older sellers, since the discounts are increasing in seller age, insensitive to the timing of sales in relation to death, large for single-family houses and very small for collectively maintained condominiums, and greater for houses with more valuable structures.

Bankruptcy-related discounts are consistent with a true liquidity effect. Bankrupt sellers aim to reduce their housing costs after bankruptcy, and the urgency of doing this is greater for houses in expensive neighborhoods and zipcodes because these houses have higher implicit rental costs. Bankruptcy-related discounts are higher for such houses, and higher when a house is sold the year after bankruptcy, but relatively insensitive to housing type.

Foreclosure-related discounts appear to be related both to the urgency of sale, and to vandalism. Foreclosed houses may have been vandalized during the transfer of ownership to mortgage lenders; and lenders sell urgently both because empty houses deliver no housing services, and because it is expensive to protect such houses against vandalism. Foreclosure-related discounts are larger in low-priced neighborhoods and zipcodes, and larger for cheaper houses. This pattern may reflect a greater threat of vandalism in bad neighborhoods, and fixed costs of protection that justify larger proportional discounts on cheaper houses.

3.3 Persistence of the forced sale discount

We have estimated significant effects of forced sales on house prices. An interesting question is to what extent these effects persist. If the same house is sold again after a forced sale, does it continue to have a lower price or does its price return to the level predicted by the hedonic regression? In Table 9 we re-estimate our hedonic regressions including information on the price at which each house was previously sold. We first identify the date of the most recent previous sale of each house in our transactions dataset, the price of that previous sale, and whether the previous sale was forced. We create dummy variables for previous sales that took place within the year before the current sale, one to three years before the current sale, three to five years before the current sale, and five years or more before the current sale. Then we interact the previous sales price, and dummies indicating whether the previous sale was forced, with these dummies for the timing of the previous sale.

Table 9 shows that previous sales prices do have a persistent effect, which seems almost invariant to the length of time since the last sale. The coefficient on the previous sales price of about 0.15 implies that a 10% lower price at the time of the last sale, unexplained by the other variables in the hedonic regression, is associated with a 1.4% lower price at the time of the current sale. This persistent price effect, which is exploited by repeat-sales house price indexes (Case and Shiller 1987, 1989), could reflect unmeasured quality differentials across houses or the use of previous prices as reference prices in bargaining by sellers and buyers.

Controlling for the general persistence of house prices, we do not find that forced sales have large dynamic effects. Perhaps the most interesting result is that if the previous sale was death-related, there is a modest positive effect on the subsequent sales price that roughly offsets the persistent negative effect of the death-related component of the previous sales price (0.15 times the death-related discount). Thus, if lack of maintenance is partly responsible for the measured death-related price discount, it appears to be rectified by the next owner of the property. However, one must be cautious about this conclusion given the large standard errors on the estimated effects. The coefficients for bankruptcy-related and foreclosure-related sales do not show any strong or consistent patterns.

4 Forced Sales and Neighborhood House Prices

4.1 Zipcode-level price dynamics

In this section we ask how the incidence and prices of forced sales relate to the prices of unforced sales. We begin by aggregating house prices to the zipcode-year level and examining the dynamics of zipcode-level house prices. In each zipcode in each year, we weight each transaction equally and calculate the average price of forced sales, the average price of unforced sales, and the share of forced sales. The appendix reports summary statistics for this dataset. Unsurprisingly, we again find that forced sales take place at lower prices. The distribution of the forced-sales share is extremely right-skewed, with a median of only 4% but a 99th percentile of 34%. We winsorize the fraction of forced sales at this level.

Table 10 presents regressions that describe the dynamics of house prices at the zipcode level. To eliminate zipcode fixed effects, we difference the levels of log prices to obtain house price growth rates in each zipcode. We also cross-sectionally demean the data to control for the general evolution of house prices in Massachusetts.

Our first regression does not distinguish between forced and unforced sales prices. When price growth is regressed on lagged price growth, we obtain a negative coefficient of about -0.44, indicating that zipcode-level price variation is mean-reverting. This result contrasts with the price momentum, or positive serial correlation of price changes, observed in citywide, statewide, or national house price indexes (Case and

Shiller, 1989). However, the explanatory power of this regression is modest, about 20%.

Next we separate log forced and unforced sales prices, and estimate an error-correction model for the two of them. More specifically, we estimate a first-order vector autoregression (VAR) for the change in log forced sales prices and the level of the forced sales discount, that is, the difference between log unforced and forced sales prices. This procedure is appropriate if the forced sales discount is stationary, so that log forced and unforced sales prices are cointegrated (Campbell and Shiller 1987, Engle and Granger 1987). The estimated VAR implies time-series behavior for the omitted variable, in this case the log unforced sales price.[6]

We find a strong tendency for reversal in forced sales price growth. Lagged forced price changes predict forced price changes with a coefficient of -0.08. In addition, a large discount of forced sales prices from unforced prices predicts that forced sales prices will increase. These two effects together explain about 46% of the variation in forced sales price growth. The forced sales discount is mean-reverting, with a coefficient of 0.07 on its own lag. The discount also has a coefficient of 0.05 on lagged forced sales price growth, implying that the discount is more likely to narrow if it reached its previous level through a recent decline in forced sales prices; this is another manifestation of reversal in forced sales price growth. The equations for these two variables imply only very modest predictability for unforced sales prices, with negative coefficients of -0.03 on lagged forced sales prices and -0.09 on the lagged discount, and an R^2 statistic of 9%.

These VAR results imply that both forced and unforced sales prices move in such a way as to narrow unusually large forced sales discounts. However, the explanatory power of the regression is much greater for forced sales prices, at 46%, than for unforced sales prices, at 9%. Zipcode averages of unforced sales prices appear to be much closer to a random walk than are zipcode averages of forced sales prices. This result supports the view that on average within each zipcode, unforced sales take place at approximately efficient prices, while forced sale prices are mean-reverting because they reflect time-varying illiquidity in zipcode-level housing markets.

The variation over time in the incidence of forced sales allows us to ask whether

[6]If enough lags are included in the system, the implied dynamics are the same whether one omits the unforced or the forced sales price. We obtain broadly consistent results if we estimate a VAR for the change in log unforced sales prices and the level of the forced sales discount, including either one or two lags.

zipcode-level house price dynamics are affected by this incidence. In the first panel of Table 11, we add the share of forced sales as a variable in the VAR system. We find that the forced sales share is highly persistent, with a coefficient of 0.52 on its own lag, and that it depresses forced sales price growth (with a coefficient of -0.63) and widens the forced sales discount (with a coefficient of 0.61). Once again, this VAR implies very little predictability in the growth rate of unforced sales prices.

Finally, we consider the possibility that a high share of forced sales affects the dynamics of forced sales prices not only by directly predicting price changes, but by altering the coefficients on the other variables of the VAR system. In the second panel of Table 11, we regress the forced sales share, the change in the log forced sales price, and the forced sales discount on their own lags and the interaction of the lagged forced sales share with the other two explanatory variables. We find that a high forced sales share reduces the tendency for forced sales price growth to reverse, and reduces the response of forced sales price growth to the forced sales discount. Consistent with this, a high forced sales share increases the persistence of the forced sales discount. The autoregressive coefficient for the forced sales discount increases from 0.07, in an environment with an average 5% share of forced sales, to 0.37, in an environment with a share of forced sales at the 34% winsorization point. In other words, a location with a high share of forced sales is likely to have persistently depressed forced sales prices and high forced sales discounts.

In all these specifications, we continue to find that unforced sales price growth is hard to predict. The R^2 statistic for unforced sales price growth is never more than 14% in models with single lags, and even if we add one more lag of each variable the R^2 statistic never exceeds 20%. The limited predictability of zipcode-level house price movements, when sales are unforced, is a robust result across all the models we estimate.

