Appendix to Forced Sales and House Prices

This appendix contains four parts:

A. Regression specifications

B. Data appendix

C. Guide to appendix figures and tables

D. Appendix figures and tables

A. Regression specifications

The notation for the regression equations estimated in Table 5 is involved. Space constraints in the main text require us to specify the details in this appendix.

We first describe the specification estimated in column (1) of Table 5 without our adjustments for extreme values. The log price of property i in census tract s in year t is:

$$y_{ist} = \alpha_{st} + \beta' X_i + \lambda' F_i + \delta_{C,B} \cdot g(N_{C,B}, D_{C,B}) + \delta_{F,B} \cdot h(N_{F,B}) + \epsilon_{ist}, \tag{1}$$

where α_{st} are census tract-year effects, X_i are house characteristics, and F_i is a vector of indicators for the property's forced classification (young death, old death, bankruptcy, foreclosure). $N_{C,B}$ is the number of *close* foreclosures, within a 0.1 mile radius of property i, that take place in the year *before* property i is sold and $D_{C,B}$ is a vector with $N_{C,B}$ elements where entry $D_{C,B}(j)$ is the distance between foreclosed property j and property i. The weighting function for close foreclosures is

$$g(N_{C,B}, D_{C,B}) = \sum_{j=1}^{N_{C,B}} [0.1 - D_{C,B}(j)]/0.1. \tag{2}$$

For instance, each foreclosure at distance 0 (as in the case of two properties in a condominium complex) contributes 1 to the value, while a foreclosure at distance 0.1 contributes 0. For *far* foreclosures, the weighting function $h(N_{F,B})$ is the unweighted number of foreclosures in the 0.25 mile radius around property i:

$$h(N_{F,B}) = N_{F,B}. \tag{3}$$

As mentioned in the main text, we allow the impact of close and far foreclosures to differ at the extreme. To do so in a parsimonious way, we estimate a piece-wise linear function, where the slope may differ at 99.0, 99.5, and 99.9. Let $N^{99.0}$ denote the value of the 99th percentile of the count of

foreclosures, $N^{99.5}$ denote the value of the 99.5th percentile, and $N^{99.9}$ denote the value of the 99.9th percentile. To write the equation, first define indicator variables

$$\mathcal{I} = \begin{cases} 1 & \text{if } N < N^{99.0}, \\ 0 & \text{otherwise} \end{cases}$$

$$\mathcal{I}_{99.0} = \begin{cases} 1 & \text{if } N^{99.0} \leq N < N^{99.5}, \\ 0 & \text{otherwise} \end{cases}$$

$$\mathcal{I}_{99.5} = \begin{cases} 1 & \text{if } N^{99.5} < N \leq N^{99.9}, \\ 0 & \text{otherwise} \end{cases}$$

$$\mathcal{I}_{99.9} = \begin{cases} 1 & \text{if } N^{99.9} < N, \\ 0 & \text{otherwise.} \end{cases}$$

Next, define link function

$$\begin{aligned} m(\boldsymbol{\delta}, f, N) = {} & \mathcal{I} \cdot \delta f(N) \\ & + \mathcal{I}_{99.0} \cdot [\delta f(N^{99.0}) + \delta^{99.0}(f(N) - f(N^{99.0}))] \\ & + \mathcal{I}_{99.5} \cdot [\delta f(N^{99.0}) + \delta^{99.0}(f(N^{99.5}) - f(N^{99.0})) + \delta^{99.5}(f(N) - f(N^{99.5}))] \\ & + \mathcal{I}_{99.9} \cdot [\delta f(N^{99.0}) + \delta^{99.0}(f(N^{99.5}) - f(N^{99.0})) + \delta^{99.5}(f(N^{99.9}) - f(N^{99.5})) + \delta^{99.9}(f(N) - f(N^{99.9}))] \end{aligned}$$

where $\boldsymbol{\delta}$ is the four-vector $(\delta, \delta^{99.0}, \delta^{99.5}, \delta^{99.9})$, f is the weighting function, and N is the number of foreclosures. We leave the arguments to f implicit. This link function is defined so that, e.g., the estimate $\delta^{99.0}$ is the incremental impact, relative to the 99.0th percentile, of foreclosures above the 99th percentile of the distribution of the number of foreclosures.

The estimating equation in column (1) of Table 5 is:

$$y_{ist} = \alpha_{st} + \beta' X_i + \lambda' F_i + m(\boldsymbol{\delta_{C,B}}, g, N_{C,B}) + m(\boldsymbol{\delta_{F,B}}, h, N_{F,B}) + \epsilon_{ist},$$

where g is defined in equation (2) and h is defined in equation (3). For close foreclosures before the property transacts, column (1) reports estimates of $\delta_{C,B}, \delta^{99.0}_{C,B}, \delta^{99.5}_{C,B}$, and $\delta^{99.9}_{C,B}$ and for far foreclosures, $\delta_{F,B}, \delta^{99.0}_{F,B}, \delta^{99.5}_{F,B}$, and $\delta^{99.9}_{F,B}$.

Column (2) of Table 5 adds two additional controls, intended to capture price levels within the 0.25 mile radius. Let p_j be the log price of transacted property j within 0.25 miles of property i.

Suppose there are M properties which transact during the year before when property i is sold that are within 0.25 miles. We construct the average price of properties that transact as the linear-distance weighted average price:

$$\bar{p}_{iB} = \frac{\sum_{j=1}^{M} p_j[0.25 - d(j)]}{\sum_{j=1}^{M} 0.25 - d(j)}, \tag{4}$$

where $d(j)$ is the distance between property i and j. If $M = 0$, then there are no transactions within a 0.25 mile radius before property i is sold. Let M_{iB} be an indicator equal to 1 in this case, and 0 otherwise.

The estimating equation in column (2) of Table 5 is:

$$y_{ist} = \alpha_{st} + \beta' X_i + \lambda' F_i + m(\boldsymbol{\delta_{C,B}}, g, N_{C,B}) + m(\boldsymbol{\delta_{F,B}}, h, N_{F,B}) + \gamma_1(1 - M_{iB})\bar{p}_{iB} + \gamma_2 M_{iB} + \epsilon_{ist}, \tag{5}$$

where g is defined in equation (2) and h is defined in equation (3). Column (2) also reports estimates of γ_1 and γ_2.

In column (3) of Table 5, we add terms for weighted and unweighted counts of foreclosures that take place after the property i transacts. For close foreclosures, we use weighting function g as defined in equation (2), and for foreclosures far, we use weighting function h as defined in equation (3). The estimating equation is:

$$\begin{aligned} y_{ist} = \alpha_{st} + \beta' X_i + \lambda' F_i + m(\boldsymbol{\delta_{C,B}}, g, N_{C,B}) + m(\boldsymbol{\delta_{C,A}}, g, N_{C,A}) \\ + m(\boldsymbol{\delta_{F,B}}, h, N_{F,B}) + m(\boldsymbol{\delta_{F,A}}, h, N_{F,A}) + \epsilon_{ist}. \end{aligned}$$

Unlike in column (1) and (2), in column (3) we report estimates of before minus after differences in δ. That is, the first cell in column (3) is $\delta_{F,B} - \delta_{F,A}$, the second cell is $\delta_{C,B} - \delta_{C,A}$, the third cell is $\delta^{99.0}_{F,B} - \delta^{99.0}_{F,A}$, the fourth cell is $\delta^{99.0}_{C,B} - \delta^{99.0}_{C,A}$, and so on.

In column (4) of Table 5, we add controls for average price in a 0.25 mile neighborhood. Following (4), we construct $\bar{p}_{iB}$ and $\bar{p}_{iA}$ as the linear-distance weighted average log price of all transacted properties within 0.25 miles of property i. $\bar{p}_{iB}$ is the average price for properties which transact in the year before property i transacts, while $\bar{p}_{iA}$ is the average price for properties which transact in the year after. Indicators M_{iB} and M_{iA} are defined following the definitions used in (5). The estimating

equation is:

$$\begin{aligned} y_{ist} = \alpha_{st} + \beta' X_i + \lambda' F_i + m(\boldsymbol{\delta_{C,B}}, g, N_{C,B}) + m(\boldsymbol{\delta_{C,A}}, g, N_{C,A}) \\ + m(\boldsymbol{\delta_{F,B}}, h, N_{F,B}) + m(\boldsymbol{\delta_{F,A}}, h, N_{F,A}) \\ + \gamma_1(1 - M_{iB})\bar{p}_{iB} + \gamma_2 M_{iB} + \gamma_3(1 - M_{iA})\bar{p}_{iA} + \gamma_4 M_{iA} + \epsilon_{ist}. \end{aligned}$$

The estimates reported in column (4) parallel those reported in column (3). That is, the first cell in column (4) is $\delta_{F,B} - \delta_{F,A}$, the second cell is $\delta_{C,B} - \delta_{C,A}$, the third cell is $\delta^{99.0}_{F,B} - \delta^{99.0}_{F,A}$, the fourth cell is $\delta^{99.0}_{C,B} - \delta^{99.0}_{C,A}$, and so on. The last four entries of column (4) are estimates of $\gamma_1, \gamma_2, \gamma_3$ and γ_4.

B. Data Appendix

The data appendix discusses the preparation of the housing transactions, death, and bankruptcy datasets. It then describes the procedures to match datasets and identify forced sales.

Housing Transactions dataset

The housing transactions dataset is the residential changes-of-ownership file maintained and sold by the Warren Group. We obtained all records for the state of Massachusetts from 1987 through March 2009. Since this dataset is a changes-of-ownership file, some records are not market transactions. Moreover, since the data are collected from the deeds offices of Massachusetts towns, there are adjusted and changes we made to ensure we capture market transactions.

The modifications to the dataset are:

1. *Intra-family or intra-firm transactions*

   In some cases, a change-of-ownership is recorded between individuals that have the same surname or within the same real estate trust or firm. Since these records are unlikely market transactions, they are excluded from the empirical analysis. Since it is possible that realty trust or firm names do not have a standardized spelling, we only use the first 5 characters to identify intra-firm transactions. For example, CITIGROUP and CITIGRP are considered the same firm.

2. *Duplicate or repeated observations*

   The dataset contains cases where consecutive records of the same property (i.e., sales which are recorded with different IDs and are in consecutive order) have the same buyer or seller. We have identified two main cases:

   – First, it is possible that property is bought by a person and is then sold to the same person plus a second seller, or vice versa. For example, we have the following two consecutive records:

   $$A \text{ sells to } B$$

   $$B \text{ sells to } B \text{ and } C.$$

   In this case, we keep the non intra-family transaction, which is found above in step 1. In the example, the second observation is excluded from the empirical analysis because B appears both as a buyer and as a seller.

– Otherwise, these cases are mainly corrections introduced after a transaction had been written in the original deeds record. For example, consider the price correction:

$$A \text{ sells to } B, \quad \text{for } \$4,000$$

$$A \text{ sells to } B, \quad \text{for } \$40,000.$$

We keep the most recent record in these cases as it contains the most up-to-date information. There are also cases where there is more than one sale of the same house in a given day. In these cases, we keep the record with the highest ID number in the Warren Group dataset. Even though a higher ID is not always associated with a more recent transaction, our discussions with the data provider suggest this is the case most of the time and the two IDs are often consecutive numbers. These corrected records are immediately removed from the dataset, so that they are not treated as consecutive sales.

