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When Does Delinquency Result in Neglect? Mortgage Distress and Property Maintenance

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Abstract:

Studies of foreclosure externalities have overwhelmingly focused on the impact of forced sales on the value of nearby properties, typically finding modest evidence of foreclosure spillovers. However, many quality-of-life issues posed by foreclosures may not be reflected in nearby sale prices. This paper uses new data from Boston on constituent complaints and requests for public services made to City government departments, matched with loan-level data, to examine the timing of foreclosure externalities. I find evidence that property conditions suffer most while homes are bank owned, although reduced maintenance is also common earlier in the foreclosure process. Since short sales prevent bank ownership, they should result in fewer neighborhood disamenities than foreclosures.

JEL Classifications: G11, G21, R31

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Mortgages are financial contracts between borrowers and lenders, but when a borrower loses his property through foreclosure, the process impacts parties external to the contract. If foreclosures result in vacancy, deferred maintenance, or vandalism and other crime, then tenants and neighboring owners may suffer. This paper examines the timing of one type of foreclosure externality, reduced property upkeep, which is measured using conditions reported by constituents in the city of Boston.

Most existing studies of foreclosure externalities use neighboring house prices as the metric for spillovers. While prices are easy to measure and may literally put a dollar value on foreclosure spillovers, these studies are typically unable to distinguish between whether foreclosures hurt neighbors' home values because of deferred maintenance and vacancy or because foreclosures add to the supply of low-priced properties on the market, pushing prices down. Moreover, these studies often find only negligible evidence of spillovers, perhaps because the valuation of a property, as a long-lived asset, may be based more on the expected future value than on the short-term use value of the home. Since neighboring foreclosures represent only a temporary nuisance, buyers may not adjust their willingness to pay for a home with distressed sales nearby, even though those properties may, at least in the short run, harm neighborhood quality of life. Finally, price spillover studies tell us little about how foreclosures impact neighboring owners who do not sell their properties.

The purpose of this paper is to fill these gaps in the existing literature by determining whether (and when) properties owned by delinquent borrowers and lenders become public nuisances in their neighborhoods. Using a rich administrative dataset from Boston, Massachusetts, I capture information on when residents in a neighborhood report problems about particular properties to local government. I link this property-level dataset of constituent complaints and requests to three other datasets—a property-level dataset of sales transactions and mortgage originations, a loan-level dataset of mortgage performance for subprime and Alt-A mortgage borrowers,[1] and real estate sale listings data from the area multiple listing service. Using this four-part, master dataset, I estimate a set of multilevel longitudinal models to compare the incidence and timing of complaints, identifying when in the delinquency and foreclosure process a property becomes the subject of resident complaints. I also distinguish between owners who attempt to sell their properties through short sales and those who do not try to sell short.

[1]As Haughwout, Peach, and Tracy (2008) explain, "Subprime mortgages are small loans (compared to Alt-A loans) and are often made to borrowers with some blemish on their credit history, or who are willing to commit large shares of their incomes to debt service. Alt-A mortgages are typically larger value loans made to more creditworthy borrowers who, for a variety of reasons, may choose not to provide the income or asset verification required to obtain a prime mortgage," (249). The CoreLogic dataset includes essentially all securitized subprime mortgages originated in 2003 and later (Mayer and Pence 2008).

I find no relationship between property upkeep and short sale attempts. However, I do find that the level of property maintenance varies during different stages of the foreclosure process. I find that borrowers begin neglecting maintenance when they are seriously (90 days or more) delinquent, and property distress becomes more common once the owner has been in foreclosure for over a year. But properties are most likely to be the subject of constituent complaints when they are bank owned. This particularly holds true for single-family properties, which are more than nine times as likely to be the subject of a constituent complaint when REO as before the borrowers became delinquent.

The harm caused by bank-owned properties suggests that more might still be done to hold banks accountable for property maintenance, including providing easier access to the contact information of property caretakers. Since mortgages terminated through short sales avoid bank ownership entirely, they should impose less damage on neighborhood quality of life. Finally, well-intentioned policy interventions that lengthen the foreclosure timeline while failing to prevent foreclosures may lead to longer periods in which foreclosure externalities are likely to plague neighborhoods.

1 Prior evidence of foreclosure externalities

Economists typically quantify foreclosure externalities by measuring the impact on sale prices of houses located near foreclosed properties. The reasoning is that if foreclosures result in vacancies and decreased maintenance, this "disamenity" will harm neighboring properties, and so they will sell for less. This method has advantages in that prices are easy to measure and should, theoretically, be an objective and holistic measure of foreclosures' damages to their neighbors, assuming the various foreclosure-related neighborhood disamenities are fully capitalized into house prices. But a limitation of the price spillovers approach is its inability to determine the causal mechanism through which foreclosures impact neighboring house prices. While foreclosures can hurt neighbors by generating a disamenity effect or negative stigma, they can also increase the supply of low-cost properties on the market, creating competition for neighboring sellers and pushing area prices down.[2] It is hard to tease out exactly how foreclosures are harmful, making it difficult to design policies to mitigate these foreclosure externalities.

[2]Some argue that foreclosures may also reduce area house prices by providing low priced "comparables" for assessors to use in the valuation process (Lee 2008). As explained to the author by a mortgage broker, an assessor, and a real estate agent in the Boston area, assessors are aware that foreclosures do not reflect arm's length transactions, and they typically do not use these sales as comparables. However, in some neighborhoods where foreclosures are prominent and arm's length sales are scarce, sales out of bank ownership may occasionally be used as comparables. In the event that they are, appraisers should adjust their calculations accordingly (Ellen, Madar, and Weselcouch 2012).