4.2 Local effects of foreclosures

Even though forced sales do not seem to drive large predictable movements in average unforced sales prices within the same zipcode, it is possible that there are more local effects of forced sales on neighboring houses that do not show up in data aggregated to the zipcode level. A particular concern is that houses vacated during the foreclosure process drive down neighborhood house prices. In this section we use data on the precise location of each house transaction in our dataset to try to identify such effects.

Our main approach is to add variables to our hedonic regression that measure the number of foreclosures, defined as cases in which ownership of neighboring houses has been transferred to mortgage lenders, causing them to enter an urgent sales process. We find considerable evidence that foreclosures within 0.25 mile, and particularly within 0.1 mile, lower the price at which a house can be sold.

A challenge in interpreting this result is that local economic shocks, such as plant closings, may drive both house prices and foreclosures. Furthermore, foreclosures are endogenous to house prices because homeowners are more likely to default if they have negative equity, which is more likely as house prices fall. Ideally, we would like an instrument that influences foreclosures but that does not influence house prices except through foreclosures; however, we have not been able to find such an instrument. Instead, we compare the effects of foreclosures before and after each transaction, and the effects of extremely close foreclosures (under 0.1 mile from the target house) with those that occur further away within the 0.25 mile radius.

Leigh and Rockoff (2008) use such a comparison to identify the effect of sex offenders on house prices. They perform a difference-in-difference analysis, comparing house prices before and after a sex offender moves into a neighborhood, and house prices closer to the sex offender's address with those further away. The difference between house price growth in the sex offender's immediate neighborhood and house price growth in the sex offender's broader neighborhood is an estimate of the effect of the sex offender's arrival on house prices. We have imitated Leigh and Rockoff's methodology, treating foreclosures as negative events analogous to sex offender arrivals, and averaging the residuals from hedonic house-price regressions during the year before and after each foreclosure, and within an inner circle of radius 0.1 mile and an outer ring obtained by removing the inner circle from an outer circle of radius 0.25 mile. When we do this, we obtain a difference-in-difference estimate that a foreclosure lowers the price of neighboring houses by about 1%.

A limitation of the difference-in-difference approach is that it does not readily handle the fact that foreclosures are clustered, so many houses are close neighbors of multiple foreclosures. (This is a much less serious problem in the case of sex offenders.) In the presence of clustering, the difference-in-difference estimate will misstate the effect of each foreclosure, since low house prices caused by multiple foreclosures are attributed to each one independently; clustering also complicates the calculation of standard errors. For this reason, we return to our hedonic regression, in which the sales price of a house is the dependent variable, and include measures of nearby foreclosures as explanatory variables.

Table 12 reports the results. All the previous hedonic variables are included in the regressions of this table, but with the exception of the dummies for foreclosure-related sales, they are not reported. In the first column, we add the number of foreclosures that have occurred within 0.25 mile of each house during the year before its date of sale. Because the distribution of foreclosures is extremely right-skewed, we winsorize it at the 99th percentile (10 foreclosures) so that a few outliers do not dominate the results. We are, however, particularly interested in the effects of foreclosure waves on house prices, so we include dummy variables for cases where the number of foreclosures within 0.25 mile lies between the 99th and 99.5th percentile (10-15 foreclosures), between the 99.5th and 99.9th percentile (15-28 foreclosures), and above the 99.9th percentile up to the sample maximum (28-73 foreclosures). Because 82% of our transactions have no foreclosures within 0.25 mile during the year before sale, these tail dummies capture a meaningful fraction of the cases with foreclosures. For example, 0.01/0.18 or 5.6% of transactions with foreclosures nearby are above the 99th percentile of the foreclosure distribution.

We also include an indicator of extremely close foreclosures, a weighted sum of foreclosures within 0.1 mile of the target house, where the weight is 0.1 less the distance to the foreclosure in miles, divided by 0.1. This indicator gives a weight of 1 to a foreclosure at the same location (which can occur in a condo complex), a weight of 0.5 to a foreclosure 0.05 miles or 88 yards away, and a weight of zero to a foreclosure 0.1 miles or 176 yards away. It is also winsorized at the 99th percentile (1.49), and we include dummies for extreme cases (1.49-2.42, 2.42-7.83, and 7.83-50.95). 92% of our transactions have no foreclosures within 0.1 mile during the year before sale, so as before, the tail dummies include a meaningful fraction of the cases with extremely close foreclosures. We include this variable because it is plausible that spillover effects of foreclosures on crime and the social cohesion of neighborhoods are extremely local, more so than common economic shocks that might drive both foreclosures and house prices.

In the second column, we control for average prices of unforced sales within the 0.25 mile radius during the previous year. We calculate a weighted average of log prices (a geometric average price), using a linear weighting scheme that gives a weight of 0.25 less the distance to the house in miles, divided by 0.25. By contrast with the local foreclosure indicator, this is a weighted average, not a weighted sum, so it divides by the sum of the weights. We set the variable to zero in cases where no unforced transaction has occurred within 0.25 miles during the previous year, and include a dummy for these cases.

The third and fourth columns repeat the first two columns, adding foreclosure variables and average neighborhood house prices during the year after each transaction. If unobserved local shocks drive both prices and foreclosures, or if foreclosures react to prices with a lag, we would expect that future foreclosures would have at least as much explanatory power for house prices as lagged foreclosures.

The results of Table 12 imply that recent neighborhood foreclosures are highly relevant for predicting the price at which a house will sell. Each foreclosure within a 0.25 mile radius of a given house lowers the predicted log price by 1.8% in column 1, or 1.1% in column 2 when we control for the average level of recent unforced sales prices in the neighborhood. Foreclosures within a 0.1 mile radius are even stronger predictors, lowering the log price of a house by 9.1% if the foreclosure is at zero distance, or 7.3% when we control for recent unforced sales prices, numbers close to those claimed recently by the Obama Administration (US Treasury 2009). For both variables, but particularly the local foreclosure indicator, we find extremely powerful effects in the right tail of the distribution. A house in the top 0.1% of the distribution for both variables has a price forecast that is lower by almost 50% in column 1, or 40% in column 2.

Of course, these estimates are not structural because they do not control for unobserved common shocks that drive both foreclosures and house prices, or for reverse causality from house prices to foreclosures. To move closer to structural estimates of foreclosure effects, in columns 3 and 4 of Table 12 we add foreclosures that take place in the year after a house is sold. The linear variables enter the regression with negative signs, but with smaller coefficients than on the corresponding lagged variables. The tail dummies enter the regression with signs that are almost always positive. Including future foreclosures reduces the coefficients on lagged foreclosures only modestly.

Within this framework, the equivalent of Leigh and Rockoff's difference-in-difference approach is to take the difference between the coefficients on lagged and led distance-weighted foreclosures within 0.1 mile. This procedure delivers an estimate that each nearby foreclosure lowers the price of a house by about 2% if it takes place at zero distance, and 1% if it takes place at a distance of 0.05 miles. This estimate is close to that we obtained using the Leigh-Rockoff approach.

What do these estimates imply about the effects of the current foreclosure wave? As a rough calculation, we have studied the foreclosures that took place during the first quarter of 2008. If we use the forecasting model in column 2 of Table 12, the typical foreclosure during this period lowered the price of the foreclosed house by $46,000 and the prices of all neighboring houses by a total of $406,000, for a total loss in housing value of $452,000. If we use the difference-in-difference estimate from column 4 of Table 12, the typical foreclosure in 2008:1 lowered the price of the foreclosed house by $43,000 and the prices of neighboring houses by a total of $110,000, for a total loss of $153,000. Even this considerably smaller estimate implies that foreclosures have important negative effects on the prices of nearby houses.

To gain insight about the economic mechanism by which foreclosures lower the value of nearby houses, in Table 13 we explore how spillover effects vary with housing type and with the components of housing value. To save space, we use only the final specification of Table 12, column 4, and report only the difference between the before and after coefficients on distant foreclosures, close foreclosures, and dummies for the 99th percentile of the distant and close foreclosure distribution.