3. *Multiple sales in the same day*

In some cases, the same property is sold several times in the same day. This can create problems for determining the order of transactions in successive sales of the property. Since the Warren Group ID is not always associated with the most recent transaction, we cannot use that to order the records. Rather, we connect consecutive sales by matching buyers and sellers of different records at the same address. Multiple sales on the same day occur mainly in the following cases:

– The sale happens through an intermediary. In this case, we identify the record which contains the market price. This record is usually the more recent record at that location, but exceptions are possible. The following is an example where the two observations appear out-of-order:

Intermediary sells to B $(*)$

A sells to Intermediary.

Here, we keep observation (*).

– One of the two observations is in fact a correction that was not eliminated in previous steps. This possibility can occur if the correction involved changing the name of the buyer and the seller. For example:

Ax sells to Bx

A sells to B,

where Ax and Bx indicates that the name of the buyer and seller are different than A and B, respectively. In this case, it is impossible to determine the order of the two transactions and difficult to isolate this case from other mistakes in the original deeds record, so we exclude both transactions.

- The two records cannot be connected, either because some intermediate transaction is missing in the deeds record, or because of misspellings or other mistakes in recording the transaction. All of these cases are excluded from the empirical analysis.

Our approach to keep track of these cases and avoid problems in linking the sales for these properties is:

- Whenever we have more than two records on same day and we cannot establish the correct order, we do not use these records in the empirical analysis. However, we do not drop these records at this stage. Instead, one of the records is kept in the dataset, while the others are eliminated from the dataset. The remaining record will act as a placeholder to keep track of the fact that there were some transaction on that day. This record will not be included later in the empirical analysis.
- For the rest of the groups of (two) transactions that happen on the same date, we match buyers and sellers, attempting to establish the right order of sales. Since misspellings are possible both for first names and for institutions and corporations, we match the records using the last name (if it is an individual) or the first 5 letters of the name (if it is an institution).
- If we cannot establish the link in any direction, we proceed as when we have more than two records: one record is kept in the dataset only as a placeholder and the other is dropped.

4. *Group sales*

   In some cases, several properties in the same building are sold at the same time. In these situations, the price reported for each sale may not reflect the market price of each unit, but only an average of the group. We identify these records if they occur on the same day, for the same price, and on the same street and in the same city. These records are removed from the dataset.

5. *Impossible and missing values, outliers*

Some records have missing or clearly implausible values. We eliminate the transactions whose house type we cannot classify, leaving only transactions of single-family, multi-family, and condominium properties. Next, we remove outliers by eliminating extreme observations. In all cases, whenever there are impossible values, the elimination of outliers is performed using percentiles calculated only on the plausible values (i.e., after removing the impossible observations).

The details are as follows:

- Price: removed records up to the 1st percentile and after the 99th.
- Total rooms: impossible if 0, 1, or less than the sum of bathrooms and bedrooms. Winsorize at the 99th percentile.
- Bedrooms: impossible if 0. Winsorize at the 99th percentile.
- Bathrooms (full and half): impossible if not at least 0.5 bathrooms. Winsorize at the 99th percentile.
- Lot size: impossible if 0 and the house is not a condominium. Winsorize at 99th percentile.
- Interior square feet: impossible if 0. Winsorize at 1st and 99th percentile.
- Gross building area: impossible if 0. Winsorize at 1st and 99th percentile.
- Percentage of common area owned: impossible if ¿100%
- House age: impossible if less than 0 (0=new construction)

6. *Foreclosure attribution*

When a foreclosure occurs, the property is auctioned and the outcome of the auction is recorded in the changes-of-ownership file. When the auction is successful, it is either won by an individual or firms and is marked in the deed record. These cases are identified when at least one of the buyers is a person or a realty trust, plus cases where the buyer is financing the purchase with a mortgage. This transaction is considered a forced sale, which occurs 0 days from the date of the foreclosure.

When the auction is unsuccessful, the lender obtains the ownership of the property. This transfer of ownership is recorded in the dataset, but the recorded price is not necessarily a market price. We consider the subsequent sale of the property as the forced sale. The record for the unsuccessful auction is removed from the dataset.

We also measure the time between the foreclosure auction date and the date the property is sold. As before, there is a potential for same-day records. Our approach for these cases is:

– Whenever a sale that is identified in the original dataset as an unsuccessful auction is followed by a group of sales in the same day, we proceed as follows.

  If we can identify the order of sales, the last same-day sale is identified as the forced sale. The first one will be eliminated later (we exclude the transactions where the lender acquires the property and, as described above, we exclude the first of two same-day observations). The following example of this case, where [X] indicates records excluded from the empirical analysis and [FD] indicates the forced sale, which is included:

  A sells to B, May 1, Foreclosure (unsuccessful auction) [X]
  B sells to C, May 23 (1st obs) [X]
  C sells to D, May 23 (2nd obs) [FD]

  If we cannot identify the order of sales, we do not consider any record to be a forced sale. This situation is in the following example:

  A sells to B, May 1, Foreclosure (unsuccesful auction) [X]
  B sells to C, May 23 (? obs) [X]
  D sells to E, May 23 (? obs) [X]

– When a sale is identified in the original dataset as an unsuccessful foreclosure auction and is within a group of same-day sales which can be ordered, we proceed by identifying the next record as the forced sale. For instance, if the first sale is a foreclosure, then the second same-day sale is considered a forced sale for our analysis and the first of these records is dropped. If the second sale is identified as a foreclosure, then the next record (which happens on the following date) is the forced sale, and both records in the same day are dropped: the first one because it was the first in a two-sale day and the second one because it was the transmission of property to the lender.

  The most common example of this case is of the form:

  B sells to C, May 23 (1st obs), Foreclosure (unsucc.) [X]
  C sells to D, May 23 (2nd obs) [FD]
  D sells to E, June 4

  Another example is the following:

  B sells to C, May 23 (1st obs) [X]
  C sells to D, May 23 (2nd obs), Foreclosure (unsucc.) [X]
  D sells to E, June 4 [FD]

– Whenever a sale is identified in the original dataset as a foreclosure and is within a group of same-day sales which *cannot* be ordered, none of the records are identified as forced sales. The reason for this conservative approach is that we do not know if the forced sale is the next record for that property or another record on the same date. An example of this case is:

B sells to C, May 23 (? obs), Foreclosure (unsucc.) [X]
F sells to M, May 23 (? obs) [X]
D sells to E, June 4

If two consecutive records are identified as foreclosures but are both unsuccessful, the subsequent transaction is considered forced. An example of this case is:

A sells to B, Foreclosure (unsucc.) [X]
B sells to C, Foreclosure (unsucc.) [X]
C sells to D [FD]

All records in which the property is transferred to the lender are excluded from the price regressions, since the price recorded does not correspond to a market price.

Bankruptcy Dataset

We assembled the bankruptcy dataset using information from Lexis/Nexis's database of Incorporation, Bankruptcy and Liens (Menu Item *WSP606*), which begins in Massachusetts in 1993. We use only Chapter 7, 11, 13 bankruptcies and open/re-open filing records. Each bankruptcy record has the name and address of the petitioner and three dates: the filing date, the day of the first meeting, and the date of dismissal of the case.

There are sometimes corrections to the bankruptcy record. This can happy if there are different records corresponding to the same bankruptcy, but where some of the listed information is different, such as the spelling of the name of the street. These instances are difficult to distinguish from the case where a person or a corporation files for bankruptcy twice. For instance, in such a case, the person or corporation files a first time and then withdraws the petition. Since we are interested in knowing whether a certain sale is associated with bankruptcy, we keep all corrections. For our matching to the house transactions database (described below), we chose the bankruptcy record that is closest in time to the sale.

Death Dataset

The death dataset comes from the Social Security Administrations Death Master File, created from 65 million records on social security payments. The dataset has the following information on each decedent, if the data are available to the Social Security Administration: social security number, name, date of birth, date of death, state or country of residence (2/88 and prior), ZIP code of last residence, and ZIP code of lump sum payment.

The only modification we make to this file, prior to matching, is to handle erroneous dates and ages. We substitute "15th" instead of "00" in the day of the death date, when only month and year are reported, and we substitute the closest valid day/month pair for impossible combinations, e.g. the month-day combination of 01/32 becomes 01/31. Records where the reported age at death is negative or more than 120 years are eliminated.

Matching the Datasets

To construct the dataset of forced sales, we match the housing transactions dataset to the bankruptcy and death datasets using the names of sellers and the date of sale. We first describe the principles we employ for the matching, and then present a simplified example of the matching process. Since it is possible that there are multiple owners of the property, if one of the matched sellers is involved in a bankruptcy or death, the record is considered to be a forced sale.

The matching is performed in two steps. In the first step, we match the datasets (one at a time) based on zip code, last name, and first name. In the second step, we adapt the procedure to handle the possibility of multiple matches.

1) First step

   We match to the transactions database based on zip code, last name, and first name. We only match a transaction with a death or a bankruptcy when the zip code of the house sold is the same as the zip code reported in the address of the bankruptcy file or the death file, and similarly for first and last name. Note that if one of the records only has a first name initial while the other record has the full first name, it is not considered a valid match. Also single letter first name matches are not valid.

   To distinguish between true two-letter names from names that appear to have two letters because only the initials of the first and middle name were recorded in the first name field (e.g. John Adam Smith recorded as Smith, JA), we use the following rule:

   – If the two-letter name is followed by a middle name, we consider the first name as such.

– If instead there is no middle name, we consider it as initials.

2) Second step: multiple matches

The matching procedure allows many-to-many matches: the same zip code-last name-first name combination could appear twice in both datasets. For example, if both sellers of a house file for bankruptcy (so, the house is matched twice, once for the first seller, once for the second seller) or any of the sellers goes bankrupt more than once, this would generate multiple matches. Once we have all the matches from step 1, for each original record in the changes-of-ownership file that was matched at least once we select from the multiple matches according to the following criteria:

– We first check if any of those matches also matches the middle name initial. If so, these ones are used as matches and the others are discarded. If there is no match where middle initial coincides we keep the matches and proceed to the next step.

– If there are several matches with the same middle initial, or several matches with no middle initial matching, we select among these by keeping the event closest in time to the sale.

We first apply our procedure to match the housing and bankruptcy dataset. The matched dataset is denoted as the H+B dataset. At this point, each record ID for which we found at least one match in the bankruptcy file is associated with one of the bankruptcy filings selected among the matches as described above.

Next, we repeat the matching algorithm to merge the housing and death dataset. Each observation in the H+B dataset (which is uniquely identified by the sale ID and has already a label for bankruptcies) is compared against the matches between the housing and death dataset. At this stage, multiple matches are possible. For example, if two people with the same name happen to die in the same zip code in different times, they could be matched to the same property record. To choose among these, we employ the procedure for multiple matches described above.

At the end of this procedure, each sale in the original dataset is either matched with a bankruptcy, or a death, or not matched with any, or possibly matched with both at the same time. The latter case will be tackled in the section on classification of forced sales below.

Classification of Forced Sales

For each transaction in the housing dataset, we create dummy variables for the type of forced sale (foreclosure, death, bankruptcy) and also code the time between the forcing event and the sale (sale

date – forcing event date). If a record is matched with more than one forcing event, the rules we use are:

- If the forcing event is a foreclosure, it prevails over deaths and bankruptcies. We do this since foreclosures are not subject to additional matching issues due to the name and zip code match, as foreclosure deeds are recorded directly in the original changes-of-ownership file.
- Otherwise, if we have both death and bankruptcy, we assign the record to death or bankruptcy according to the priority:
  - middle name initial match, if available
  - closest date to the sale.