Despite the limitations of these studies, they offer important insights that are relevant to understanding the issue of financial distress and property upkeep. The results from house price spillover studies vary considerably, although the majority show relatively small or nonexistent spillovers.[3] Immergluck and Smith (2006), who provide some of the earliest evidence on foreclosure externalities, find that single-family foreclosures in Chicago in 1997 and 1998 generated a nearly 1 percent decline in the prices of properties sold in 1999 within an eighth of a mile, with foreclosures occurring in the band one-eighth to one-quarter of a mile away generating no significant spillovers. Schuetz, Been, and Ellen (2008) offer some of the first evidence on the neighborhood impacts of the current foreclosure crisis, examining foreclosures in New York City. They find that foreclosure starts are correlated with lower area house prices, particularly when there are three or more foreclosure filings within a short distance (250 to 500 feet) and within 18 months preceding a sale. These results, which show limited negative impacts from single foreclosures nearby, are more likely to be relevant to Boston, which, like New York, has a generally robust housing market. Individual foreclosures may impact neighboring property owners and tenants, but perhaps not enough to have an economically or statistically significant impact on house prices.

Gerardi et al. (2012) go a step further and assess the impact of foreclosures on neighboring house prices in 15 metropolitan areas, distinguishing between foreclosure spillovers generated by properties in different stages of the foreclosure process: in the default stage, bank-owned, or post-foreclosure and owned by new parties. They find that foreclosure spillovers peak when a property is in foreclosure, but still owned by the delinquent borrower. During this time, foreclosed properties generate an average negative spillover of about 1.2 percent of the prices of neighboring properties located within 0.1 mile. In another innovation, Gerardi et al. (2012) control for the condition of foreclosed properties, as reported by lender-commissioned appraisals. They find that foreclosure spillovers can be explained entirely by property condition, presumably associated with deferred maintenance by financially distressed homeowners. In other words, well-maintained properties in foreclosure do not harm their neighbors' sale prices.

Moving to the Massachusetts setting, Campbell, Giglio, and Pathak (2011) also find that the typical price discount associated with a neighboring foreclosure is about 1 percent. Interestingly, the spillovers are primarily experienced by condominiums, as opposed to single-family or small multifamily properties, which have been the focus of previous studies. Fisher, Lambie-Hanson, and Willen (2012) examine this finding in greater detail, ultimately focusing

[3]Studies of house price spillovers typically utilize some form of a spatial externality regression of prices on property characteristics and the number of neighboring foreclosures located within a specified time window and distance, either in a hedonic or repeat-sales framework. For a thorough summary of the evolution of the existing literature on foreclosures' price spillovers, see Frame (2010) or Gerardi et al. (2012).

on the city of Boston, this paper's setting as well. They find that "condo-on-condo" spillover effects are the strongest, with the worst of foreclosure externalities being experienced by owners who share a condo association with a foreclosed unit. They find scant evidence that other spillover effects exist, which suggests that foreclosure-related undermaintenance and vacancy within one's building, coupled with condo association financial solvency status, drive foreclosures' impacts on house prices, rather than increased supply. Further, the absence of negative externalities from single-family and multifamily foreclosures casts doubt on the importance of foreclosure-related deferred maintenance on house prices.

However, changes in a property's maintenance are unlikely to be fully capitalized into neighboring house values, as estimated by hedonic and repeat-sales models. Housing is a long-lived asset, and negative externalities caused by nearby foreclosures typically represent only a temporary shock to neighborhood conditions. The transient inconveniences from having a foreclosure nearby should impact only a small, possibly negligible, portion of the present discounted value of an investment in housing, having an inappreciable impact on prospective buyers' willingness to pay (as captured by sale prices). By focusing on constituent complaints rather than prices, I show that upkeep does worsen as a property experiences foreclosure, no matter what type of property it is—contrary to the price spillover results reported by Fisher, Lambie-Hanson, and Willen (2012). In fact, the most severe effects from foreclosure are for single-family properties, which are more than 10 times as likely to receive a complaint while bank owned as while owned by a borrower who is current on his mortgage.

Although short sales have become an increasingly common exit strategy for delinquent borrowers, little research exists on the spillovers from these types of transactions. Daneshvary, Clauretie, and Kader (2011) find that short sales do not depress nearby sale prices in Las Vegas, though sales of real estate owned (REO) properties generate the roughly 1 percent sale price reduction common in the literature. They conjecture that the absence of a short sale spillover may be "...due to relative property upkeep that may take place when borrowers are permitted to use a short-sale process instead of a foreclosure process," (p. 203). If these results hold for other markets and truly reflect better maintenance by short sale sellers, it may be advisable for policymakers to increase incentives for borrowers and lenders to pursue short sales as an alternative to foreclosure.

Daneshvary, Clauretie, and Kader (2011) find that only about 15 percent of short sales in their sample are of fair or poor property condition, as opposed to over 29 percent of REOs, but what explains this difference is unclear. It is possible that this reflects a selection effect—that borrowers who pursue short sales also happen to live in better-maintained properties or that short sale buyers are primarily attracted to well-maintained properties. On the other hand, a short sale property may receive better care than a property in the conventional

foreclosure process if it is less likely to be vacant or if the owner tries to maintain the property in order to achieve a sale, thereby reducing damage to his credit and avoiding the social stigma of foreclosure.