There are several interesting results in Table 13. First, foreclosure spillover effects are largest for single-family houses and condominiums, and absent for multi-family houses. This may reflect the fact that single-family housing is most vulnerable to neighborhood crime and vandalism, while condominiums are collectively maintained so foreclosures in a condominium complex adversely affect the maintenance budget for all other units in the complex. Second, like the foreclosure discounts themselves, spillovers tend to be larger for less valuable houses in less expensive zipcodes, once again suggesting the importance of crime and vandalism.

Another important question about spillover effects is how long they last. In Table 14 we show that lagged foreclosures are good predictors of neighborhood house prices. Column 1 of Table 14 repeats column 1 of Table 12, showing only the foreclosure coefficients to save space. Column 2 lags all foreclosures by a year, with little effect on the estimated coefficients. Column 3 includes both foreclosures during the most recent year and foreclosures from the previous year; both sets of foreclosures enter significantly with comparable coefficients. Column 4 adds average neighborhood house prices, as in column 2 of Table 12, with little effect on the coefficients of lagged foreclosures. While these estimates do not control for future foreclosures, their persistence suggests that foreclosures do not merely cause transitory liquidity discounts on the prices of neighboring houses, but may have negative physical effects on neighborhoods which last for some time. If this is the case, it adds credibility to the concern that foreclosures reduce the ability of neighbors to refinance their mortgages, and may even drive down neighbors' home equity to the point at which they also have incentives to default.

Several other results about spillovers are reported in the appendix to this paper. We have distinguished between foreclosed houses which are already sold by the time a neighboring house is sold, and those which are still on the market. There is little difference between the estimated spillovers of these two types of houses. Also, we have asked whether neighborhood foreclosures affect the discount at which foreclosure-related sales take place. We find that foreclosures within 0.25 mile of a house tend to increase the discount at which a foreclosed house is sold relative to comparable unforced sales, but foreclosures within 0.1 mile tend to reduce that discount.

Our results cannot prove causality from foreclosures to house prices, but the combination of timing effects (stronger from lagged foreclosures than from future foreclosures) and geographical effects (stronger at extremely short distances) suggests that there is reason to be concerned about spillovers from foreclosures to neighboring houses despite the reassuring zipcode-level results reported in the previous subsection. The persistence of the spillovers we estimate, and their greater magnitude in low-priced neighborhoods, suggest that like foreclosure discounts themselves, they may be related to physical damage caused by the foreclosure process.

5 Conclusion

This paper uses data on almost 1.8 million house transactions in Massachusetts to show that houses sold after foreclosure, or close in time to the death or bankruptcy of at least one seller, are sold at lower prices than other houses. The discount is particularly large for foreclosures, 28% of a house's value on average. It is smaller for death-related sales at 5-7% of value, and smaller again for bankruptcy-related sales at 3% of value.

The pricing pattern for death-related sales suggests that the discount may be due to poor maintenance, because it does not depend sensitively on the timing of the sale relative to the timing of a seller's death, is larger for deaths of older sellers, and is larger for houses where the structure accounts for a greater fraction of the value of the property. The pricing pattern for foreclosures is quite different. Foreclosure discounts are larger for low-priced properties in low-priced zipcodes, which suggests that foreclosing mortgage lenders face fixed costs of homeownership, probably related to vandalism, that induce them to accept absolute discounts that are proportionally larger for low-priced houses.

After aggregating to the zipcode-year level and controlling for movements in the overall level of Massachusetts house prices, we find that the prices of unforced transactions are close to a random walk, while forced sales take place at a substantial and time-varying discount. This discount is larger and more persistent when the share of forced sales is higher. These patterns suggest that most unforced transactions in residential real estate take place at efficient prices, at least relative to the general level of house prices in Massachusetts. Forced sales take place at lower prices, which one might think of as revealing a "bid price" for houses as in the finance literature on the bid-ask spread in dealer markets (e.g. Roll 1984). When many homeowners are selling urgently, the implied bid-ask spread widens for housing.

We also look for evidence that forced sales have spillover effects on the prices of local unforced sales. This question is of particular interest given the increase in the foreclosure rate in the current housing downturn (Gerardi, Shapiro, and Willen 2007, Calomiris, Longhofer, and Miles 2008). We find that foreclosures predict lower prices for houses located less than 0.25 mile, and particularly less than 0.1 mile away. Although foreclosures and prices are both endogenous variables, the fact that foreclosures lead prices at such short distances does reinforce the concern that foreclosures have negative external effects in the housing market. Our preferred estimate of the spillover effect suggests that each foreclosure that takes place 0.05 miles away lowers the price of a house by about 1%.

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Table 1 - Descriptive statistics

	Min	Max	Mean	Stdev	1%	25%	50%	75%	99%
Panel I: Housing characteristics									
Price ($1000)	6.80	1,820.00	225.40	169.18	23.50	117.00	175.80	289.90	860.00
Total rooms	2	16	6.79	2.56	3	5	6	8	16
Full bathrooms	0	4	1.64	0.71	1	1	2	2	4
Half bathrooms	0	2	0.44	0.53	0	0	0	1	2
Bedrooms	1	9	3.15	1.31	1	2	3	4	8
Lotsize	0	261,360	20,781	36,493	0	2,875	9,452	22,005	229,997
Interior Square Feet	509	4,627	1,725	823	509	1,122	1,535	2,145	4,404
House age	0	356	48.28	42.33	0	14	38	78	184
Panel II: Neighborhood characteristics									
Median Income	2,499	200,001	58,945	23,376	16,861	43,385	55,521	70,250	131,823
% Hispanic	0.00	1.00	0.05	0.09	0.00	0.01	0.02	0.04	0.50
% Black	0.00	0.95	0.04	0.10	0.00	0.00	0.01	0.03	0.59
% 0-17 years old	0.00	0.49	0.23	0.07	0.04	0.20	0.24	0.28	0.37
% 65+ years old	0.00	0.71	0.14	0.07	0.03	0.09	0.13	0.17	0.39
% Female-headed HH	0.00	0.48	0.06	0.05	0.01	0.03	0.04	0.07	0.26
% with Bachelor's degree	0.00	0.73	0.21	0.10	0.02	0.13	0.20	0.28	0.45
% with graduate degree	0.00	0.72	0.15	0.12	0.00	0.06	0.11	0.20	0.52
% with less than high school degree	0.00	1.00	0.13	0.11	0.00	0.06	0.10	0.17	0.50

Notes: dataset is an extract of the residential real estate changes of ownership file from the Warren Group for Massachusetts. The details for creating the extract are contained in the data appendix. Panel I reports values per sale, while Panel II reports 2000 census data at the tract level for each sale.

Table 2 - Frequency of forced sales

Panel A: Forced transactions by year

Year	Total Obs	Deaths	Bankruptcies	Foreclosures	Total Forced
1987	89,596	1.0%	0.0%	0.0%	1.0%
1988	79,684	0.9%	0.0%	0.1%	0.9%
1989	66,762	0.9%	0.0%	0.3%	1.2%
1990	54,635	0.9%	0.0%	1.2%	2.1%
1991	57,571	1.1%	0.1%	5.3%	6.4%
1992	68,878	1.2%	0.2%	8.3%	9.8%
1993	74,756	1.6%	0.3%	9.7%	11.6%
1994	81,205	1.8%	0.5%	8.4%	10.7%
1995	76,104	1.8%	0.6%	7.1%	9.4%
1996	84,319	1.6%	0.7%	5.0%	7.3%
1997	90,403	1.8%	0.8%	4.3%	6.9%
1998	99,945	1.9%	0.9%	3.0%	5.7%
1999	103,375	1.8%	1.1%	2.2%	5.2%
2000	95,452	1.9%	1.1%	1.8%	4.8%
2001	89,956	2.0%	1.1%	1.4%	4.5%
2002	92,989	2.2%	1.2%	1.2%	4.6%
2003	94,987	2.3%	1.4%	0.7%	4.5%
2004	106,077	2.5%	1.4%	0.7%	4.5%
2005	102,492	2.1%	1.3%	0.8%	4.2%
2006	86,924	1.8%	1.2%	1.6%	4.5%
2007	78,001	1.6%	0.9%	5.2%	7.7%
2008	9,249	1.0%	0.8%	12.7%	14.5%
Total	1,783,360	1.7%	0.8%	3.1%	5.6%