  Also, in case a death comes before a bankruptcy, we do not classify the bankruptcy as a forced sale on the grounds that it may be a spurious match.

  remove the forced sale label, as it is likely a spurious match.

Matching of census data

The matched transactions and forced sale dataset is then merged with census information from the 2000 decennial census, where properties are geocoded in ArcGIS based on the street address using Census 2000 TIGER/Line data and Streetmaps USA. About 20,000 observations are not matched and these records are removed from the dataset.

Information on previous sales

To link consecutive transactions we order the sales by date and check whether the preceding record is coded as a forced sale. If we identified the preceding sale as one by a lender following a foreclosure, or as a successful auction, the previous sale is forced. If, instead, the previous sale was matched with a death or a bankruptcy, we identify it as a forced sale only if the sale happened within a (-3 years ; +3 years) window. We also measure the time between sales, and the previous price. In some cases, the previous price is 0, and we do not consider this transaction valid, so we do not include its information in the next sale.

To ensure that we link only market transactions, we eliminate same-day transactions that happen through an intermediary (keeping only the last one) and the transactions where a lender becomes the owner of the foreclosed property. We also eliminate intra-family transactions. Finally, we do not link a transaction with a previous sale if the latter was part of a group of same-day sales that we could not order.

List of control variables

The following table shows the complete list of control variables. The table reports whether the variable is categorical and whether it was cleaned or winsorized in some way. Whenever the variable is categorical, we create a special category for "missing." If variables are missing in some records, the record is kept in the empirical analysis, the missing value is set to 0 and a missing dummy indicator for that variable is set to 1. If a variable is winsorized, a winsorization dummy for that variable is set to 1.

	Variable type	Winsorized	Comments
Bedrooms		Winsorize, 99%	
Full bathrooms		Winsorize, 99%	
Half bathrooms		Winsorize, 99%	
Total rooms		Winsorize, 99%	
Lot size (0 for condos)		Winsorize, 99%	
Interior square feet		Winsorize, 1% and 99%	
Gross area of the unit		Winsorize, 1% and 99%	
House age (with square)			
Condominium	dummy		
Amenities	categorical		More than one amenity possible simultaneously
Percentage of common area owned			
Renovation	categorical		4 dummies created: renovation less than 10 yrs before; 10 to 20; 20 to 30; more than 30 years before
Floor number	categorical		
Number of fireplaces			
Number of parking spots			
Style of the building	categorical		
Condition of the unit	categorical		
Type of construction	categorical		
Type of external covering	categorical		
Type of roof	categorical		
Material of roof	categorical		
Type of parking	categorical		
Type of heating	categorical		
Fuel used for heating	categorical		
Month	categorical		
Census tract-year interactions			

C. Guide to appendix figures and tables

- *Figure A.1 - Geographic Distribution of Housing Transactions by Zip Code*

  This figure shows the number of housing transactions in each zip code.

- *Table A.1 - Descriptive Statistics*

  This table reports descriptive housing and neighborhood characteristics of all transactions in the dataset. The neighborhood characteristics are from the 2000 decennial census file for all sales.

- *Table A.2 - Other Characteristics of Forced Sales*

  This table reports other descriptive statistics for forced sales, including the fraction for each property type, the fraction located in Boston, the fraction of foreclosure sales that are also death and bankruptcy-related, the fraction of bankruptcy-related sales that are also death-related, and the fraction of death-related sales that are also bankruptcy-related. The Data Appendix describes the tie-breaking criteria when a sale can be classified under more than one forcing category.

- *Table A.3 - Descriptive Statistics for Forced Sales*

  This table reports housing and neighborhood characteristics for the transactions identified as forced. Panel A reports the distribution of characteristics, while Panel B presents the ratio of the summary statistic of the characteristic in Panel A to the corresponding characteristic in Table A.1. For instance, the mean nominal price of a house in our sample is $123,500 and this is 0.69 times the mean of the corresponding characteristic in the overall dataset.

- *Table A.4 - Covariate Balance Between Forced and Unforced Sales*

  This table reports regression estimates of house characteristics on the various forced indicators, including the census tract-year controls. The regression estimates indicate that forced sales tend to have between 0.10 and 0.19 more rooms than unforced sales, tend to be on smaller lots, and tend to be older. To make a comparison between all characteristics in a parsimonious manner, we also predict the log house price using our main hedonic regression model, equation (1) in the main text, and then we regress this predicted price on the four forced indicators. This is reported in column (8) of Table A.4. We find that sales that are forced by old deaths and foreclosures tend to affect houses whose characteristics would normally make them slightly cheaper than average by about 2% and 4%, respectively.

- *Table A.5 - Hedonic Regression Coefficients*

This table reports the regression coefficients for a subset of the control variables in the hedonic regression reported in Panel B of Table 2.

- *Table A.6 - Forced Sales Discount by Year*

  This table reports estimates of the forced sale discount, for all forced sales and for four specific types of forced sales, where we allow the coefficient of the discount to vary by year.

- *Table A.7 - Forced Sales Coefficients, Single family vs. Multi family vs. Condominium*

  This table reports estimates of the forced sale discount, for four specific types of forced sales, where we allow the coefficient of the discount to vary with the amount of time between the forcing event and the transaction.

- *Table A.8 - Forced Sales Coefficients, by Time Subperiods*

  This table reports estimates of the forced sale discount, for four specific types of forced sales, where we allow the coefficient of the discount to vary the amount of time between the forcing event and the transaction, and the sample is split between the two foreclosure waves in Massachusetts: 1987-1996 and 1997-2009.

- *Table A.9 - Forced Sales Coefficients, Eastern vs. Western Massachusetts*

  This table reports estimates of the forced sale discount, for four specific types of forced sales, where we allow the coefficient of the discount to vary with the amount of time between the forcing event and the transaction, and the sample is split between Eastern and Western Massachusetts. Western Massachusetts includes all transactions in Worcester, Hampden, Hampshire, Franklin, and Berkshire counties, while Eastern Massachusetts includes the remaining counties.

- *Table A.10 - Estimates from Models with Previous Sale Price and Interactions with Forced Indicators*

  This table reports estimates of the forced sale discount where we include controls for the previous sale price. 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. The table shows that previous sales prices do have a persistent effect, which is 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.

- *Table A.11 - Neighborhood Summary Statistics*

  This table reports descriptive statistics on the zipcode-year level dataset used for the analysis in Section 4.1 of the text.

- *Table A.12 - Spillover Estimates of Foreclosures, Alternative Definition of Foreclosure*

  This table reports estimates of the spillover effect of foreclosures considering only the subset of foreclosures where the property continues to be owned by the lender at the time the neighboring house is sold. This table reveals that the main estimated spillover is larger for these cases than when we include foreclosures that have already been sold by the lender. We view this as supporting a causal interpretation of our spillover estimate as the channels that are typically discussed for spillovers to operate (vacant houses, vandalism, etc.) are likely stronger when a house is owned by a lender rather than a new occupant.

- *Table A.13 - Spillover Estimates of Foreclosures, by Time Period*

  This table reports estimates of the spillover effect where we split the dataset by the first foreclosure wave (1987-1996) and the second wave (1997-2009). We find precisely estimated spillovers during both waves, but the estimate is larger in the earlier wave.

- *Table A.14 - Spillover Estimates, Eastern vs. Western Massachusetts*

  This table reports estimates of the spillover effect where we split the dataset into two regions of the state. Western Massachusetts includes all transactions in Worcester, Hampden, Hampshire, Franklin, and Berkshire counties, while Eastern Massachusetts includes the remaining counties. We find precise estimates for both parts of the state, with a larger Eastern Massachusetts effect. The estimates at the 99.0th percentile are of comparable magnitudes, however.

- *Table A.15 - Spillover Estimates, Various Definitions for Far and Close*

  This table reports estimates of the spillover effect under three definitions of close/far: 0.25/0.10, 0.10/0.05 and 0.05/0.01 miles. Each definition generates a precisely estimated spillover. This result reassures us that we are not simply estimating a common shock as it seems unlikely that such a shock is likely to operate at a geography smaller than a 0.05 mile radius around a foreclosure.

- *Table A.16 - Spillover Estimates, Alternate Definitions for Before and After*

  This table reports estimates of the spillover effect where we alter the definition of the time window before and after. We consider three alternatives for before/after: 12 months, 9 months and 6 months. Each of these definitions generates the main effect of a foreclosure which is precisely estimated and within the ballpark of 1% effect from the 12 month estimate that we report in the main text.

- *Table A.17 - Estimates of Spillover Effects, Alternative Weighting Functions for Far and Close*

  This table reports estimates of spillover effects varying the parametric specification for multiple foreclosures. We investigate 5 alternatives weighting schemes which are various permutations of linearly distance-weighted, exponentially distance-weighted, and unweighted for *close* and linearly distance-weighted and unweighted for *far*. Each approach yields a precise estimate of a spillover within the ballpark of the 1% estimate we focus on in the main text.

- *Table A.18 - Estimates Using only Previous Foreclosures within the Last Two Years*

  This table reports specifications paralleling Column (1) of Table 5 where we only count foreclosures prior to the sale. The first column reports Column (1) of Table 5. The second column reports estimates from the specification in Column (1) of Table 5 where only foreclosures that occurred 12-24 months before the house transaction are counted. The third column reports estimates with separate controls for foreclosures 12-24 months before and 0-12 months before. The last column of the table reports the same estimates with additional controls for the average prices within the previous 24 months following Column (2) of Table 5. We find that there there is a significant effect of foreclosures that happened between one and two years before a house is sold, an effect that is present even when we include controls for average house prices within the 0.25 mile neighborhood. 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.

- *Table A.19 - Spillover Estimates by Housing Type and Interactions with Value Components*

  This table estimates spillovers separately by housing type in the top panel and interactions with value components in the bottom panel. The largest estimated spillover is for condominiums. In

the overall sample, there is also evidence that properties that are located in worse neighborhoods experience a larger spillover.