In this sense, short sales may help financially distressed owners maintain a stake in their properties that owners resigned to foreclosure no longer have. As housing economist Ed Glaeser (2009) writes, "Delinquent homeowners want to inhabit and to control their homes. Lenders want to get them out and to limit the damage done to the property. During the foreclosure process, home occupants have no reason to invest in their homes. Indeed, spite sometimes pushes them to abuse the property." Economists at the Federal Reserve Bank of New York go a step further, conjecturing, "with little to gain, negative equity homeowners will be much less likely to pursue improvements in their homes or communities. Their situation is essentially analogous to that of renters, who have little incentive to make improvements to the homes they occupy since it is the landlord who reaps the economic benefits," (Haughwout, Peach, and Tracy 2010, p. 3). Using the Bureau of Labor Statistics' Consumer Expenditure Survey, Melzer (2012) finds that borrowers with negative equity spend 30 percent less than positive equity homeowners on home maintenance and improvements.

However, there is little evidence in the literature that addresses the question of whether homeowners in foreclosure neglect basic maintenance. Daneshvary, Clauretie, and Kader (2011) and others document the poor quality of foreclosed properties, but it is possible that the homes that end up in foreclosure and bank ownership are simply of poorer quality and upkeep to begin with, and reduced maintenance is not the result of mortgage distress and foreclosure. I attempt to address this selection versus treatment effect question in this paper by following individual properties through the foreclosure process. By using data on constituent reports of neighborhood problems, I am able to capture public nuisances that house price models may fail to capture. I also contribute to the literature by distinguishing between borrowers who do and do not attempt to sell their properties short, in order to determine whether the short sale process engages owners to continue to care for their properties or whether they lose the maintenance incentives associated with ownership. Unlike foreclosures, short sales cannot be identified in public records data. The rich dataset of mortgage performance indicators that I match with property transactions and listings data enables me to observe short sales for a specific sample of nonprime mortgage borrowers. Finally, I offer new information on the claim of Haughwout, Peach, and Tracy (2010) and finding of Melzer (2012) that owners with negative equity take worse care of their properties. I use borrower-level, monthly data on estimated property values and mortgage indebtedness to test for correlations between each borrower's equity and the condition of his property.

2 Data sources

A unique, four-part dataset enables me to address the research questions on the timing of foreclosure externalities and the difference between externalities associated with foreclosures and those associated with short sales. I begin with a dataset of mortgage and sale transactions from public records, which I merge with a loan-level dataset on mortgage performance. I combine these data with a rich administrative dataset of constituent complaints about property conditions in Boston, as well as data from the local multiple listing service on sale listings posted by real estate agents. The datasets are described more thoroughly in the following sections, and the information I use from each is summarized in Table 3.

2.1 Property transactions from public records

The foundation of my final dataset consists of public records data on property transactions (deeds of sale), mortgages, and foreclosure starts for single-family, 2–3 family, and condominium properties. The data, based on information from the county registries of deeds and the Massachusetts Land Court, are compiled, cleaned, and processed by the Warren Group, a New England-based company. I include data from 1987 to September 2012 for owners who held their properties at some point during June 2009–December 2011, as this is the time period for which I have complete data on constituent reports (described below). All deeds, mortgages, and foreclosure starts have complete address information, and most have assessors' parcel numbers, matched by the Warren Group using local assessing data.[4] Deeds in the dataset include buyer (grantee) and seller (grantor) names, prices, dates of sale, and book and page numbers of the deed documents filed at the local registry of deeds; they are also distinguished as foreclosures, when applicable. The mortgage data include the name of the lender (mortgagee), borrower (mortgagor), and the amount of the mortgage. Foreclosure starts (commonly referred to as "foreclosure petitions" or "foreclosure complaints") signal the beginning of the foreclosure process, after a borrower has defaulted and the lender has accelerated the remaining mortgage payments, meaning that the borrower must either pay off the entire balance of his mortgage or lose the property to foreclosure.[5] The entire dataset is also matched by the Warren Group to assessors' data on property characteristics, such as number of bedrooms, baths, parking spaces, and fireplaces.

[4]When assessors' parcel numbers were missing, I looked them up manually by address in the City's online assessing database (`http://www.cityofboston.gov/assessing/search/`).

[5]See Lambie-Hanson and Lambie-Hanson (2012) for a full explanation of the foreclosure process in Massachusetts and the timing of each of these steps.

2.2 CoreLogic loan-level data

In order to determine the status of an owner's mortgage at a given point in time, I match the three datasets above with loan-level data from CoreLogic on securitized subprime and Alt-A mortgages. I conduct the match between the CoreLogic and public records based primarily on the origination amount and date of the mortgage, the ZIP code of the collateral property, and the lender's name. I successfully match over 83 percent of CoreLogic first-lien mortgages to an owner in the Warren Group. The CoreLogic dataset includes rich information on static mortgage terms (for example, level and type of interest rate, lien status, reset procedures for adjustable-rate mortgages, etc.) and borrower characteristics (like credit score and debt-to-income ratio at origination). The dataset also includes dynamic, monthly information on the loans, such as the contemporaneous payment amount, balance, and mortgage status (for example, current, 30 days delinquent, 60 days delinquent, in foreclosure, etc.). Importantly, the dataset also includes information on the dollar value of losses experienced by mortgage holders when a property is sold, which helps to identify short sales. For 63 percent of the loans, CoreLogic offers TrueLTV fields each month, which include the borrower's total outstanding mortgage debt (including subordinate-lien mortgages) and the number of outstanding liens, as well as an estimate of the owner's current property value, based on the value at the time the mortgage was originated, adjusted using automated valuation models (AVMs) and changes in area house prices.[6] I use these fields to estimate the owner's level of equity each month, calculated as the difference between the contemporaneous property value and mortgage debt, divided by the value. The majority of my analysis relies on the CoreLogic-matched sample, because it enables me to examine the mortgage status of an owner during each particular month. However, as a robustness check, I examine the results from the models on the full population of owners in Boston who held their properties between June 2009 and December 2011. These results are presented in Table A-5 of the appendix.