Panel B: Timing of forced transactions

Group	Death	Bankruptcy	Foreclosure
sale 3 yrs before event	0.21%	0.08%	
sale 2 yrs before event	0.26%	0.08%	
sale 1 yr before event	0.35%	0.07%	
sale 1 yr after event	0.50%	0.24%	2.64%
sale 2 yrs after event	0.26%	0.17%	0.29%
sale 3 yrs after event	0.13%	0.13%	0.06%

Notes: data on deaths from the Social Security Death Master file and data on bankruptcies obtained from the MA Bankruptcy Court. Panel A reports the percentage of observations that are classified as deaths, bankruptcies, or foreclosures each year. An observation is assigned to one of the mutually exclusive categories according to the rules described in Appendix A. For deaths and bankruptcies, a sale is considered forced if the sale happens within 3 years before or after the sale. For foreclosures, a sale is considered forced whenever the sale occurs after the auction (or at the auction itself if successful). For each type of forced sale, Panel B reports how the forced sales as a percentage of total observations are distributed before and after the event which forces the sale. Our main housing dataset includes sales up to March 2008.

Table 3 - Other characteristics of forced sales

		Property type (% of firesale type)				% of each type also:	
	% of total obs	Single family	Multifamily	Condo	% Boston	Death	Bankruptcy
All observations	100.0%	64.4%	11.1%	24.5%	8.1%		
Unforced	94.4%	64.6%	10.5%	24.9%	8.0%		
Forced	5.6%	62.2%	19.7%	18.0%	9.7%		
Death	1.7%	76.6%	14.5%	9.0%	5.3%		0.7%
Bankruptcy	0.8%	71.3%	15.3%	13.4%	5.5%	1.1%	
Foreclosure	3.1%	52.1%	23.7%	24.2%	13.2%	0.5%	3.1%

Notes: the first column reports the fraction of observations identified as forced, following the matching process described in the data appendix. The next three columns report the property type composition, while the fifth column reports the fraction of observations in Boston. The last two columns report, for each category, how many matches were also matched as another type of forced sale before applying the rules we use to classify the transaction in these cases.

Table 4 - Descriptive statistics for forced sales

Panel A: Characteristics of forced sales

	Min	Max	Mean	Stdev	1%	25%	50%	75%	99%
Panel A.I: Housing characteristics									
Price ($1000)	7.15	1,675.00	151.46	126.82	13.50	68.00	116.00	197.00	600.00
Total rooms	2	16	7.18	3.06	3	5	6	8	16
Full bathrooms	0	4	1.60	0.73	1	1	1	2	4
Half bathrooms	0	2	0.34	0.50	0	0	0	1	2
Bedrooms	1	9	3.37	1.57	1	2	3	4	9
Lotsize	0	261,360	16,524	31,105	0	3,825	7,508	16,117	185,086
Interior Square Feet	509	4,627	1,713	850	509	1,090	1,480	2,128	4,374
House age	0	341	58.97	40.38	0	53	91	106	341
Panel A.II: Neighborhood characteristics									
Median Income	7,271	200,001	50,613	19,766	15,268	37,143	48,269	61,047	115,456
% Hispanic	0.00	0.96	0.07	0.12	0.00	0.01	0.02	0.08	0.59
% Black	0.00	0.95	0.07	0.15	0.00	0.01	0.02	0.05	0.83
% 0-17 years old	0.00	0.49	0.24	0.07	0.05	0.21	0.24	0.28	0.40
% 65+ years old	0.00	0.71	0.14	0.07	0.03	0.09	0.13	0.17	0.37
% Female-headed HH	0.00	0.48	0.08	0.06	0.01	0.04	0.06	0.09	0.29
% with Bachelor's degree	0.00	0.73	0.17	0.10	0.01	0.10	0.15	0.23	0.43
% with graduate degree	0.00	0.72	0.10	0.09	0.00	0.04	0.08	0.14	0.44
% with less than high school degree	0.00	0.83	0.17	0.12	0.01	0.08	0.14	0.24	0.55

Panel B: Ratio of characteristics of forced sales to all sales

	Min	Max	Mean	Stdev	1%	25%	50%	75%	99%
Panel B.I: Ratio of housing characteristics of forced sales to all sales									
Price ($1000)	1.05	0.92	0.67	0.75	0.57	0.58	0.66	0.68	0.70
Total rooms	1.00	1.00	1.06	1.19	1.00	1.00	1.00	1.00	1.00
Full bathrooms	-	1.00	0.98	1.04	1.00	1.00	0.50	1.00	1.00
Half bathrooms	-	1.00	0.76	0.95	-	-	-	1.00	1.00
Bedrooms	1.00	1.00	1.07	1.20	1.00	1.00	1.00	1.00	1.13
Lotsize	-	1.00	0.80	0.85	-	1.33	0.79	0.73	0.80
Interior Square Feet	1.00	1.00	0.99	1.03	1.00	0.97	0.96	0.99	0.99
House age	-	0.96	1.22	0.95	-	3.79	2.39	1.36	1.85
Panel B.II: Ratio of neighborhood characteristics of forced sales to all sales									
Median Income	2.91	1.00	0.86	0.85	0.91	0.86	0.87	0.87	0.88
% Hispanic	-	0.96	1.50	1.26	1.07	1.15	1.37	1.94	1.20
% Black	-	1.00	1.71	1.52	-	1.32	1.43	1.72	1.41
% 0-17 years old	-	1.00	1.04	0.95	1.15	1.06	1.01	1.01	1.06
% 65+ years old	-	1.00	0.99	0.98	1.04	0.99	0.99	1.00	0.96
% Female-headed HH	-	1.00	1.33	1.31	1.54	1.19	1.27	1.40	1.12
% with Bachelor's degree	-	1.00	0.81	0.96	0.53	0.74	0.76	0.82	0.94
% with graduate degree	-	1.00	0.71	0.78	-	0.68	0.68	0.69	0.84
% with less than high school degree	-	0.83	1.33	1.17	-	1.40	1.42	1.37	1.10

Notes: sample is subset of transactions which are deaths and bankruptcies within 3 year from the sale, plus foreclosures. Panel A is analogous to Table 1. Panel B reports the ratio of values in Panel A with the corresponding values in Table 1. Whenever the value in Table 1 is 0, we do not report the number, as the ratio cannot be computed.

Table 5 - Hedonic regression coefficients

Variable	Estimate	Standard Error
Lot size (x10,000)	0.001	(0.000)
Bedrooms	0.023	(0.000)
Total number of rooms	0.013	(0.000)
Full Bathrooms	0.098	(0.001)
Half Bathrooms	0.094	(0.001)
Interior Square Feet (x10,000)	0.764	(0.010)
House Age (x10)	-0.016	(0.000)
House Age Squared	0.0005	(0.000)
Condominium	-0.204	(0.002)
High number of Rooms Indicator	-0.083	(0.004)
High number of Bedrooms Indicator	-0.076	(0.004)
High number of Full Bathrooms Indicator	-0.089	(0.003)
High number of Half Bathrooms Indicator	-0.082	(0.003)
High square feet Indicator	-0.027	(0.005)
Low square feet Indicator	-0.225	(0.008)
Renovated in the last 10 years	0.056	(0.002)
Renovated 10 to 20 years before	0.010	(0.003)
Renovated 20 to 30 years before	0.007	(0.003)
Renovated more than 30 years before	0.005	(0.004)
% Hispanic	-0.220	(0.008)
% Black	-0.136	(0.008)
% Less than 17 years old	-0.204	(0.011)
% More than 65 years old	0.386	(0.007)
% Female-headed household	-0.066	(0.015)
Median Income	0.018	(0.000)
% Bachelor Degree	0.225	(0.006)
% Graduate Degree	0.346	(0.006)
% Less than High School Diploma	-0.102	(0.007)
Number of Observations	1,783,360	
R-squared	0.718	

Notes: the table reports the coefficients and standard errors (in parenthesis) of a regression of log house price on house and census characteristics and forced sale indicators as in Table 6, panel B. The regression includes zip code-year fixed effects.