- *Table A.20 - Spillover Estimates of Deaths and Bankruptcies*

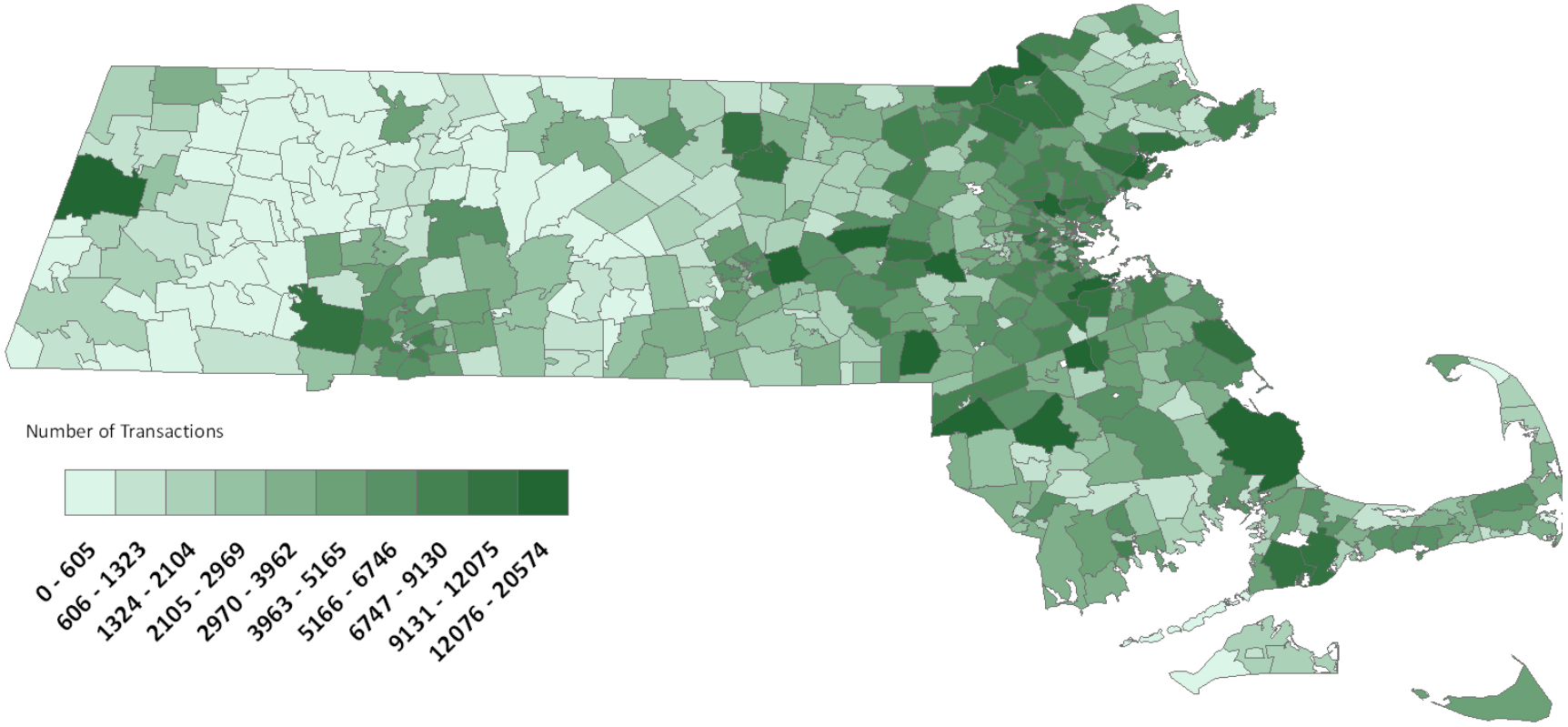
  This table reports estimates of the spillover effects of deaths and bankruptcies, paralleling Table 5.

- *Table A.21 - Spillover Estimates of Unforced Sales*

  This table reports estimates of the spillover effects of unforced sales, paralleling Table 5.

- *Table A.22 - Estimates of Forced Sale Discount Interacted with Neighborhood Foreclosures*

  This table reports estimates of the forced sale discount where the forced indicator is interacted with the measures of local foreclosures prior to the sale in Table 5. The estimates of how more foreclosures affect the forced sale discount for bankruptcies and deaths are imprecise. For foreclosures, 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, consistent with our zipcode-level finding in Table 4, but foreclosures within 0.1 mile tend to reduce that discount.



Appendix Figure 1: Geographic Distribution of Housing Transactions by Zip Code

Table A.1 - Descriptive Statistics

	Min	Max	Mean	Stdev	1%	25%	50%	75%	99%
Panel A: Housing characteristics									
Price ($1000)	6.53	1,768.50	229.39	172.28	24.90	119.00	180.00	294.95	877.40
Total rooms	2	16	6.80	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	0.52	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 B: 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	0.58
% 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. Details for creating the sample in the Data Appendix. Panel A reports values per sale, while Panel B reports tract-level characteristics from the 2000 decennial census for each sale.

Table A.2 - Other Characteristics of Forced Sales

	% total observations	Property type (% of forced sale type)				% of each type also:	
		Single family	Multi family	Condominium	% in Boston	Death	Bankruptcy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
All observations	100.0%	64.8%	11.0%	24.1%	8.0%		
Unforced	93.9%	65.0%	10.4%	24.6%	7.9%		
Forced	6.1%	62.3%	20.4%	17.4%	9.5%		
Death	1.8%	76.6%	14.2%	9.2%	5.3%		0.7%
Bankruptcy	0.8%	71.4%	15.2%	13.4%	5.4%	1.2%	
Foreclosure	3.5%	52.9%	24.7%	22.4%	12.5%	0.4%	2.8%

Notes: 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 the City of 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 A.3 - Descriptive Statistics for Forced Sales

Panel A: Characteristics of forced sales

	Min	Max	Mean	Stdev	1%	25%	50%	75%	99%
				I. Housing characteristics					
Price ($1000)	7.15	1,700.00	157.89	128.77	15.00	72.00	123.50	209.00	610.00
Total rooms	2	16	7.23	3.07	3	5	6	8	16
Full bathrooms	0	4	1.60	0.73	1	1	1	2	4
Half bathrooms	0	2	0.33	0.50	0	0	0	1	2
Bedrooms	1	9	3.40	1.58	1	2	3	4	9
Lotsize	0	261,360	16,452	30,984	0	3,910	7,500	15,952	183,823
Interior Square Feet	510	4,625	1,721	848	525	1,096	1,489	2,141	4,364
House age	0	341	60.31	40.66	1	55	92	108	341
				II. Neighborhood characteristics					
Median Income	7,271	200,001	50,397	19,731	15,268	36,964	48,000	60,809	115,456
% Hispanic	0.00	0.96	0.07	0.12	0.00	0.01	0.02	0.08	0.62
% Black	0.00	0.95	0.07	0.15	0.00	0.01	0.02	0.06	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	0.10	0.29
% with Bachelor's degree	0.00	0.73	0.17	0.09	0.01	0.10	0.15	0.23	0.42
% with graduate degree	0.00	0.72	0.10	0.09	0.00	0.04	0.08	0.13	0.44
% with less than high school degree	0.00	0.83	0.17	0.13	0.01	0.08	0.14	0.24	0.56

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

	Min	Max	Mean	Stdev	1%	25%	50%	75%	99%
				I. Ratio of housing characteristics of forced sales to all sales					
Price ($1000)	1.10	0.96	0.69	0.75	0.60	0.61	0.69	0.71	0.70
Total rooms	1.00	1.00	1.06	1.20	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	0.75	0.95	-	-	-	1.00	1.00
Bedrooms	1.00	1.00	1.08	1.20	1.00	1.00	1.00	1.00	1.13
Lotsize	-	1.00	0.79	0.85	-	1.36	0.79	0.72	0.80
Interior Square Feet	1.00	1.00	1.00	1.03	1.03	0.98	0.97	1.00	0.99
House age	-	0.96	1.25	0.96	-	3.93	2.42	1.38	1.85
				II. Ratio of neighborhood characteristics of forced sales to all sales					
Median Income	2.91	1.00	0.85	0.84	0.91	0.85	0.86	0.87	0.88
% Hispanic	-	0.96	1.56	1.31	1.08	1.16	1.41	2.04	1.26
% Black	-	1.00	1.75	1.54	-	1.33	1.46	1.78	1.43
% 0-17 years old	-	1.00	1.04	0.94	1.22	1.06	1.02	1.02	1.06
% 65+ years old	-	1.00	0.99	0.98	1.06	0.98	0.98	0.99	0.96
% Female-headed HH	-	1.00	1.35	1.33	1.60	1.20	1.28	1.43	1.14
% with Bachelor's degree	-	1.00	0.80	0.95	0.52	0.73	0.75	0.81	0.93
% with graduate degree	-	1.00	0.70	0.77	-	0.67	0.67	0.68	0.84
% with less than high school degree	-	0.83	1.35	1.18	-	1.43	1.44	1.39	1.12

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

Table A.4 - Covariate Balance Between Forced and Unforced Sales

	Number of rooms (1)	Number of full bathrooms (2)	Number of half bathrooms (3)	Number of bedrooms (4)	Lot size (x 10000) (5)	Interior square feet (x10000) (6)	House age (x10) (7)	Predicted log price (8)
Young death	0.189	-0.012	-0.031	0.107	-0.046	-0.001	0.523	-0.009
	(0.039)	(0.009)	(0.007)	(0.018)	(0.034)	(0.001)	(0.044)	(0.003)
Old death	0.104	-0.069	-0.062	0.017	0.028	-0.004	0.792	-0.022
	(0.017)	(0.004)	(0.003)	(0.008)	(0.016)	(0.000)	(0.022)	(0.002)
Bankruptcy	0.177	0.009	-0.014	0.136	-0.031	0.001	0.204	0.005
	(0.025)	(0.006)	(0.004)	(0.012)	(0.023)	(0.001)	(0.029)	(0.002)
Foreclosure	0.165	0.031	-0.047	0.115	-0.193	0.001	0.508	-0.044
	(0.019)	(0.004)	(0.002)	(0.009)	(0.013)	(0.000)	(0.018)	(0.002)
Median	6	2	0	3	0.945	0.153	3.8	12.1
Std	2.55715	0.70642	0.52498	1.31017	3.649	0.082	4.2	0.6
R-squared	0.334	0.163	0.160	0.285	0.383	0.560	0.440	0.818

Notes: table reports the estimates and standard errors, in parenthesis, from regressions of the variable indicated in each column on an indicator for each type of forced sale. The regression includes census tract-year controls and standard errors are clustered by tract-year. The predicted price in Column (8) is the estimated price using the model with all covariates together with tract-year fixed effects, but without the forced indicators. The number of observations is 1,831,393.

Table A.5 - Hedonic Regression Coefficients

	Estimate	Std Err
	(1)	(2)
Lot size (x10,000)	0.001	(0.000)
Bedrooms	0.021	(0.001)
Total number of rooms	0.015	(0.001)
Full Bathrooms	0.099	(0.001)
Half Bathrooms	0.095	(0.001)
Interior Square Feet (x10,000)	0.819	(0.018)
House Age (x10)	-0.014	(0.001)
House Age Squared	0.000	(0.000)
Condominium	-0.181	(0.007)
High number of Rooms Indicator	-0.081	(0.005)
High number of Bedrooms Indicator	-0.070	(0.005)
High number of Full Bathrooms Indicator	-0.087	(0.004)
High number of Half Bathrooms Indicator	-0.084	(0.003)
High square feet Indicator	-0.030	(0.007)
Low square feet Indicator	-0.210	(0.012)
Renovated in the last 10 years	0.064	(0.005)
Renovated 10 to 20 years before	0.019	(0.005)
Renovated 20 to 30 years before	0.017	(0.006)
Renovated more than 30 years before	0.028	(0.007)
Observations	1,831,393	
R-squared	0.724	

Notes: table reports the estimates and standard errors, in parenthesis, of a regression of log house price on house characteristics and forced sale indicators as in Table 2.B. The regression includes census tract -year fixed effects. Standard errors are clustered by tract-year.