2.3 Constituent complaints

Since October 2008 the City of Boston has maintained an administrative database of constituent requests and complaints made to a centralized constituent services' system and to its various City departments. This Constituent Response Management (CRM) database includes reports made by phone (calls or text messages), internet (website submissions or "tweets"), smart phone application, and in-person visits. This system of constituent reporting is known in Boston as the Citizens Connect initiative.[7] Reports range from requests for

[6]Based on an analysis of observable characteristics, it appears the TrueLTV data are missing at random.

[7]This is not the first study to utilize Boston's CRM data, nor is Boston's system entirely unique. As Levine and Gershenson (2012) explain, "Boston's system is similar to '311' systems in place in New York

recycling bins or pothole repair to complaints about graffiti, illegal dumping, and abandoned properties. Each report is dated, refers to a specific address (and assessors' parcel number), and includes a detailed description of the request, including a standardized category for the type of request being made.[8] Table 4 displays some of the most common types of requests. Boston's system is heavily used; for example, in July 2009 alone over 6,400 reports were filed.

For each property and each month, I calculate the number of constituent reports that reference quality of life problems related to property distress, including, for example, unsafe living conditions, rodent infestations, and occupation by illegal squatters. I exclude cases that are unlikely to be related to vacant and distressed housing, such as complaints about noisy parties or public works requests (for example, reports that a street light is out on a particular city block). The system was widely used for these relevant types of complaints by June 2009, which is when I begin my analysis, and I capture complaints through December 2011. I link each complaint with the public records data using the assessors' parcel number of the property, achieving a match rate of over 94 percent.[9] To limit multiple reports of the same incident, I exclude duplicate records and complaints that occur within two weeks of a previous report of a similar nature on the same property. Unit information is not available for condominiums, but because most of the complaints appear to focus on exterior conditions of a property or problems that are likely to impact an entire building (like utilities or lead concerns), I match complaints based on a condominium address to each unit within the condo association.[10] Naturally, some neighborhoods are more likely than others to report problems to the City, and so, as discussed in Section 4, I examine within-property differences in the incidence of constituent complaints in order to combat this problem.

City, Washington DC, and San Francisco, but includes its own designated phone number in City Hall and a 24-hour call center. Each caller speaks directly with a city employee. A Spanish speaker is always available, and speakers of other languages are available down the hall from the call center in the City of Boston's immigration department during normal business hours," (14). Levine and Gershenson (2012) use data dating back to November 2009, although this paper uses data from earlier-June 2009, since the Inspectional Services Department cases, which this paper uses, are complete from that time. Although the dataset used in this paper was prepared for the author by City staff, most of the data fields have recently become publicly available on the new City of Boston Boston Data portal, `https://data.cityofboston.gov/`.

[8] I use the terms "complaint" and "service request" interchangeably in this paper, since most observations involve both a complaint about a particular problem and a request for the City to provide some service to mitigate the problem.

[9] There appear to be no substantive differences in the types or timing of the matched and unmatched samples of complaints.

[10] This is possible because the first seven digits of condo units' parcel numbers are identical within the association. To examine the impact of this decision on my findings, I present the results of the main model separately for each property type in Table 8.

2.4 Multiple listing service data

Finally, I supplement the dataset with information on real estate sale listings from Massachusetts' main multiple listing service, the MLS Property Information Network. These data give information on real estate sale listings submitted to the proprietary database by real estate agents from January 1993 to February 2012. The data include a vast array of information, including, but not limited to: address of the property, date the listing was created, initial listing price, status of the listing (including date of termination if sold, expired, or withdrawn), current listing price, sale price, and book and page of a recent sale deed for the property. Starting in 2009, the data also include a flag for short sales and lender-owned properties. As discussed in the appendix, the address, sale date and price, and book and page information make it possible to match over 92 percent of the Boston MLS listings with a property in the Warren Group dataset.

2.5 Matched dataset

The matched dataset I use includes monthly loan observations between 2003 and May 2012 for 5,600 properties, where the first-lien subprime and Alt-A mortgages in CoreLogic were originated between 2003 and 2007 and were active in June 2009 through December 2011, the time period for which I have Boston CRM data.[11] Properties are tracked from the month the loan was originated through the last month of available data or until the time the borrower sold the property. If the sale was a foreclosure and the property was bought back by the lender at the foreclosure auction, I also include in the dataset the months during which the property was held as REO. The data for each property terminate when the property is sold to a new, third-party buyer (either through arm's length sale, short sale, sale at foreclosure auction, or transaction out of REO).[12]

For each owner in the dataset, sale dates, prices, and property characteristics are included from the transactions dataset, including an indicator for whether the owner's sale deed (if he sold) is a foreclosure. Each month I observe whether the property is listed in the MLS, and if so, the listing price, whether the listing is flagged as a short sale or lender-owned property, and when the listing was created. Finally, for each month, I observe the number and type of constituent reports to the City of Boston.

[11] Details of the matching procedures can be found in the appendix.

[12] As discussed in Section A6 of the appendix, I distinguish between REO and non-REO buyers using a carefully constructed dataset of all foreclosures in Boston, created for an earlier study, Lambie-Hanson and Lambie-Hanson (2012). This is necessary because the CoreLogic data can be ambiguous about precisely when the auction occurs and whether it results in a bank buyback or third-party sale.