Table 6 - Price Discount for Forced Sales

Panel A

	Full sample		*Single Family*		*Multi Family*		*Condominium*	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Forced (-3 years;+3 years)	-0.199	(0.001)	-0.151	(0.002)	-0.240	(0.003)	-0.235	(0.003)
Number of Observations	1,783,360		1,149,215		197,124		437,021	
R-squared	0.716		0.714		0.742		0.805	

Panel B

	Full sample		*Single Family*		*Multi Family*		*Condominium*	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Death, young seller (-3;+3)	-0.051	(0.005)	-0.063	(0.006)	-0.028	(0.013)	-0.008	(0.012)
Death, old seller (-3;+3)	-0.068	(0.002)	-0.081	(0.003)	-0.058	(0.007)	-0.010	(0.007)
Bankruptcy (-3;+3)	-0.032	(0.003)	-0.040	(0.004)	-0.018	(0.009)	-0.030	(0.008)
Foreclosure	-0.323	(0.002)	-0.253	(0.002)	-0.359	(0.004)	-0.322	(0.003)
Number of Observations	1,783,360		1,149,215		197,124		437,021	
R-squared	0.718		0.715		0.745		0.806	

Notes: table reports the coefficients and standard errors (in parenthesis) of a regression of log house price on house and census characteristics and disaggregated forced sale indicators, on the full sample, and separately for each house type. Coefficients on house and census characteristics for the full sample specification are reported in Table 5. Death, bankruptcy and foreclosure indicators are mutually exclusive. Young seller is defined as a seller younger than 70 at the time of death. There are 5,311 cases of young deaths and 25,100 cases of old deaths. The regression includes zip code-year fixed effects.

Table 7 - Number of sellers effects

	Full sample		*Single Family*		*Multi Family*		*Condominium*	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
One seller								
Death, young seller (-3;+3)	-0.082	(0.009)	-0.087	(0.011)	-0.062	(0.021)	0.009	(0.021)
Death, old seller (-3;+3)	-0.095	(0.004)	-0.103	(0.005)	-0.092	(0.011)	-0.021	(0.011)
Bankruptcy (-3;+3)	-0.061	(0.005)	-0.072	(0.006)	-0.014	(0.013)	-0.054	(0.011)
Two sellers								
Death, young seller (-3;+3)	-0.035	(0.006)	-0.050	(0.007)	-0.006	(0.017)	-0.017	(0.015)
Death, old seller (-3;+3)	-0.053	(0.003)	-0.070	(0.003)	-0.038	(0.008)	-0.004	(0.009)
Bankruptcy (-3;+3)	-0.014	(0.004)	-0.022	(0.005)	-0.021	(0.012)	-0.006	(0.011)

Notes: table reports coefficients and standard errors (in parenthesis) of hedonic regression of log price with interactions of the forced sale variables with indicators for one and two sellers. 42% of the full sample has two sellers. The regression includes the house and census characteristics of Table 5.

Table 8 - Price discount and value components

	Full sample		*Single Family*		*Multi Family*		*Condominium*	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Levels of forced sale effects								
Death, young seller (-3;+3)	-0.052	(0.005)	-0.065	(0.006)	-0.026	(0.013)	0.001	(0.013)
Death, old seller (-3;+3)	-0.069	(0.002)	-0.089	(0.003)	-0.059	(0.007)	-0.009	(0.007)
Bankruptcy (-3;+3)	-0.040	(0.004)	-0.044	(0.004)	-0.023	(0.009)	-0.037	(0.009)
Foreclosure	-0.256	(0.002)	-0.227	(0.003)	-0.267	(0.005)	-0.271	(0.005)
Forced sale effects interacted with building component								
Death, young seller (-3;+3)	-0.017	(0.006)	-0.012	(0.007)	0.028	(0.014)	0.013	(0.014)
Death, old seller (-3;+3)	-0.033	(0.003)	-0.019	(0.003)	0.009	(0.007)	-0.007	(0.008)
Bankruptcy (-3;+3)	0.002	(0.004)	0.005	(0.004)	-0.002	(0.009)	0.000	(0.008)
Foreclosure	0.052	(0.002)	0.029	(0.003)	-0.004	(0.004)	0.046	(0.003)
Forced sale effects interacted with lotsize component								
Death, young seller (-3;+3)	-0.003	(0.006)	-0.009	(0.007)	0.004	(0.016)	-0.008	(0.014)
Death, old seller (-3;+3)	-0.004	(0.003)	-0.024	(0.003)	0.017	(0.008)	0.007	(0.008)
Bankruptcy (-3;+3)	-0.001	(0.004)	-0.004	(0.005)	-0.004	(0.011)	-0.005	(0.009)
Foreclosure	-0.020	(0.002)	0.000	(0.003)	-0.010	(0.005)	-0.011	(0.003)
Forced sale effects interacted with census component								
Death, young seller (-3;+3)	0.001	(0.006)	0.004	(0.007)	0.008	(0.015)	0.016	(0.014)
Death, old seller (-3;+3)	0.006	(0.003)	0.010	(0.003)	0.017	(0.008)	0.014	(0.009)
Bankruptcy (-3;+3)	-0.025	(0.004)	-0.017	(0.005)	-0.033	(0.009)	-0.018	(0.009)
Foreclosure	0.052	(0.002)	0.033	(0.002)	0.086	(0.004)	-0.005	(0.003)
Forced sale effects interacted with zipcode component								
Death, young seller (-3;+3)	-0.012	(0.006)	-0.008	(0.006)	-0.009	(0.014)	-0.046	(0.014)
Death, old seller (-3;+3)	-0.004	(0.003)	-0.001	(0.003)	-0.008	(0.007)	-0.020	(0.008)
Bankruptcy (-3;+3)	-0.015	(0.004)	-0.015	(0.004)	-0.013	(0.009)	-0.003	(0.009)
Foreclosure	0.042	(0.002)	-0.001	(0.003)	0.074	(0.004)	0.033	(0.003)

Notes: table reports coefficients and standard errors (in parenthesis) of hedonic regression of log price with indicators of forced sales, plus the interactions with standardized components of the value of the house. These components are obtained in a first stage regression of log price on the house and census characteristics of Table 5. The predicted price is then decomposed into the components explained by the value of the building, the size of the lot, the census data and the zipcode-year interaction. The second-stage regression regresses log price on the forced sales dummies interacted with the components described above, standardized to zero mean and unit variance. These components also enter in levels (not shown).

Table 9 - Previous Forced Sales Effect

Variable	Estimate	Standard Error
Previous price x time between sales		
Less than a year	0.154	(0.001)
Between 1 and 3 years	0.155	(0.001)
Between 3 and 5 years	0.156	(0.001)
More than 5 years	0.156	(0.001)
Previous sale: young death		
Sale within a year before	0.002	(0.023)
Sale within 1 and 3 years before	0.012	(0.018)
Sale within 3 and 5 years before	0.014	(0.019)
Sale more than 5 years before	0.023	(0.014)
Previous sale: old death		
Sale within a year before	0.023	(0.011)
Sale within 1 and 3 years before	0.014	(0.008)
Sale within 3 and 5 years before	0.011	(0.009)
Sale more than 5 years before	0.045	(0.007)
Previous sale: bankruptcy		
Sale within a year before	-0.037	(0.012)
Sale within 1 and 3 years before	-0.004	(0.010)
Sale within 3 and 5 years before	0.006	(0.012)
Sale more than 5 years before	0.022	(0.012)
Previous sale: foreclosure		
Sale within a year before	0.011	(0.005)
Sale within 1 and 3 years before	-0.028	(0.005)
Sale within 3 and 5 years before	-0.018	(0.005)
Sale more than 5 years before	0.033	(0.004)

Notes: table reports coefficients and standard errors (in parenthesis) of hedonic regression of log price with indicators of forced sales in the previous transaction, decomposed into different windows depending on the time since the last transaction. The regression includes the house and census characteristics of Table 5, and the forced sales indicators of the Table 6, Panel B.