Table A.6 - Forced Sales Discount by Year

	All forced sales		*Young death*		*Old death*		*Bankruptcy*		*Foreclosure*	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1987	-0.094	(0.017)	-0.071	(0.037)	-0.101	(0.018)	-	-	-	-
1988	-0.090	(0.017)	-0.037	(0.031)	-0.099	(0.020)	-	-	-0.187	(0.082)
1989	-0.065	(0.015)	-0.016	(0.036)	-0.067	(0.018)	-	-	-0.093	(0.031)
1990	-0.077	(0.013)	-0.045	(0.054)	-0.052	(0.022)	0.002	(0.062)	-0.102	(0.017)
1991	-0.193	(0.010)	-0.010	(0.040)	-0.062	(0.019)	-0.095	(0.081)	-0.226	(0.011)
1992	-0.240	(0.009)	-0.028	(0.035)	-0.044	(0.017)	-0.053	(0.057)	-0.278	(0.010)
1993	-0.278	(0.009)	-0.017	(0.029)	-0.048	(0.016)	-0.059	(0.043)	-0.332	(0.010)
1994	-0.302	(0.009)	-0.042	(0.027)	-0.076	(0.013)	-0.058	(0.022)	-0.372	(0.010)
1995	-0.270	(0.007)	-0.063	(0.027)	-0.061	(0.013)	-0.022	(0.020)	-0.353	(0.009)
1996	-0.251	(0.007)	-0.058	(0.027)	-0.069	(0.012)	-0.024	(0.015)	-0.353	(0.009)
1997	-0.209	(0.007)	-0.048	(0.029)	-0.071	(0.012)	-0.020	(0.015)	-0.308	(0.009)
1998	-0.196	(0.007)	-0.036	(0.023)	-0.072	(0.011)	-0.021	(0.011)	-0.336	(0.010)
1999	-0.163	(0.007)	-0.036	(0.021)	-0.072	(0.010)	-0.019	(0.012)	-0.316	(0.011)
2000	-0.151	(0.009)	-0.059	(0.021)	-0.081	(0.010)	-0.026	(0.013)	-0.311	(0.014)
2001	-0.120	(0.007)	-0.078	(0.027)	-0.053	(0.009)	-0.021	(0.009)	-0.292	(0.012)
2002	-0.113	(0.007)	-0.047	(0.018)	-0.062	(0.009)	-0.033	(0.009)	-0.298	(0.015)
2003	-0.093	(0.006)	-0.065	(0.018)	-0.067	(0.008)	-0.050	(0.008)	-0.262	(0.015)
2004	-0.094	(0.006)	-0.056	(0.016)	-0.064	(0.008)	-0.055	(0.008)	-0.288	(0.016)
2005	-0.089	(0.005)	-0.044	(0.014)	-0.064	(0.007)	-0.059	(0.008)	-0.226	(0.011)
2006	-0.110	(0.005)	-0.073	(0.017)	-0.066	(0.007)	-0.026	(0.008)	-0.240	(0.010)
2007	-0.180	(0.005)	-0.096	(0.018)	-0.075	(0.008)	-0.014	(0.010)	-0.255	(0.006)
2008	-0.301	(0.007)	-0.088	(0.021)	-0.099	(0.010)	-0.050	(0.016)	-0.349	(0.007)
2009	-0.317	(0.012)	-0.137	(0.065)	-0.057	(0.038)	0.017	(0.054)	-0.354	(0.012)

Notes: table reports estimates and standard errors, in parenthesis, of hedonic regressions on forced sale indicators interacted with the year of transaction. The first column is interacts the forced indicator with the sale year, following the specification in Table 2 Panel A, while the remaining columns report estimates with the four forced indicators interacted with sale year. Standard errors are clustered by tract-year.

Table A.7 - Forced Sale Coefficients, Single family vs. Multi family vs. Condominium

	Single Family	Multi Family	Condominium	Full sample
	(1)	(2)	(3)	(4)
Death, young seller (<70 years old)				
Sale more than 3 yrs before death	-0.056	-0.006	-0.003	-0.048
	(0.007)	(0.018)	(0.013)	(0.006)
Sale 3 yrs before death	-0.090	-0.050	-0.011	-0.069
	(0.021)	(0.038)	(0.039)	(0.017)
Sale 2 yrs before death	-0.068	-0.035	-0.008	-0.063
	(0.015)	(0.033)	(0.031)	(0.013)
Sale 1 yr before death	-0.101	-0.004	-0.001	-0.074
	(0.014)	(0.032)	(0.030)	(0.012)
Sale 1 yr after death	-0.043	-0.097	-0.012	-0.042
	(0.009)	(0.032)	(0.017)	(0.008)
Sale 2 yrs after death	-0.080	0.050	-0.026	-0.048
	(0.014)	(0.028)	(0.029)	(0.012)
Sale 3 yrs after death	-0.035	-0.032	-0.027	-0.033
	(0.022)	(0.051)	(0.036)	(0.018)
Sale more than 3 yrs after death	-0.026	-0.027	-0.002	-0.023
	(0.005)	(0.010)	(0.010)	(0.004)
Death, old seller (>70 years old)				
Sale more than 3 yrs before death	-0.109	-0.076	-0.008	-0.099
	(0.004)	(0.009)	(0.009)	(0.003)
Sale 3 yrs before death	-0.117	-0.041	0.008	-0.092
	(0.009)	(0.018)	(0.017)	(0.008)
Sale 2 yrs before death	-0.117	-0.097	-0.024	-0.101
	(0.008)	(0.019)	(0.016)	(0.007)
Sale 1 yr before death	-0.104	-0.076	-0.020	-0.086
	(0.006)	(0.014)	(0.016)	(0.005)
Sale 1 yr after death	-0.063	-0.035	-0.027	-0.049
	(0.004)	(0.012)	(0.010)	(0.004)
Sale 2 yrs after death	-0.067	-0.067	-0.025	-0.058
	(0.006)	(0.019)	(0.016)	(0.005)
Sale 3 yrs after death	-0.060	-0.099	0.017	-0.057
	(0.010)	(0.025)	(0.019)	(0.009)
Sale more than 3 yrs after death	-0.035	-0.011	-0.001	-0.026
	(0.003)	(0.007)	(0.007)	(0.003)
Bankruptcy				
Sale more than 3 yrs before bankruptcy	-0.009	0.011	-0.001	-0.009
	(0.006)	(0.014)	(0.010)	(0.005)
Sale 3 yrs before bankruptcy	-0.036	0.028	-0.006	-0.022
	(0.014)	(0.025)	(0.021)	(0.011)
Sale 2 yrs before bankruptcy	-0.016	0.012	-0.004	-0.004
	(0.013)	(0.026)	(0.024)	(0.010)
Sale 1 yr before bankruptcy	-0.015	-0.009	-0.032	-0.017
	(0.011)	(0.024)	(0.023)	(0.010)
Sale 1 yr after bankruptcy	-0.064	-0.039	-0.058	-0.056
	(0.005)	(0.014)	(0.016)	(0.005)
Sale 2 yrs after bankruptcy	-0.052	-0.055	-0.046	-0.048
	(0.006)	(0.018)	(0.014)	(0.006)
Sale 3 yrs after bankruptcy	-0.038	-0.010	-0.013	-0.029
	(0.007)	(0.019)	(0.014)	(0.007)
Sale more than 3 yrs after bankruptcy	-0.036	0.010	-0.016	-0.025
	(0.004)	(0.008)	(0.008)	(0.003)
Foreclosure				
Sale 1 yr after foreclosure	-0.256	-0.335	-0.313	-0.308
	(0.003)	(0.005)	(0.006)	(0.003)
Sale 2 yrs after foreclosure	-0.359	-0.440	-0.402	-0.428
	(0.009)	(0.013)	(0.015)	(0.007)
Sale 3 yrs after foreclosure	-0.354	-0.525	-0.296	-0.430
	(0.027)	(0.038)	(0.037)	(0.019)
Sale more than 3 yrs after foreclosure	-0.169	-0.195	-0.146	-0.207
	(0.018)	(0.027)	(0.013)	(0.010)

Notes: table reports estimates and standard errors, in parenthesis, of hedonic regression of log price on the controls of Table 2 and the disaggregated forced sales indicators. Column (1) reports estimates for single family transactions, Column (2) reports estimates for multi family transactions, and Column (3) reports estimates for condominiums. Standard errors are clustered by census tract-year.

Table A.8 - Forced Sale Coefficients, by Time Subperiods

	1987-1996	1997-2009	Full sample
	(1)	(2)	(3)
Death, young seller (<70 years old)			
Sale more than 3 yrs before death	-0.047	-0.047	-0.048
	(0.008)	(0.009)	(0.006)
Sale 3 yrs before death	-0.053	-0.078	-0.069
	(0.030)	(0.021)	(0.017)
Sale 2 yrs before death	-0.087	-0.049	-0.063
	(0.025)	(0.014)	(0.013)
Sale 1 yr before death	-0.064	-0.079	-0.074
	(0.022)	(0.014)	(0.012)
Sale 1 yr after death	-0.003	-0.054	-0.042
	(0.020)	(0.009)	(0.008)
Sale 2 yrs after death	-0.030	-0.059	-0.048
	(0.023)	(0.013)	(0.012)
Sale 3 yrs after death	-0.018	-0.038	-0.033
	(0.041)	(0.019)	(0.018)
Sale more than 3 yrs after death	-0.019	-0.026	-0.023
	(0.008)	(0.004)	(0.004)
Death, old seller (>70 years old)			
Sale more than 3 yrs before death	-0.097	-0.098	-0.099
	(0.004)	(0.005)	(0.003)
Sale 3 yrs before death	-0.098	-0.088	-0.092
	(0.015)	(0.008)	(0.008)
Sale 2 yrs before death	-0.092	-0.104	-0.101
	(0.013)	(0.008)	(0.007)
Sale 1 yr before death	-0.088	-0.084	-0.086
	(0.011)	(0.006)	(0.005)
Sale 1 yr after death	-0.042	-0.050	-0.049
	(0.009)	(0.004)	(0.004)
Sale 2 yrs after death	-0.053	-0.060	-0.058
	(0.012)	(0.006)	(0.005)
Sale 3 yrs after death	-0.064	-0.056	-0.057
	(0.017)	(0.010)	(0.009)
Sale more than 3 yrs after death	-0.017	-0.030	-0.026
	(0.005)	(0.003)	(0.003)
Bankruptcy			
Sale more than 3 yrs before bankruptcy	-0.007	-0.010	-0.009
	(0.007)	(0.006)	(0.005)
Sale 3 yrs before bankruptcy	-0.062	-0.006	-0.022
	(0.028)	(0.009)	(0.011)
Sale 2 yrs before bankruptcy	-0.014	0.001	-0.004
	(0.028)	(0.010)	(0.010)
Sale 1 yr before bankruptcy	-0.002	-0.021	-0.017
	(0.026)	(0.010)	(0.010)
Sale 1 yr after bankruptcy	-0.047	-0.057	-0.056
	(0.016)	(0.005)	(0.005)
Sale 2 yrs after bankruptcy	-0.038	-0.048	-0.048
	(0.028)	(0.006)	(0.006)
Sale 3 yrs after bankruptcy	-0.045	-0.026	-0.029
	(0.031)	(0.007)	(0.007)
Sale more than 3 yrs after bankruptcy	0.029	-0.026	-0.025
	(0.034)	(0.003)	(0.003)
Foreclosure			
Sale 1 yr after foreclosure	-0.309	-0.310	-0.308
	(0.004)	(0.003)	(0.003)
Sale 2 yrs after foreclosure	-0.445	-0.410	-0.428
	(0.010)	(0.010)	(0.007)
Sale 3 yrs after foreclosure	-0.466	-0.348	-0.430
	(0.024)	(0.033)	(0.019)
Sale more than 3 yrs after foreclosure	-0.386	-0.160	-0.207
	(0.030)	(0.011)	(0.010)

Notes: table reports estimates and standard errors, in parenthesis, of hedonic regression of log price on the controls in Table 2 and the disaggregated forced sales indicators, for two time periods. Standard errors are clustered by census tract-year.