3 Mortgage distress and property maintenance in Boston

Unlike some other large cities across the United States, Boston has maintained a fairly robust housing market during the current mortgage crisis. When the market in Boston bottomed out in 2009, house prices were at 82 percent of peak 2005 values.[13] Citywide, about 3,400 foreclosures of single-family, 2–3 family, and condo properties were completed between 2007 and 2011. Although short sales are becoming more common relative to foreclosures, as shown in Figure 1, they still make up a smaller share of the distressed sales. An estimated 1,200 short sales were completed in Boston between 2007 and 2011.[14]

Most of Boston's distressed sales have been concentrated in a few hard-hit neighborhoods. For example, in 2011, 70 percent of Boston's foreclosure deeds were filed for properties located in one of five neighborhoods: Dorchester, East Boston, Hyde Park, Mattapan, and Roxbury (Delgado 2012). The CRM data are one measure of property conditions that can reflect how these distressed sales have impacted neighborhoods. The complaints can originate from any constituent, although the most common users seem to be residents of the neighborhoods. Depending on the type of complaint, reports about a particular property may be more likely to be made by neighbors (for issues like overflowing trash barrels or squatters) or by tenants of the building itself (for problems like lead paint). In fact, a property owner could even request services for his or her own property, although among the types of complaints examined in this dataset, these types of requests appear rare.[15]

By matching the CRM data with sale transaction records for 1–3 family and condo properties, I find that about 27 percent of owners had one or more relevant reports about their properties. As shown in Table 1, the most common problem, experienced by nearly 13 percent of owners, was poor property conditions, which tends to reflect a catch-all group of complaints about abandoned homes and dangerous or unsafe living conditions on the interior

[13]By 2011 in Boston, house prices had nearly recovered to 2004 levels. In contrast, house prices in Massachusetts were stagnant from 2009 to 2011, approximately equivalent to their 2003 levels (81 percent of peak 2005 house prices). For more details on house prices, foreclosure rates, and subprime lending in Massachusetts and its 351 cities and towns, see the Federal Reserve Bank of Boston's mapping module: `http://www.bostonfed.org/economic/dynamicdata/module1/bmap.html`.

[14]Short sales are hard to count, since they appear identical to arm's length sales in the documentation filed with the registries of deeds. However, I estimate the number of short sales by counting the nonforeclosure sales in which the price is less than 75 percent of the combined mortgage principal taken out by the seller when he purchased the property. This method gives estimates that are consistent with other short sale indicators, like those in the MLS and CoreLogic data, discussed in this paper.

[15]Unfortunately, I do not have information on the identity of the person making each request, so I am unable to distinguish between neighbors, tenants, landlords, and occupant-owners of the properties that are the subjects of complaints and service requests. Examples of requests likely to be made by an occupant-owner or landlord are building inspection requests and reports of illegal dumping. Because these may or may not reflect problems with a property that are tied to the owner's mortgage status, I model these outcomes separately from other reports in the dataset, as I discuss later.

or exterior of a property. Structural complaints include specific issues about plumbing, electrical work, methods of egress, or ventilation. About 7 percent of properties were the subject of this type of request between June 2009 and December 2011. Nearly 8 percent of properties were the subject of public health reports, which included bed bugs, rodents, pigeons, mold, and lead concerns. A small share of owners, 1.6 percent, were reported to be using their property illegally, including for alleged violations like overcrowding and using a home as an illegal boarding house, while 5.6 percent had a trash complaint (usually about improper outdoor trash storage, including overflowing barrels). About 3 percent of owners allegedly failed to keep their sidewalks clear of snow following a storm. For nearly 3 percent, the owner or a tenant requested a building inspection, which may occur either because a problem exists at the property or because an owner wants to ensure that a property is move-in ready for tenants when there is a turnover in occupancy. Finally, about 3 percent had a report of illegal dumping of items on the property, which could be called in by the owner himself, if he was a victim of this dumping. As displayed in Figure 2, the system has been used increasingly over time, although there is significant month-to-month variation in the number and types of complaints reported. Of course, snow complaints are restricted to the winter, and some complaints, like trash problems, are more common in the spring, summer, and fall.

The most common type of complaints, the poor condition indicator, has wide variation between distressed and nondistressed property owners. Owners without foreclosure starts (also known as foreclosure petitions) received complaints of this kind 12.4 percent of the time, as compared with 16.8 percent of owners who had been petitioned but had not lost their properties to foreclosure and 16.0 percent of owners who experienced a completed foreclosure. Among bank owners, 17.2 percent received this type of complaint. Structural complaints and illegal use complaints were also somewhat more common among the three groups of distressed owners than for nonbank owners who were never in foreclosure.

As shown in Table 2, overall, banks made up 2.2 percent of owners but were the subject of 2.7 percent of complaints and requests (4.0 percent of the "poor condition" reports). It is important to remember, however, that banks tend to hold properties for shorter periods than other owners. In this sample, the average period of ownership overlapping with the CRM window (June 2009–December 2011) was 24 months. However, for banks, the mean was just 10 months. With this in mind, we would expect that the monthly probability of complaints among banks would be even higher, relative to other types of owners. The same can be said for foreclosed owners, who owned for an average of 13 months within the window of analysis. In other words, the disparities in complaints reflected in Table 2 appear smaller than they would be if we corrected for the length of time the owner held the property and

was eligible to be reported in the database.

In order to correct for disparities in tenure length and to examine owner and property characteristics such as owners' mortgage status and amount of equity during each month, I turn to the four-part matched dataset, including property transactions, CRM data, MLS real estate listings data, and CoreLogic loan-level data. This dataset includes 5,812 borrowers of subprime and Alt-A mortgages and, when applicable, bank owners that take control of properties through foreclosure. These borrowers' characteristics are summarized in Table 5. A large share of the borrowers, 53 percent, had defaulted by May 2012. Also consistent with the nonprime nature of the mortgages, the FICO scores tend to be lower (about half are below 680), and nearly half of the borrowers purchased their properties at the height of the market, in 2004 and shortly thereafter, when subprime lending was at its peak (Mayer and Pence 2008).