Table 10 - VAR for neighborhood house prices

	Δp_t	Δpf_t	pu_t-pf_t	Δpu_t
Δpf_{t-1}		-0.075	0.046	-0.029
		(0.012)	(0.012)	(0.004)
pu_{t-1}-pf_{t-1}		0.832	0.077	-0.090
		(0.015)	(0.015)	(0.005)
Δp_{t-1}	-0.443			
	(0.009)			
Observations	9820	6801	6801	6801
R-squared	0.204	0.463	0.220	0.089

Notes: table reports coefficients and standard errors (in parenthesis) of VAR of percentage change in average forced and unforced house prices at the zipcode-year level, cross-sectionally demeaned. *p* is the average price of all sales, *pf* is the average price of forced sales and *pu* is the average price of unforced sales in each zipcode at time t. Each specification includes neighborhood fixed effects.

Table 11 - Neighborhood VAR with share of forced sales

Panel A: VAR with lagged forced share

	sf_t	Δpf_t	pu_t-pf_t	Δpu_t
sf_{t-1}	0.519	-0.628	0.609	-0.020
	(0.012)	(0.084)	(0.083)	(0.031)
Δpf_{t-1}	0.000	-0.068	0.040	-0.029
	(0.002)	(0.012)	(0.012)	(0.004)
pu_{t-1}-pf_{t-1}	0.009	0.850	0.061	-0.090
	(0.002)	(0.017)	(0.017)	(0.006)
Observations	6,801	6,801	6,801	6,801
R-squared	0.614	0.468	0.227	0.089

Panel B: VAR with lagged forced share interactions

	sf_t	Δpf_t	pu_t-pf_t	Δpu_t
sf_{t-1}	0.496	-0.378	0.500	0.120
	(0.012)	(0.086)	(0.086)	(0.031)
Δpf_{t-1}	-0.002	-0.051	0.028	-0.023
	(0.002)	(0.012)	(0.012)	(0.004)
pu_{t-1}-pf_{t-1}	0.011	0.831	0.072	-0.097
	(0.002)	(0.017)	(0.017)	(0.006)
sf_{t-1} x Δpf_{t-1}	-0.052	-0.039	-0.460	-0.499
	(0.031)	(0.219)	(0.218)	(0.079)
sf_{t-1} x (pu_{t-1}-pf_{t-1})	0.200	-2.432	0.884	-1.548
	(0.035)	(0.243)	(0.242)	(0.088)
Observations	6,801	6,801	6,801	6,801
R-squared	0.618	0.479	0.231	0.132

Notes: table reports coefficients and standard errors (in parenthesis) of VAR of percentage change in average forced and unforced house prices at the zipcode-year level, cross-sectionally demeaned. *pf* is the average price of forced sales, *pu* the average price of unforced sales, and *sf* the share of forced sales in each zipcode at time t. Each specification includes neighborhood fixed effects.

Table 12 - Cross-price effects of foreclosures

	[1]	[2]	[3]	[4]
Far, before	-0.018	-0.011	-0.015	-0.006
	(0.000)	(0.000)	(0.000)	(0.000)
Far, after			-0.006	-0.001
			(0.000)	(0.000)
Close, before	-0.091	-0.073	-0.082	-0.059
	(0.002)	(0.002)	(0.002)	(0.002)
Close, after			-0.062	-0.042
			(0.002)	(0.002)
Far 99.0, before	0.021	0.004	0.017	-0.007
	(0.005)	(0.005)	(0.005)	(0.005)
Far 99.0, after			0.049	0.014
			(0.005)	(0.005)
Far 99.5, before	-0.025	-0.025	-0.030	-0.029
	(0.006)	(0.006)	(0.006)	(0.006)
Far 99.5, after			0.060	0.024
			(0.006)	(0.006)
Far 99.9, before	-0.109	-0.085	-0.117	-0.070
	(0.012)	(0.012)	(0.012)	(0.012)
Far 99.9, after			0.049	0.027
			(0.012)	(0.011)
Close 99.0, before	-0.017	-0.016	-0.010	-0.009
	(0.005)	(0.005)	(0.005)	(0.005)
Close 99.0, after			0.006	0.002
			(0.005)	(0.005)
Close 99.5, before	-0.120	-0.100	-0.092	-0.071
	(0.006)	(0.005)	(0.006)	(0.006)
Close 99.5, after			0.004	0.007
			(0.006)	(0.005)
Close 99.9, before	-0.258	-0.184	-0.210	-0.121
	(0.011)	(0.011)	(0.012)	(0.012)
Close 99.9, after			-0.025	0.012
			(0.012)	(0.011)
Average price, before		0.270		0.191
		(0.001)		(0.001)
Average price, after				0.207
				(0.001)
No transaction before		3.256		2.290
		(0.012)		(0.013)
No transaction after				2.520
				(0.013)
Sale 1 yr after foreclosure	-0.29	-0.283	-0.287	-0.278
	(0.002)	(0.002)	(0.002)	(0.002)
Sale 2 yrs after foreclosure	-0.414	-0.405	-0.41	-0.396
	(0.005)	(0.005)	(0.005)	(0.005)
Sale 3 yrs after foreclosure	-0.433	-0.419	-0.429	-0.406
	(0.012)	(0.012)	(0.012)	(0.011)
Sale more than 3 yrs	-0.210	-0.186	-0.208	-0.177
after foreclosure	(0.008)	(0.008)	(0.008)	(0.008)

Notes: table reports coefficients and standard errors, in parenthesis, of hedonic regression of log price on the unweighted number of foreclosures in the 0.25mi area around the house sold winsorized at the 99th percentile (variable Far), and the linearly weighted number of foreclosures in the 0.1mi area, also winsorized at the 99th percentile (variable Close), for the year before and after the sale. We also add indicators for the 99th, 99.5th and 99.9th percentile of those variables. They are as follows. For Close, before: 1.59 (99%), 2.57 (99.5%) and 8 (99.9%). For Far, before: 10 (99%), 15 (99.5%) and 28 (99.9%). For Close, after: 1.54 (99%), 2.32 (99.5%) and 6.71 (99.9%). For Far, after: 10 (99%), 14 (99.5%) and 26 (99.9%). Finally, columns 2 and 4 add the distance-weighted average log price of neighboring houses (0.25mi), in the year before and after the sale, and an indicator for the cases where there are no transactions in the neighborhood, for that time frame. The regression includes the house and census characteristics in Table 5, and the foreclosure and bankruptcy indicators of Table 6, Panel B.