Table A.9 - Forced Sale Coefficients, Eastern vs. Western Massachusetts

	Eastern MA	Western MA	Full sample
	(1)	(2)	(3)
Death, young seller (<70 years old)			
Sale more than 3 yrs before death	-0.048	-0.047	-0.048
	(0.007)	(0.013)	(0.006)
Sale 3 yrs before death	-0.072	-0.055	-0.069
	(0.019)	(0.034)	(0.017)
Sale 2 yrs before death	-0.060	-0.079	-0.063
	(0.015)	(0.026)	(0.013)
Sale 1 yr before death	-0.066	-0.095	-0.074
	(0.013)	(0.026)	(0.012)
Sale 1 yr after death	-0.042	-0.052	-0.042
	(0.010)	(0.017)	(0.008)
Sale 2 yrs after death	-0.052	-0.041	-0.048
	(0.014)	(0.022)	(0.012)
Sale 3 yrs after death	-0.035	-0.022	-0.033
	(0.021)	(0.035)	(0.018)
Sale more than 3 yrs after death	-0.024	-0.022	-0.023
	(0.004)	(0.009)	(0.004)
Death, old seller (>70 years old)			
Sale more than 3 yrs before death	-0.086	-0.128	-0.099
	(0.004)	(0.007)	(0.003)
Sale 3 yrs before death	-0.092	-0.087	-0.092
	(0.009)	(0.015)	(0.008)
Sale 2 yrs before death	-0.089	-0.126	-0.101
	(0.008)	(0.014)	(0.007)
Sale 1 yr before death	-0.081	-0.097	-0.086
	(0.006)	(0.011)	(0.005)
Sale 1 yr after death	-0.054	-0.044	-0.049
	(0.004)	(0.006)	(0.004)
Sale 2 yrs after death	-0.055	-0.075	-0.058
	(0.006)	(0.011)	(0.005)
Sale 3 yrs after death	-0.043	-0.101	-0.057
	(0.010)	(0.020)	(0.009)
Sale more than 3 yrs after death	-0.023	-0.035	-0.026
	(0.003)	(0.006)	(0.003)
Bankruptcy			
Sale more than 3 yrs before bankruptcy	-0.013	0.001	-0.009
	(0.005)	(0.009)	(0.005)
Sale 3 yrs before bankruptcy	-0.008	-0.050	-0.022
	(0.012)	(0.024)	(0.011)
Sale 2 yrs before bankruptcy	-0.005	0.001	-0.004
	(0.013)	(0.017)	(0.010)
Sale 1 yr before bankruptcy	-0.014	-0.025	-0.017
	(0.011)	(0.020)	(0.010)
Sale 1 yr after bankruptcy	-0.065	-0.039	-0.056
	(0.006)	(0.008)	(0.005)
Sale 2 yrs after bankruptcy	-0.056	-0.033	-0.048
	(0.007)	(0.010)	(0.006)
Sale 3 yrs after bankruptcy	-0.028	-0.030	-0.029
	(0.007)	(0.012)	(0.007)
Sale more than 3 yrs after bankruptcy	-0.030	-0.011	-0.025
	(0.004)	(0.006)	(0.003)
Foreclosure			
Sale 1 yr after foreclosure	-0.302	-0.317	-0.308
	(0.003)	(0.004)	(0.003)
Sale 2 yrs after foreclosure	-0.414	-0.450	-0.428
	(0.008)	(0.012)	(0.007)
Sale 3 yrs after foreclosure	-0.425	-0.430	-0.430
	(0.023)	(0.036)	(0.019)
Sale more than 3 yrs after foreclosure	-0.205	-0.199	-0.207
	(0.012)	(0.022)	(0.010)

Notes: table reports estimates and standard errors, in parenthesis, from regressions of log price on the controls in Table 2 and the disaggregated forced sales indicators, for two geographic regions in Massachuestts. Western Massachusetts includes all transactions in Worcester, Hampden, Hampshire, Franklin, and Berkshire counties, while Eastern Massachusetts are the remaining counties. Standard errors are clustered by census tract-year.

Table A.10 - Estimates from Models with Previous Sale Price and Interactions with Forced Indicators

	Estimate	Std Err
	(1)	(2)
Previous price x time between sales		
Less than a year	0.152	(0.002)
Between 1 and 3 years	0.152	(0.002)
Between 3 and 5 years	0.153	(0.002)
More than 5 years	0.154	(0.002)
Previous sale: young death		
Sale within a year before	0.011	(0.018)
Sale within 1 and 3 years before	0.023	(0.013)
Sale within 3 and 5 years before	0.013	(0.013)
Sale more than 5 years before	0.023	(0.010)
Previous sale: old death		
Sale within a year before	0.031	(0.010)
Sale within 1 and 3 years before	0.022	(0.007)
Sale within 3 and 5 years before	0.019	(0.007)
Sale more than 5 years before	0.043	(0.005)
Previous sale: bankruptcy		
Sale within a year before	-0.043	(0.010)
Sale within 1 and 3 years before	-0.010	(0.006)
Sale within 3 and 5 years before	-0.001	(0.007)
Sale more than 5 years before	0.016	(0.008)
Previous sale: foreclosure		
Sale within a year before	0.020	(0.005)
Sale within 1 and 3 years before	-0.013	(0.006)
Sale within 3 and 5 years before	-0.014	(0.005)
Sale more than 5 years before	0.026	(0.003)

Notes: table reports estimates and standard errors, in parenthesis, of regressions following Table 2.B, with the addition of the previous price interacted with indicators for the time since the last transaction. The models also include indicators for whether the previous sale was forced together with indicators for time since the last transaction. Standard errors are clustered by census tract-year.

Table A.11 - Neighborhood Summary Statistics

	Min	Max	Mean	Stdev	1%	25%	50%	75%	99%
Overall Price (x1000)	7.50	1500.00	221.89	142.40	54.70	122.65	176.29	281.55	708.52
Unforced (x1000)	0.00	1500.00	224.43	143.30	52.21	124.30	178.44	284.82	712.76
Forced (x1000)	0.00	1650.00	149.89	139.95	0.00	59.44	120.00	210.38	632.50
Share	0.00	0.47	0.06	0.08	0.00	0.01	0.04	0.08	0.47

Notes: summary statistics on the zip code house price panel dataset. Each observation is for a five digit zip code in a particular year.

Table A.12 - Spillovers Estimates of Foreclosures, Alternative Definition of Foreclosure

	Using only Foreclosures Before Transaction: Before [$\delta_{F,B}$ and $\delta_{C,B}$]		Estimated Difference in Coefficients: Before - After [($\delta_{F,B}$ - $\delta_{F,A}$) and ($\delta_{C,B}$ - $\delta_{C,A}$)]	
	(1)	(2)	(3)	(4)
Slope: far (δ_F)	-0.012	-0.006	-0.004	0.001
	(0.000)	(0.000)	(0.003)	(0.001)
Slope: close (δ_C)	-0.084	-0.069	-0.034	-0.026
	(0.002)	(0.002)	(0.004)	(0.003)
Outlier controls:				
Slope at 99.0: far ($\delta_F^{99.0}$)	0.006	0.004	-0.013	-0.009
	(0.002)	(0.002)	(0.001)	(0.003)
Slope at 99.0: close ($\delta_C^{99.0}$)	-0.012	-0.011	-0.038	-0.034
	(0.007)	(0.006)	(0.002)	(0.011)
Slope at 99.5: far ($\delta_F^{99.5}$)	0.000	0.000	0.001	0.001
	(0.001)	(0.001)	(0.008)	(0.002)
Slope at 99.5: close ($\delta_C^{99.5}$)	-0.013	-0.010	-0.001	0.000
	(0.003)	(0.003)	(0.006)	(0.006)
Slope at 99.9: far ($\delta_F^{99.9}$)	-0.002	-0.003	-0.009	-0.011
	(0.002)	(0.002)	(0.003)	(0.007)
Slope at 99.9: close ($\delta_C^{99.9}$)	0.001	0.002	0.004	0.000
	(0.002)	(0.002)	(0.012)	(0.004)
Additional controls:				
Average price, before		0.239		0.175
		(0.002)		(0.002)
Average price, after				0.180
				(0.002)
No transaction before indicator		2.891		2.110
		(0.026)		(0.021)
No transaction after indicator				2.191
				(0.022)

Notes: table reports estimates and standard errors, in parenthesis, which parallel Table 5. The cutoff points are the same as those in Table 5: for *close* , they are 1.696 (99th percentile), 2.661 (99.5 percentile), and 7.338 (99.9th percentile) and for *far,* they are 11 (99th percentile), 17 (99.5th percentile), and 31 (99.9th percentile). The alternative foreclosure definition counts only those unsuccessful auctions that occurred before the sale but were still owned by the lender at the time of the sale. Standard errors are clustered by census tract-year.

Table A.13 - Spillover Estimates of Foreclosures, by Time Period

	1987-1996	1997-2009	Full sample
	(1)	(2)	(3)
Slope: far ($\delta_{F,B} - \delta_{F,A}$)	0.000	-0.005	-0.003
	(0.001)	(0.014)	(0.001)
Slope: close ($\delta_{C,B} - \delta_{C,A}$)	-0.020	-0.014	-0.017
	(0.005)	(0.004)	(0.003)
Outlier controls:			
Slope at 99.0: far ($\delta_{F,B}^{99.0} - \delta_{F,A}^{99.0}$)	-0.004	-0.013	-0.007
	(0.004)	(0.003)	(0.002)
Slope at 99.0: close ($\delta_{C,B}^{99.0} - \delta_{C,A}^{99.0}$)	-0.050	-0.023	-0.043
	(0.02)	(0.023)	(0.009)
Slope at 99.5: far ($\delta_{F,B}^{99.5} - \delta_{F,A}^{99.5}$)	-0.002	-0.008	-0.005
	(0.003)	(0.003)	(0.001)
Slope at 99.5: close ($\delta_{C,B}^{99.5} - \delta_{C,A}^{99.5}$)	-0.026	-0.045	-0.027
	(0.01)	(0.019)	(0.004)
Slope at 99.9: far ($\delta_{F,B}^{99.9} - \delta_{F,A}^{99.9}$)	0.000	-0.002	-0.001
	(0.003)	(0.003)	(0.002)
Slope at 99.9: close ($\delta_{C,B}^{99.9} - \delta_{C,A}^{99.9}$)	-0.001	-0.006	0.002
	(0.004)	(0.001)	(0.002)
Additional controls:			
Average price, before	0.185	0.186	0.180
	(0.003)	(0.002)	(0.001)
Average price, after	0.206	0.180	0.184
	(0.003)	(0.002)	(0.001)
No transaction before indicator	2.163	2.302	2.168
	(0.033)	(0.029)	(0.013)
No transaction after indicator	2.436	2.235	2.244
	(0.035)	(0.029)	(0.013)

Notes: table reports estimates and standard errors, in parenthesis, which parallel Column (4) of Table 5. The cutoff points are the same as those in Table 5: for close, they are 1.696 (99th percentile), 2.661 (99.5 percentile), and 7.338 (99.9th percentile) and for far they are 11 (99th percentile), 17 (99.5th percentile), and 31 (99.9th percentile). Columns (1) and (2) are estimated using data from 1987-1996 and 1997-2009, respectively. Standard errors are clustered by census tract-year.