As with the full population of 1-to-3-family properties and condos discussed above, the CoreLogic-matched sample shows a disproportionate incidence of complaints when properties are bank owned. Listed and nonlisted REO properties make up 1.6 percent of the monthly observations, but 5 percent of the observations where complaints are logged. Similarly, borrowers in foreclosure make up 15 percent of the sample, but 21 percent of observations with complaints. On the other hand, monthly observations for borrowers who were current, 30–60 days delinquent, and even seriously delinquent (90 or more days) but pre-foreclosure received disproportionately low rates of complaints.

Interestingly, borrowers with different levels of equity are proportionally represented among the owners who do and do not receive complaints each month. In other words, there appears to be no relationship between equity and property upkeep, as evidenced by neighbor and tenant reports to City government. This relationship holds in the regression models (discussed in the next section) after attempting to correct for property-level heterogeneity in the underlying propensity to generate complaints.

While it is not possible to tell exactly which borrowers are pursuing short sales, I have a useful proxy—whether the borrower has listed the property in the MLS as a short sale.[16] For 1.4 percent of monthly observations, the properties were actively listed in the MLS as short sales. However, these listed properties constituted nearly 3 percent of the monthly

[16]The MLS data include a short sale flag, but it is often not populated, especially in 2009. Moreoever, owners attempting short sales may have an incentive to deliberately misrepresent their listings as arm's length sales, if they are concerned that prospective buyers will be repelled by the short sale label before giving their property a chance. I supplement the short sale flag with information from CoreLogic on the borrower's equity and mortgage indebtedness. If the borrower owes at least $20,000 more than his property is worth at the time of the listing, or if the listing price falls short of the mortgage debt by at least $20,000, I flag the listing as a short sale attempt. As I show in the regression results in the next section, my results are not sensitive to whether I use the MLS short sale flag alone or this enhanced version.

observations in which complaints were lodged against a borrower. As I discuss later in greater depth, the borrowers who pursue short sales appear more severely distressed than those who do not, which may confound the relationship observed between short sale listings and complaints.

4 Modeling the monthly probability of complaints

To determine whether the probability that an owner's property receives a complaint in a given month is correlated with whether he is current on his mortgage, delinquent, or in foreclosure, I use a multi-level, longitudinal regression model. To take advantage of the changes in monthly mortgage status and complaints for an owner over time, I sum the number of complaints received by the City for a given property each month.[17] I estimate the regression as a logit model—for each month m, I estimate the probability that an owner's property i is the subject of at least one complaint or request:

$$Prob(y_{im} = 1) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 \cdot \text{SRSDLQ}_{im} + \beta_2 \cdot \text{FORECL}_{im} + \beta_3 \cdot \text{REO}_{im} + \beta_4 \cdot \text{X}_i + \beta_5 \cdot \text{Z}_{im} + (\epsilon_{im} + u_i))}}, \qquad (1)$$

The first three variables indicate a property's status in the foreclosure process: $SRSDLQ_{im}$ is coded as 1 if the borrower who owns property i is 90 days or more delinquent on mortgage payments as of month m, but his lender has not initiated foreclosure proceedings.[18] $FORECL_{im}$ indicates that the mortgage is formally in foreclosure during month m, and in some specifications, I distinguish between whether at month m the borrower has been in foreclosure for more or less than one year. REO_{im} indicates that the bank owns property i, and in the main specification I compare REO status when the bank has recently acquired the property and not yet listed it to when the property is actively on the market.

There are several covariates in the model: X_i includes a vector of time-invariant, property-level predictors, namely dichotomous variables for small multifamily properties (of 2–3 units)

[17] An alternative approach is to estimate a poisson model on the number of complaints reported each month. In only 434 cases (less than 0.3 percent of the sample) did a property receive two or more complaints in a particular month, so I instead use the dichotomous outcome for the bulk of my analysis. However, results from a poisson model are consistent with my findings from the logit model and are available upon request.

[18] There is no statistically or economically meaningful difference in the rates of complaints between borrowers who are current and those who are 30-to-60 days delinquent. A couple of missed payments may not be a good indicator of financial distress for this group of borrowers. As Willen (2012) explains, "Borrowers with low credit scores are routinely delinquent on their mortgages and obligations. Herzog and Earley (1970) refer to 30 days past due as 'casual delinquency' and it was well known in the industry that it was generally not a cause for concern with low credit-quality borrowers."

and condos. Z_{im} includes a set of dichotomous time controls that correspond to the quarters of the year, to control for seasonal differences in the prevalence and types of complaints made (as displayed in Figure 2). Also included are year variables, which control for how use of the system has changed, more broadly.

In addition to determining how the mortgage status is correlated with constituent complaints and service requests, I re-specify Equation 1 to determine whether borrowers with less equity are more likely to undermaintain their properties. I use the CoreLogic TrueLTV data on borrowers' estimated home values (calculated monthly using AVMs) and total mortgage indebtedness (estimated by CoreLogic using originations of primary and subordinate-lien loans) to measure equity. Finally, I examine how outcomes differ for borrowers who do and do not attempt to resolve their mortgage defaults through short sale. As explained in Section 3, I use active short sale property listings as a proxy for a borrower's interest in and effort toward pursuing a short sale in a particular month.

It is important to account for unobserved property heterogeneity. To begin with, there are obvious reasons to believe that residents in different neighborhoods will be more or less likely to contact the City with requests and complaints. In neighborhoods where knowledge about the hotline, for example, is widespread, we would expect properties to be the subject of a greater number of complaints, all else equal. Further, using the CRM dataset and focusing on snowplow requests, Levine and Gershenson (2012) find that requests for city services (specifically, requests for snow plowing) are positively correlated with the share of a neighborhood's population that is African American and U.S.-born. They also find higher request rates among neighborhoods with greater interaction with police and where residents are better informed about community activities and organizations.