Table 13 - Interaction of spillover effect with value components

	Full sample		*Single Family*		*Multi Family*		*Condominium*	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Levels of spillover effects								
Far, before - after	0.001	(0.001)	0.000	(0.001)	-0.005	(0.002)	0.002	(0.001)
Close, before - after	-0.009	(0.004)	-0.012	(0.007)	0.016	(0.009)	-0.009	(0.004)
Far 99.0, before - after	0.003	(0.011)	-0.019	(0.029)	0.006	(0.021)	-0.003	(0.011)
Close 99.0, before - after	0.012	(0.010)	0.040	(0.027)	-0.013	(0.024)	-0.025	(0.009)
Spillover effects interacted with building component								
Far, before - after	0.006	(0.001)	0.006	(0.001)	0.005	(0.001)	-0.010	(0.001)
Close, before - after	0.012	(0.003)	0.014	(0.007)	0.003	(0.008)	0.035	(0.004)
Far 99.0, before - after	0.023	(0.007)	-0.051	(0.018)	0.035	(0.014)	0.016	(0.008)
Close 99.0, before - after	0.025	(0.007)	0.024	(0.022)	-0.006	(0.017)	0.011	(0.007)
Spillover effects interacted with lotsize component								
Far, before - after	-0.002	(0.001)	0.002	(0.001)	0.001	(0.002)	-0.001	(0.001)
Close, before - after	-0.007	(0.003)	-0.011	(0.007)	-0.012	(0.010)	0.002	(0.004)
Far 99.0, before - after	-0.033	(0.008)	-0.044	(0.019)	0.000	(0.019)	0.001	(0.009)
Close 99.0, before - after	0.003	(0.006)	0.013	(0.002)	-0.006	(0.022)	-0.010	(0.007)
Spillover effects interacted with census component								
Far, before - after	0.008	(0.001)	0.005	(0.001)	0.007	(0.001)	0.006	(0.001)
Close, before - after	-0.004	(0.003)	-0.015	(0.005)	0.012	(0.008)	-0.003	(0.004)
Far 99.0, before - after	0.020	(0.006)	0.019	(0.013)	0.028	(0.015)	0.030	(0.007)
Close 99.0, before - after	0.003	(0.006)	0.016	(0.014)	0.002	(0.018)	-0.003	(0.006)
Spillover effects interacted with zipcode component								
Far, before - after	-0.001	(0.001)	-0.003	(0.001)	-0.001	(0.001)	0.000	(0.001)
Close, before - after	0.011	(0.003)	0.011	(0.006)	0.012	(0.007)	0.009	(0.004)
Far 99.0, before - after	0.010	(0.006)	-0.003	(0.014)	-0.002	(0.012)	0.047	(0.008)
Close 99.0, before - after	0.013	(0.006)	-0.016	(0.016)	0.006	(0.015)	-0.003	(0.007)

Notes: table reports coefficients and standard errors of hedonic regression of log price on the the unweighted number of foreclosures in the 0.25mi area around the house sold winsorized at the 99th percentile (variable Far), and the linearly weighted number of foreclosures in the 0.1mi area, also winsorized at the 99th percentile (variable Close), for the year before and after the sale. We also add indicators for the 99th percentile of those variables: for Close, before: 1.59 (99%); for Far, before: 10 (99%); for Close, after: 1.54 (99%); for Far, after: 10 (99%). The estimation proceeds in two stages, as in Table 8, by first decomposing the predicted price in four parts and then in a second stage interacting those with the neighborhood foreclosure variables. The second stage regression includes (not shown) levels of the value components and neighborhood prices, before and after the sale.

Table 14 - Lagged foreclosures

	Specification [1] of T12	Only lagged	Adding lagged to [1] of T12	Adding lagged to [2] of T12
Far, before	-0.019		-0.012	-0.007
	(0.000)		(0.000)	(0.000)
Lagged far, before		-0.020	-0.013	-0.007
		(0.000)	(0.000)	(0.000)
Close, before	-0.088		-0.073	-0.060
	(0.002)		(0.002)	(0.002)
Lagged Close, before		-0.093	-0.081	-0.064
		(0.002)	-0.0020	(0.002)
Far 99.0 tail, before	-0.022		0.001	-0.009
	(0.004)		(0.005)	(0.004)
Lagged Far 99.0 tail, before		-0.014	0.007	0.003
		(0.004)	(0.005)	(0.005)
Close 99.0 tail, before	-0.080		-0.041	-0.035
	(0.004)		(0.004)	(0.004)
Lagged Close 99.0 tail, before		-0.087	-0.051	-0.042
		(0.004)	(0.004)	(0.004)

Notes: table reports coefficients and standard errors, in parenthesis, of hedonic regression of log price on the unweighted number of foreclosures in the 0.25mi area around the house sold winsorized at the 99th percentile (variable Far), and the linearly weighted number of foreclosures in the 0.1mi area, also winsorized at the 99th percentile (variable Close), for the year before the sale. It also adds the same measures for the number of foreclosures occurred between one and two years before the sale ("lagged" variables). The regression also includes a single dummy for the 99th percentile of the distribution of those variables (reported in the note of table 12). The regression includes the house and census characteristics in Table 5, and the foreclosure and bankruptcy indicators of Table 6, Panel B.