Table A.14 - Spillover Estimates, Eastern vs Western Massachusetts

	Eastern MA	Western MA	Full sample
	(1)	(2)	(3)
Slope: far ($\delta_{F,B} - \delta_{F,A}$)	-0.002	-0.006	-0.003
	(0.001)	(0.041)	(0.001)
Slope: close ($\delta_{C,B} - \delta_{C,A}$)	-0.020	-0.007	-0.017
	(0.004)	(0.001)	(0.003)
Outlier controls:			
Slope at 99.0: far ($\delta_{F,B}^{99.0} - \delta_{F,A}^{99.0}$)	-0.007	-0.009	-0.007
	(0.003)	(0.007)	(0.002)
Slope at 99.0: close ($\delta_{C,B}^{99.0} - \delta_{C,A}^{99.0}$)	-0.042	-0.045	-0.043
	(0.015)	(0.007)	(0.009)
Slope at 99.5: far ($\delta_{F,B}^{99.5} - \delta_{F,A}^{99.5}$)	-0.005	-0.010	-0.005
	(0.002)	(0.007)	(0.001)
Slope at 99.5: close ($\delta_{C,B}^{99.5} - \delta_{C,A}^{99.5}$)	-0.029	-0.007	-0.027
	(0.009)	(0.011)	(0.004)
Slope at 99.9: far ($\delta_{F,B}^{99.9} - \delta_{F,A}^{99.9}$)	-0.002	0.010	-0.001
	(0.002)	(0.007)	(0.002)
Slope at 99.9: close ($\delta_{C,B}^{99.9} - \delta_{C,A}^{99.9}$)	0.001	-0.004	0.002
	(0.005)	(0.022)	(0.002)
Additional controls:			
Average price, before	0.194	0.141	0.180
	(0.002)	(0.003)	(0.001)
Average price, after	0.200	0.147	0.184
	(0.002)	(0.003)	(0.001)
No transaction before indicator	2.374	1.660	2.168
	(0.026)	(0.039)	(0.013)
No transaction after indicator	2.485	1.739	2.244
	(0.026)	(0.040)	(0.013)

Notes: table reports estimates and standard errors, in parenthesis, which parallel those reported in Column (4) of Table 5. Column (1) reports estimates for Eastern MA, while Column (2) only uses data from Western MA. Western Massachusetts includes all transactions in Worcester, Hampden, Hampshire, Franklin, and Berkshire counties, while Eastern Massachusetts are the remaining counties. The cutoff points are the same as those in Table 5: for *close* , they are 1.696 (99th percentile), 2.661 (99.5 percentile), and 7.338 (99.9th percentile) and for *far* they are 11 (99th percentile), 17 (99.5th percentile), and 31 (99.9th percentile). Standard errors are clustered by census tract-year.

Table A.15 - Spillover Estimates, Various Definitions for Far and Close

	Estimated Difference in Coefficients: Before - After		
	Far = 0.25 miles Close = 0.10 miles	Far = 0.10 miles Close = 0.05 miles	Far = 0.05 miles Close = 0.01 miles
	(1)	(2)	(3)
Slope: far ($\delta_{F,B} - \delta_{F,A}$)	-0.003	-0.004	-0.009
	(0.001)	(0.002)	(0.003)
Slope: close ($\delta_{C,B} - \delta_{C,A}$)	-0.017	-0.022	-0.024
	(0.003)	(0.005)	(0.016)
Outlier controls:			
Slope at 99.0: far ($\delta_{F,B}^{99.0} - \delta_{F,A}^{99.0}$)	-0.007	-0.011	-0.016
	(0.003)	(0.006)	(0.012)
Slope at 99.0: close ($\delta_{C,B}^{99.0} - \delta_{C,A}^{99.0}$)	-0.043	-0.048	-0.165
	(0.014)	(0.014)	(0.115)
Slope at 99.5: far ($\delta_{F,B}^{99.5} - \delta_{F,A}^{99.5}$)	-0.005	-0.007	-0.02
	(0.002)	(0.005)	(0.007)
Slope at 99.5: close ($\delta_{C,B}^{99.5} - \delta_{C,A}^{99.5}$)	-0.027	-0.024	-0.015
	(0.008)	(0.010)	(0.010)
Slope at 99.9: far ($\delta_{F,B}^{99.9} - \delta_{F,A}^{99.9}$)	-0.001	-0.002	-0.003
	(0.002)	(0.005)	(0.005)
Slope at 99.9: close ($\delta_{C,B}^{99.9} - \delta_{C,A}^{99.9}$)	0.002	0.000	0.003
	(0.004)	(0.006)	(0.007)
Additional controls:			
Average price, before	0.180	0.166	0.173
	(0.002)	(0.001)	(0.001)
Average price, after	0.184	0.171	0.179
	(0.002)	(0.002)	(0.002)
No transaction before indicator	2.168	2.008	2.091
	(0.022)	(0.018)	(0.018)
No transaction after indicator	2.244	2.093	2.189
	(0.022)	(0.019)	(0.019)

Notes: table reports estimates and standard errors, in parenthesis, which parallel Table 5. In this table, however, the definition of the variable *far* and the variable *close* differs in Columns (2) and (3) from the estimates in Table 5, which are shown in Column (1). The cutoff points are the same as those in Table 5: for *close* , they are 1.696 (99th percentile), 2.661 (99.5 percentile), and 7.338 (99.9th percentile) and for *far* , they are 11 (99th percentile), 17 (99.5th percentile), and 31 (99.9th percentile). Standard errors are clustered by census tract-year.

Table A.16 - Spillover Estimates, Alternate Definitions for Before and After

	Estimated Difference in Coefficients: Before - After		
	Before = 1 year prior After = 1 year after	Before = 9 months prior After = 9 months after	Before = 6 months prior After = 6 months after
	(1)	(2)	(3)
Slope: far ($\delta_{F,B} - \delta_{F,A}$)	-0.003	-0.003	-0.004
	(0.001)	(0.001)	(0.001)
Slope: close ($\delta_{C,B} - \delta_{C,A}$)	-0.017	-0.014	-0.011
	(0.003)	(0.004)	(0.005)
Outlier controls:			
Slope at 99.0: far ($\delta_{F,B}^{99.0} - \delta_{F,A}^{99.0}$)	-0.007	-0.008	-0.004
	(0.003)	(0.004)	(0.004)
Slope at 99.0: close ($\delta_{C,B}^{99.0} - \delta_{C,A}^{99.0}$)	-0.043	-0.043	-0.003
	(0.014)	(0.016)	(0.022)
Slope at 99.5: far ($\delta_{F,B}^{99.5} - \delta_{F,A}^{99.5}$)	-0.005	-0.006	-0.004
	(0.002)	(0.003)	(0.003)
Slope at 99.5: close ($\delta_{C,B}^{99.5} - \delta_{C,A}^{99.5}$)	-0.027	-0.024	-0.026
	(0.008)	(0.01)	(0.012)
Slope at 99.9: far ($\delta_{F,B}^{99.9} - \delta_{F,A}^{99.9}$)	-0.001	-0.003	-0.004
	(0.002)	(0.003)	(0.002)
Slope at 99.9: close ($\delta_{C,B}^{99.9} - \delta_{C,A}^{99.9}$)	0.002	0.002	0.002
	(0.004)	(0.005)	(0.006)
Additional controls:			
Average price, before	0.180	0.161	0.139
	(0.002)	(0.002)	(0.002)
Average price, after	0.184	0.167	0.148
	(0.002)	(0.002)	(0.002)
No transaction before indicator	2.168	1.946	1.691
	(0.022)	(0.020)	(0.019)
No transaction after indicator	2.244	2.041	1.802
	(0.022)	(0.021)	(0.019)

Notes: table reports estimates and standard errors, in parenthesis, which parallel Table 5. In this table, however, we report estimates where the definition of before and after vary across the columns. The cutoff points are the same as those in Table 5: for *close* , they are 1.696 (99th percentile), 2.661 (99.5 percentile), and 7.338 (99.9th percentile) and for *far* , they are 11 (99th percentile), 17 (99.5th percentile), and 31 (99.9th percentile). Standard errors are clustered by census tract-year.

Table A.17 - Spillover Estimates, Alternate Weighting Functions for Far and Close

	Estimated Difference in Coefficients: Before - After				
	Close: linear distance Far: unweighted sum	Close: exponential distance Far: unweighted sum	Close: linear distance Far: linear distance	Close: exponential distance Far: linear distance	Close: unweighted sum Far: unweighted sum
	(1)	(2)	(3)	(4)	(5)
Slope: far ($\delta_{F,B}$ - $\delta_{F,A}$)	-0.003	-0.003	-0.005	-0.005	-0.003
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Slope: close ($\delta_{C,B}$ - $\delta_{C,A}$)	-0.017	-0.018	-0.014	-0.015	-0.008
	(0.003)	(0.004)	(0.004)	(0.005)	(0.002)
Outlier controls:					
Slope at 99.0: far ($\delta_{F,B}^{99.0}$ - $\delta_{F,A}^{99.0}$)	-0.007	-0.007	-0.018	-0.018	-0.007
	(0.003)	(0.003)	(0.007)	(0.007)	(0.003)
Slope at 99.0: close ($\delta_{C,B}^{99.0}$ - $\delta_{C,A}^{99.0}$)	-0.043	-0.044	-0.039	-0.040	-0.019
	(0.014)	(0.015)	(0.015)	(0.015)	(0.006)
Slope at 99.5: far ($\delta_{F,B}^{99.5}$- $\delta_{F,A}^{99.5}$)	-0.005	-0.005	-0.008	-0.008	-0.005
	(0.002)	(0.002)	(0.005)	(0.005)	(0.002)
Slope at 99.5: close ($\delta_{C,B}^{99.5}$ - $\delta_{C,A}^{99.5}$)	-0.027	-0.028	-0.020	-0.020	-0.010
	(0.008)	(0.008)	(0.009)	(0.009)	(0.005)
Slope at 99.9: far ($\delta_{F,B}^{99.9}$ - $\delta_{F,A}^{99.9}$)	-0.001	-0.001	0.000	0.000	-0.002
	(0.002)	(0.002)	(0.007)	(0.007)	(0.002)
Slope at 99.9: close ($\delta_{C,B}^{99.9}$ - $\delta_{C,A}^{99.9}$)	0.002	0.002	-0.001	-0.001	0.000
	(0.004)	(0.004)	(0.007)	(0.007)	(0.003)
Additional controls:					
Average price, before	0.180	0.180	0.180	0.180	0.180
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Average price, after	0.184	0.184	0.184	0.184	0.185
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
No transaction before indicator	2.168	2.168	2.170	2.170	2.175
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
No transaction after indicator	2.244	2.244	2.247	2.246	2.253
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)

Notes: table reports estimates and standard errors, in parenthesis, which parallel Table 5. In this table, we report estimates where we have different functions for the number of foreclosures in *close* and *far*. In column (1), we repeat the estimates reported in column (4) of Table 5, where the number of foreclosures in the *close* geography is weighted linearly based on the distance to transaction, while the number of foreclosures in the *far* geography is the total number of foreclosures. The other weighting scheme presented is exponential weighting where foreclosures at distance 0 are given weight 1, while those at distance 0.10 mile are given weight of 0, and those between 0 and 0.1 are given a weight exponentially proportional to their distance from 0. The cutoff points are the same as those in Table 5: for *close*, they are 1.696 (99th percentile), 2.661 (99.5 percentile), and 7.338 (99.9th percentile) and for *far*, they are 11 (99th percentile), 17 (99.5th percentile), and 31 (99.9th percentile). Standard errors are clustered by census tract-year.