Levine and Gershenson (2012) conduct their analysis of neighborhoods using census tracts as the unit of analysis. However, disparities in reporting to the City may differ even at the block level, if knowledgeable or proactive residents on some blocks are more likely to call in complaints about their immediate surroundings. In an attempt to correct for this problem, and to acknowledge that, for a variety of reasons, a particular property's likelihood of being reported in a given month is not independent of its probability of being reported at other times, I structure Equation 1 as a multilevel random-intercepts model, which contains a property-specific error term, u_i. I also show in the appendix that the model results do not change substantively when neighborhood controls (in the form of census tract fixed effects) are included.

An alternative to the random-effects model used here is a model with a separate fixed effect for each property. The two models give statistically equivalent parameter estimates if basic modeling assumptions (below) hold. However, by estimating separate parameters for

each property in the fixed-effects version, we sacrifice many degrees of freedom, leading to a reduction in statistical power and greater likelihood of committing a type II error—failing to find a correlation between mortgage status (or short sale status) and complaints when such a relationship really does exist. More importantly, the fixed-effects model can be estimated only for properties that have variation in the dependent variable. (A property that either had a complaint each month or had no complaints could not be included in the model, since the fixed effect for that property would perfectly predict its outcome.) Finally, by including property-level fixed effects, I would be unable to include in my model any static, property-level characteristics (such as time-invariant neighborhood indicators or hedonic characteristics, such as structure type), as those would be collinear with the fixed effects. It is appropriate to use the random-effects model so long as one key assumption is met—that unobserved differences among the properties are uncorrelated with other predictors included in the model.[19] If this assumption does not hold, the property-level error term, u_i, would be correlated with the predictors in the model, which would result in inconsistent estimates from the random-effects model. In contrast, the fixed-effects model does not present this issue, since the property-level variation does not enter the error term—it is captured in the fixed effects themselves.

Conducting a Hausman test to compare the coefficients estimated by the two models makes it possible to test the validity of the random-effects model. To conduct a Hausman test on my sample, I must restrict my observations to those 1,343 properties that are the subject of at least one complaint, but not a complaint in every month.[20] After doing so, I find that a parsimonious specification of my model passes the Hausman test, or in other words, the random-effects estimates are consistent.[21]

A further concern is that the random-effects model accounts for only time-invariant heterogeneity in a property's outcomes. Since the panel includes a large number of waves for each borrower, serial correlation in the error term may be an issue if, say, receiving a complaint in one month influences the probability that a property will receive a complaint in the next month. The presence of this autocorrelation would make the standard errors invalid. To verify my results, I estimate a linear probability random-effects model, which enables me to cluster the standard errors at the property level. I show in Appendix Table A-3 that the results are not substantively different using this specification.

[19] See Murnane and Willett (2011) and Wooldridge (2009) for more details.

[20] As mentioned above, properties with no variation in the dependent variable will be perfectly identified by fixed effects and so cannot be modeled in this framework.

[21] A parsimonious specification of the model, forgoing time and property type controls, is needed for estimating the fixed-effects model. Otherwise, the fixed effects perfectly identify the outcome. I find insufficient evidence to reject the null hypothesis of the Hausman test, that the differences in the two models' regression coefficients are not systematic, with p=0.645.

5 Results and Discussion

I estimate the work-horse model in this paper, the multilevel logistic regression model with property-specific random intercepts, in several different ways, utilizing both between- and within-property variation in the number of complaints reported each month during the borrowers' and lenders' ownership periods.

5.1 Delinquency and foreclosure status

I find statistically significant, economically meaningful evidence that a borrower's mortgage status (or a property's status as bank owned or resold to a new owner) is correlated with the probability that the property is the subject of a complaint or service request made by a constituent to local government. Essentially, beginning with the date when a borrower becomes seriously (90 or more days) delinquent, the incidence of complaints begins to rise. As shown in the odds ratios in Model 1 of Table 6, during the first year in default, a borrower is, on average, 1.35 times as likely to be the subject of a complaint as when that borrower was current on his mortgage. After spending a year in default, the odds increase to more than 1.7. However, serious delinquency seems to be tied to a greater incidence of complaints only when a borrower is in foreclosure (Model 2). Once a borrower is in foreclosure, he is over 1.8 times as likely to receive a complaint as when he is current on the mortgage. The effect appears to grow as a borrower spends longer in foreclosure (Model 3), although the difference in the estimates is not statistically significant (p=0.34).

Model 3 also indicates that properties are particularly susceptible to complaints after becoming REO. Specifically, prior to listing the REO properties for sale, lenders are more than 2.8 times as likely to receive a complaint as when the borrowers were making their monthly mortgage payments. After listing the properties, the odds increase to over 3.8. Because these estimates are similar in size and are statistically indistinguishable (p=0.26), I rely on the more parsimonious Model 2 of Table 6 as the main specification throughout the rest of the paper.

For illustrative purposes, consider a property owned by a borrower who is current on his mortgage payments and has a 0.02 probability (2 percent, or 1 in 50 chance) of being the subject of a complaint each month. The probability that the borrower experiences a complaint increases, on average, by about 20 percent (to 0.024) when he becomes seriously delinquent, prior to the lender initiating foreclosure proceedings. Relative to when he was current, once the borrower is in foreclosure, the likelihood that his property receives a complaint increases by about 85 percent (to 0.037), relative to being current on the mortgage. Unfortunately, it is not possible to tell why foreclosures lead to more complaints, Perhaps it is because owners

who reach this stage are more likely to have vacated their properties, or because being in formal foreclosure proceedings may cause them to "give up" on their properties, or maybe they are simply more financially distressed and less capable of maintaining their properties at this time than they were during earlier stages of delinquency.