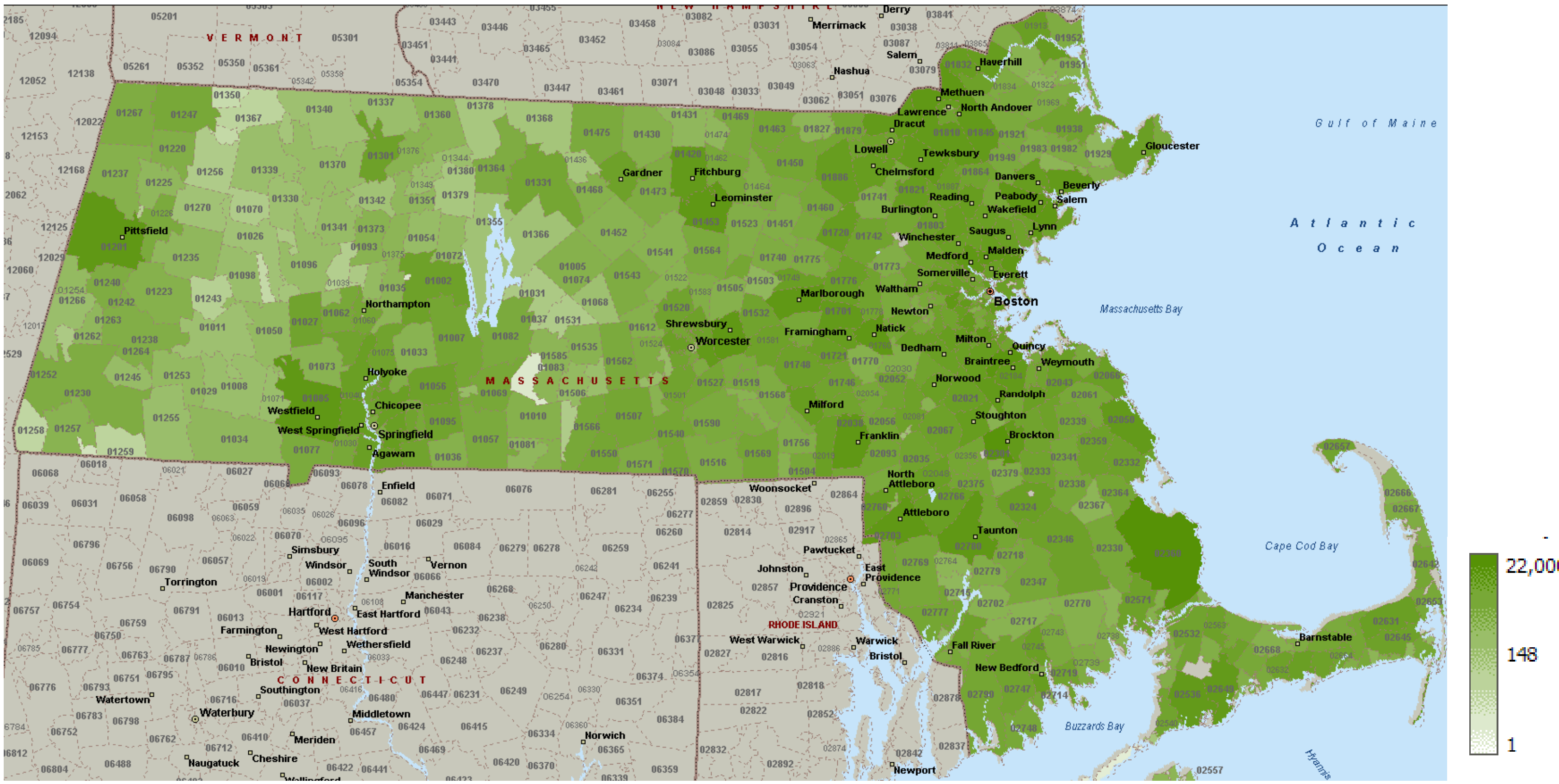

Figure 1: Geographic Distribution of Housing Transactions by Zip Code

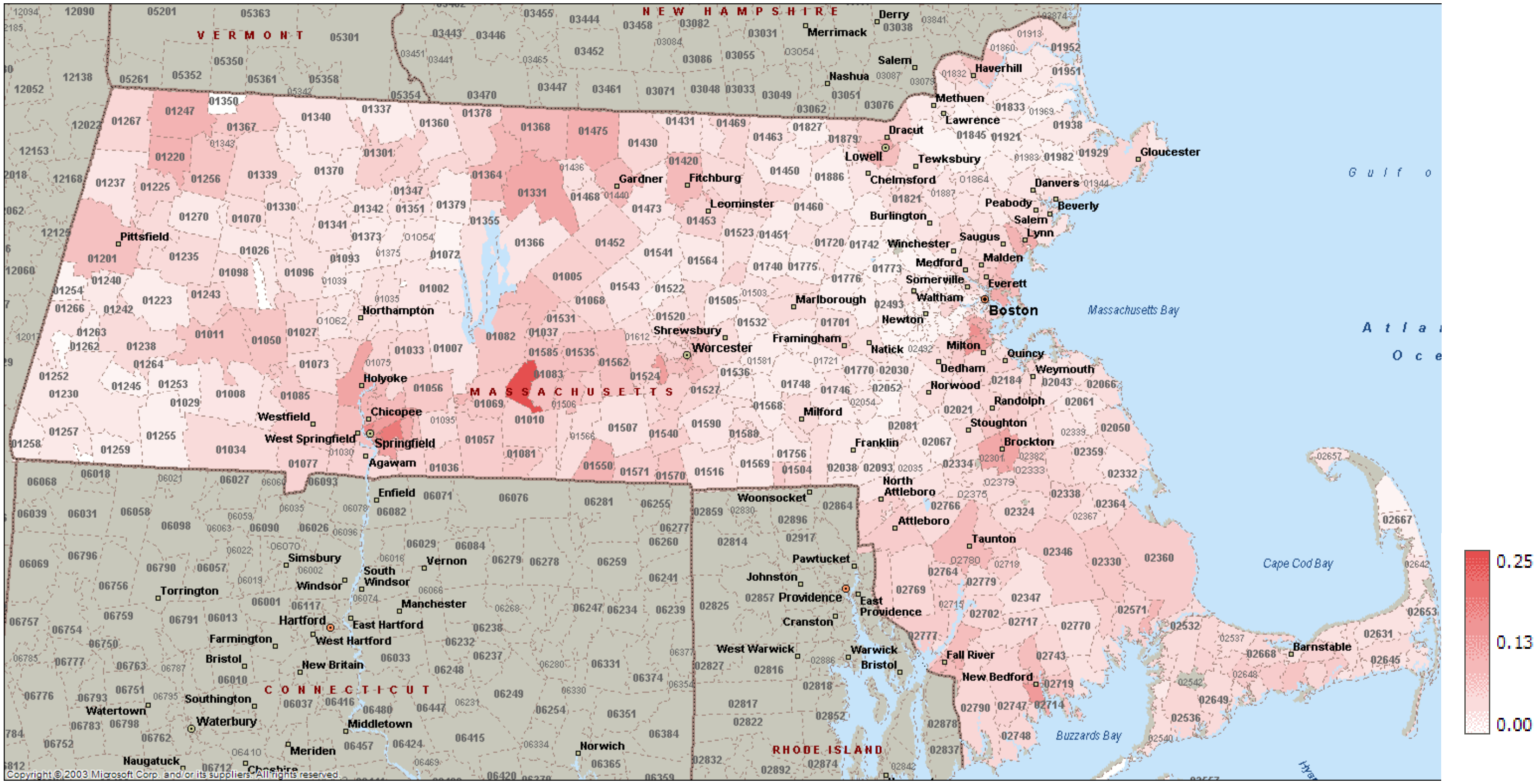

Figure 2: Geographic Distribution of Percentage of Housing Transactions that are Forced Sales by Zip Code

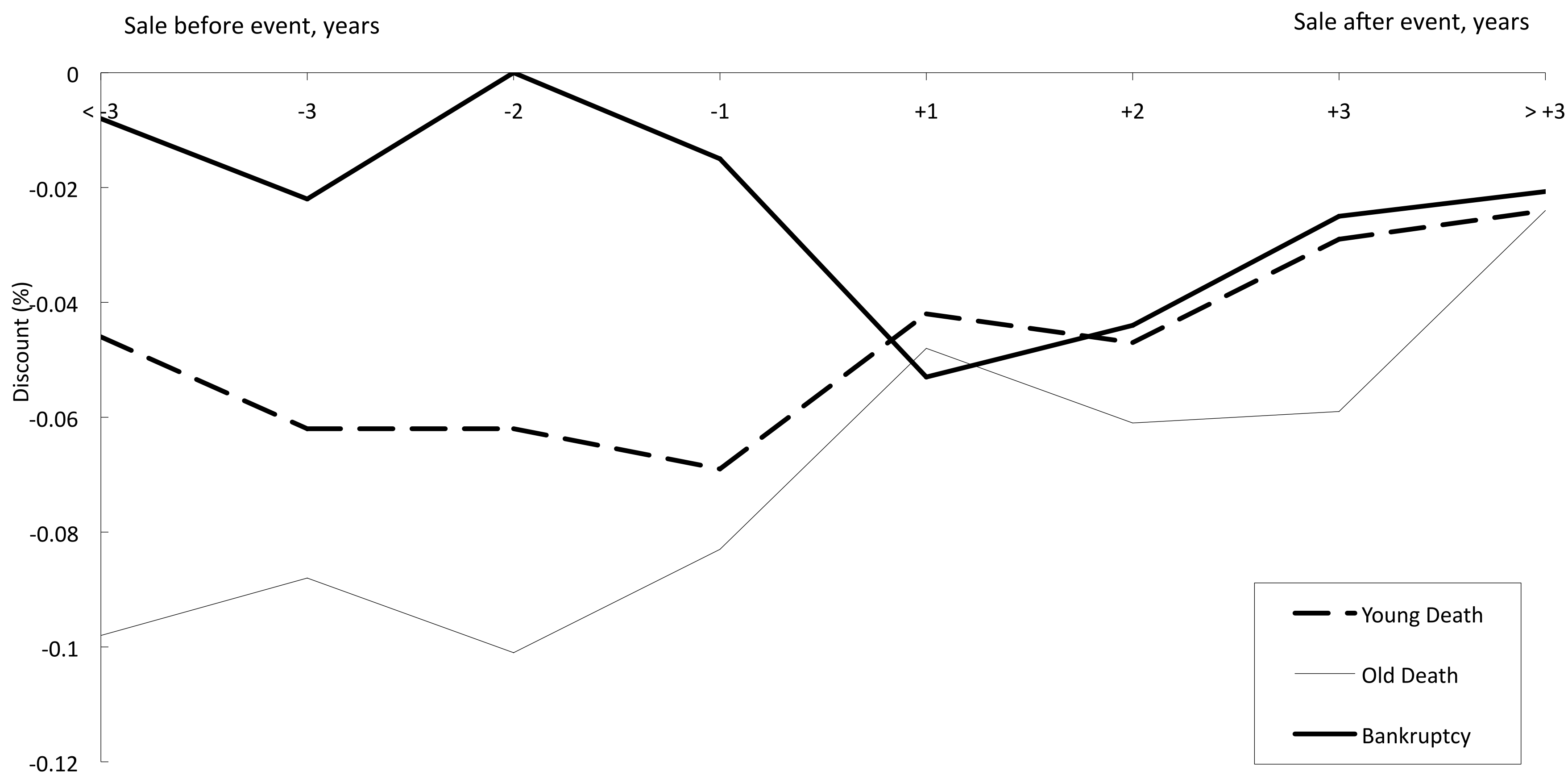

Figure 3: Forced sales discount and time between sale and event