Table A.18 - Estimates Using only Previous Foreclosures within the Last Two Years

	Column (1) of Table 5	Estimates following Column (1) of Table 5 but counting only foreclosures within 12-24 months before sale	Separate effects for foreclosures in the previous 12 months and 12-24 months	
			no controls for local house prices	with controls for local house prices
	(1)	(2)	(3)	(4)
Far, before	-0.017		-0.013	-0.008
	(0.001)		(0.001)	(0.001)
Lagged Far, before		-0.018	-0.013	-0.007
		(0.001)	(0.001)	(0.001)
Close, before	-0.087		-0.072	-0.060
	(0.003)		(0.003)	(0.003)
Lagged Close, before		-0.091	-0.079	-0.064
		(0.003)	(0.003)	(0.003)
Outlier controls:				
Far 99.0, before	0.002		0.004	0.002
	(0.002)		(0.002)	(0.002)
Lagged Far 99.0, before		0.002	0.004	0.002
		(0.003)	(0.003)	(0.002)
Close 99.0 , before	-0.055		-0.017	-0.019
	(0.012)		(0.012)	(0.011)
Lagged Close 99.0, before		-0.065	-0.034	-0.034
		(0.014)	(0.014)	(0.013)
Far 99.5, before	-0.004		-0.002	-0.002
	(0.002)		(0.002)	(0.002)
Lagged Far 99.5, before		-0.005	-0.003	-0.001
		(0.002)	(0.002)	(0.002)
Close 99.5 , before	-0.037		-0.022	-0.019
	(0.007)		(0.006)	(0.006)
Lagged Close 99.5, before		-0.050	-0.032	-0.026
		(0.007)	(0.006)	(0.006)
Far 99.9, before	-0.001		-0.002	-0.002
	(0.002)		(0.002)	(0.002)
Lagged Far 99.9, before		0.002	-0.000	-0.000
		(0.002)	(0.002)	(0.002)
Close 99.9 , before	-0.009		-0.002	0.000
	(0.003)		(0.003)	(0.003)
Lagged Close 99.9, before		-0.008	-0.002	-0.001
		(0.004)	(0.004)	(0.004)

Notes: table reports estimates and standard errors, in parenthesis, from regressions of log price on the unweighted number of foreclosures in the 0.25mi area around the house sold, and the linearly weighted number of foreclosures in the 0.1mi area, (variable close), for the year before and after the sale. The cutoff points are the same as those in Table 5: for *close* , they are 1.696 (99th percentile), 2.661 (99.5 percentile), and 7.338 (99.9th percentile) and for *far* , they are 11 (99th percentile), 17 (99.5th percentile), and 31 (99.9th percentile). The first column of this table reports the estimates from column (1) of Table 5. The second column of the table reports estimates from the specification in column (1) of Table 5 where only the foreclosures that happened 12-24 months before the house transaction are counted. The third column reports estimates with separate controls for foreclosures 12-24 months before and 0-12 months before. The last column of the table reports the same estimates with additional controls for average prices within the previous 24 months following column (2) of Table 5. Standard errors are clustered by census tract-year.

Table A.19 - Spillover Estimates by Housing Type and Interactions with Value Components

	Full sample		*Single Family*		*Multi Family*		*Condominium*	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Panel A: Estimate by House Type				
Far, before - after	-0.003	(0.001)	-0.003	(0.001)	-0.007	(0.002)	0.004	(0.002)
Close, before - after	-0.017	(0.003)	-0.006	(0.005)	-0.003	(0.008)	-0.021	(0.005)
Far 99.0, before - after	-0.007	(0.003)	-0.010	(0.004)	-0.010	(0.004)	-0.001	(0.004)
Close 99.0, before - after	-0.043	(0.014)	-0.003	(0.035)	-0.038	(0.034)	-0.040	(0.017)
Far 99.5, before - after	-0.005	(0.002)	-0.014	(0.004)	-0.003	(0.003)	-0.004	(0.004)
Close 99.5, before - after	-0.027	(0.008)	0.029	(0.04)	-0.002	(0.025)	-0.023	(0.008)
Far 99.9, before - after	-0.001	(0.002)	0.010	(0.008)	-0.009	(0.005)	0.001	(0.003)
Close 99.9, before - after	0.002	(0.004)	0.130	(0.102)	0.017	(0.166)	-0.002	(0.006)
				Panel B: Estimate by House Type Interacted with Value Components				
Main spillover estimates								
Far, before - after	-0.001	(0.001)	-0.002	(0.001)	-0.006	(0.002)	0.005	(0.002)
Close, before - after	-0.006	(0.004)	-0.007	(0.006)	-0.002	(0.007)	-0.018	(0.006)
Far 99.0, before - after	-0.004	(0.002)	-0.010	(0.002)	-0.002	(0.002)	-0.001	(0.003)
Close 99.0, before - after	-0.007	(0.007)	0.052	(0.022)	0.004	(0.018)	-0.016	(0.007)
Spillover estimates interacted with building component								
Far, before - after	0.004	(0.001)	0.005	(0.001)	0.005	(0.002)	0.006	(0.002)
Close, before - after	0.017	(0.004)	0.004	(0.007)	0.000	(0.009)	0.009	(0.006)
Far 99.0, before - after	0.000	(0.001)	-0.002	(0.002)	0.002	(0.002)	0.000	(0.002)
Close 99.0, before - after	0.000	(0.004)	0.071	(0.02)	-0.004	(0.015)	-0.002	(0.004)
Spillover estimates interacted with lotsize component								
Far, before - after	0.000	(0.001)	0.004	(0.001)	0.003	(0.002)	-0.001	(0.002)
Close, before - after	-0.005	(0.004)	-0.012	(0.006)	-0.011	(0.01)	0.002	(0.006)
Far 99.0, before - after	0.001	(0.002)	-0.005	(0.002)	0.008	(0.003)	-0.001	(0.001)
Close 99.0, before - after	-0.002	(0.003)	0.031	(0.023)	0.007	(0.023)	-0.001	(0.004)
Spillover estimates interacted with tract-year component								
Far, before - after	0.002	(0.001)	-0.002	(0.001)	0.001	(0.002)	0.004	(0.002)
Close, before - after	0.006	(0.003)	0.003	(0.005)	0.006	(0.008)	0.002	(0.005)
Far 99.0, before - after	0.001	(0.001)	0.004	(0.002)	0.000	(0.002)	0.000	(0.002)
Close 99.0, before - after	-0.001	(0.004)	-0.024	(0.018)	0.015	(0.016)	-0.004	(0.005)

Notes: table reports estimates and standard errors, in parenthesis, from regressions of log price on the the unweighted number of foreclosures in the 0.25mi area around the house sold, and the linearly weighted number of foreclosures within 0.1mi (variable *close*), for the year before and after the sale. The Panel A reproduces column (4) of Table 5, with a separate regression for each house type. In Panel B, we decompose the effect with a piecewise linear specification following Table 5, with the cutoff at the 99th percentile equal to 1.696 for *close* and 11 for *far* . The estimation proceeds in two steps, as in Table 3, by first decomposing the predicted price in four parts and then interacting these components with the neighborhood foreclosure variables. The regression includes (not shown) levels of the value components and neighborhood prices, before and after the sale. Standard errors are clustered by census tract-year.

Table A.20 - Spillover Estimates of Deaths and Bankruptcies

	Using only Deaths/Bankruptcies Before Transaction: Before [$\delta_{F,B}$ and $\delta_{C,B}$]		Estimated Difference in Coefficients: Before - After [($\delta_{F,B}$ - $\delta_{F,A}$) and ($\delta_{C,B}$ - $\delta_{C,A}$)]	
	(1)	(2)	(3)	(4)
Death: far (δ_F)	-0.002	-0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Death: close (δ_C)	-0.018	-0.011	0.007	0.007
	(0.003)	(0.003)	(0.004)	(0.003)
Bankruptcy: far (δ_F)	-0.006	-0.003	0.001	0.0001
	(0.001)	(0.001)	(0.002)	(0.001)
Bankruptcy: close (δ_C)	-0.009	-0.003	0.015	0.009
	(0.012)	(0.010)	(0.012)	(0.009)
Additional controls				
Average price, before		0.247		0.180
		(0.002)		(0.002)
Average price, after				0.184
				(0.002)
No transaction before indicator		2.989		2.165
		(0.028)		(0.022)
No transaction after indicator				2.242
				(0.022)

Notes: table reports estimates and standard errors, in parenthesis, which parallel Table 5. The forcing event, however, is a count of the number of deaths and the number of bankruptcies following Table 5 when there are multiple forcing events. Standard errors are clustered by census tract-year.

Table A.21 - Spillover Estimates for Unforced Transactions

	Using only Home Sales Before Transaction: Before [$\delta_{F,B}$ and $\delta_{C,B}$]		Estimated Difference in Coefficients: Before - After [($\delta_{F,A}$ - $\delta_{F,B}$) and ($\delta_{C,A}$ - $\delta_{C,B}$)]	
	(1)	(2)	(3)	(4)
Number of transactions: far (δ_F)	0.00004	0.0004	0.0002	-0.0001
	(0.00006)	(0.00005)	(0.0001)	(0.0001)
Number of transactions: close (δ_C)	-0.0009	-0.0002	0.0007	0.0007
	(0.0002)	(0.0002)	(0.0004)	(0.0003)
Additional controls				
Average price, before		0.257		0.187
		(0.002)		(0.002)
Average price, after				0.192
				(0.002)
No transaction before indicator		3.108		2.253
		(0.029)		(0.022)
No transaction after indicator				2.348
				(0.023)

Notes: Table reports coefficients and standard errors of regression of log price on housing characteristics, census tract - year indicators, forced sa
indicators, and foreclosure indices as in Table 5. In addition, it reports the coefficient and standard error of the indices of number of unforced sal
the neighborhood in the year before and after the sale (constructed as the foreclosure indexes described in the text and employed in Table 5).

Table A.22 - Estimates of Forced Sale Discount
Interacted with Neighborhood Foreclosures

	Estimate	Std Err
	(1)	(2)
Death, young seller (-3;+3)	-0.057	(0.005)
Death, old seller (-3;+3)	-0.071	(0.002)
Bankruptcy (-3;+3)	-0.033	(0.003)
Foreclosure	-0.270	(0.002)
Interaction with Measure of Foreclosures Before, Near (0.10 miles)		
Death, young seller (-3;+3)	0.003	(0.023)
Death, old seller (-3;+3)	-0.009	(0.013)
Bankruptcy (-3;+3)	0.005	(0.009)
Foreclosure	0.028	(0.002)
Interaction with Measure of Foreclosures Before, Far (0.25 miles)		
Death, young seller (-3;+3)	0.006	(0.005)
Death, old seller (-3;+3)	0.001	(0.002)
Bankruptcy (-3;+3)	0.004	(0.002)
Foreclosure	-0.010	(0.001)

Notes: table reports coefficients and standard errors of regression of log price on housing characteristics, census tract-year indicators, forced sales indicators, and foreclosure indices as in Table 5. In addition, it reports the coefficient and standard error of the interaction between the forced sales indicators and the indices of foreclosures in the year before the sale (constructed as Table 5). The specification has the same controls as column (2) of Table 5.