The situation becomes even worse once the property is bank owned, with the fitted probability rising dramatically to 0.06 (6 percent chance of receiving a complaint). The increase in complaints when properties become REO does not appear to be driven by the bank simply inheriting poorly maintained properties that have lingered in foreclosure. If this were true, we would expect complaint rates to be highest when banks first take over ownership or for complaints to be correlated with the time properties spend in the foreclosure process (from the time of the first missed payment to the foreclosure auction). But as Figure A-1 shows, neither of these relationships holds in the data.

These general relationships tend to hold for each type of complaint or request made (Table 7).[22] "Poor condition" complaints, which are the most common form of complaint in my dataset, reference topics like water leaking into an apartment, broken windows, or a combination of several types of problems. REOs are particularly prone to these types of complaints, receiving them, on average, at over four times the rate of properties owned by borrowers who are current (but are observed to default at some point in the dataset).

While these patterns hold for all property types, as shown in Table 8, they are particularly strong for single-family properties. Although the single-family estimates are based on a relatively small number of complaints (183, or 0.5 percent of the subsample of single-family monthly observations), I find that the typical single-family property is over nine times as likely to receive a complaint while REO than while its owner was current on his mortgage. Similarly, for single-family owners there is a greater average difference between a borrower's property upkeep while he is current and while he is in foreclosure; he is nearly 3.8 times as likely to receive a complaint while in foreclosure as when making payments regularly. Unlike in the case of small multifamily and condo properties, it may be likely that during the foreclosure and REO stages the single-family property sits vacant, in which case there is no chance that occupants of other units on the premises could help to maintain it. Vacancies in single-family homes may also be more obvious to neighbors, who may choose to report problems more expeditiously than if they believe a property is occupied.

Complaints can come from not only neighbors but also from tenants. If a property is

[22]Based on detailed descriptions of a large number of these cases, these types of complaints seem the most relevant to mortgage distress. I omit building inspection requests from the main models in Tables 6–10, since these requests may be driven by problems or can be routine or even proactive requests by owners. I also omit from the main models complaint types like graffiti and illegal dumping that likely indicate that a property owner has been a victim of others' actions.

occupied, all else equal, it may be more likely that the City receives a report about it. Tenants of foreclosed properties, particularly those living in units recently bought back at auction by lenders, may not know whom to contact about property problems, and therefore may use the City as a contact of last resort.[23] Once a property is listed for sale, it is more likely to have been brought up to code, and tenants and neighbors may find it easier to identify the party responsible for the property—either through contacting the real estate agent in charge of the listing or by checking REO registration postings at properties, which should have been brought into compliance by the servicer or the real estate agent by this time.[24] However, results from Model 3 of Table 6 indicate that, if anything, REO properties generate somewhat more complaints *after* they are listed for sale than before. Ultimately, though, the differences based on listing status are not consistent enough to be statistically compelling.

Another factor might explain why properties receive more complaints once they become REO—constituents may feel less hesitant to report code violations and other infractions to the City if a property is owned by a bank rather than by an individual in the community. However, particularly before the "for sale" sign is posted by the bank, residents may not even realize a property is bank owned. In an in-depth study of several Boston neighborhoods hard-hit by foreclosure and vacancy, Graves (2012) writes, "...with so many distressed properties in the neighborhood, it may not be that surprising that many residents did not know the home had been foreclosed on. As one male renter commented, 'Wow, it's a foreclosure. Nobody knows about it,'" (3).

5.2 Borrowers' equity

As discussed in Section 1, one interesting question is whether borrowers with less equity (particularly those with negative equity), are less likely to care for their properties, since their degree of indebtedness may place them in a position analogous to that of tenants.

To study the role of borrowers' equity in property upkeep, I use the TrueLTV fields from CoreLogic, which are available for 63 percent of borrowers in the dataset, reducing my analysis sample to 5,567 borrowers tracked for a combined total of 149,017 monthly observations. By tracking each borrower's purchase price and the principal values of various

[23]Since August 2010, Massachusetts has protected tenants from eviction until the lender sells the property out of REO, so long as the tenant pays the rent and has a valid lease. Even before this law was passed, some tenants still occupied their units after the foreclosure auction, before the lender began eviction proceedings or informal negotiations with tenants.

[24]Boston requires that REO properties be registered with the Inspectional Services Department. The REO registration ordinance requires that lenders display contact information at REO properties for locally based representatives responsible for property upkeep.

mortgages he takes out, CoreLogic is able to estimate his amount of equity each month, even accounting for subordinate liens.[25] For each month, I categorize the owner's level of equity using the bins summarized in Table 5. Table 9 shows the results of the main multilevel model, now controlling for equity.

Column 1 displays results of the main model, estimated on this reduced sample of borrowers and producing similar estimates to those in Table 6. After adding controls for the borrower's equity level (column 2), I find no consistent evidence that borrowers with less equity are more likely to be the subject of a complaint than borrowers who have more equity. However, because Model 2 of Table 9 includes controls for the borrower's mortgage status, the results should be interpreted with caution. Owners who default and have high levels of equity ought to be rare, since they should be able to sell their properties, or possibly even refinance, when they become financially distressed. Also, if borrowers with a lot of equity are seriously delinquent, that is a signal that they may be experiencing extreme financial distress or adverse life events impacting their ability to make payments, above and beyond the circumstances that might trigger default for a borrower with less equity.[26]

To confront this issue, in Model 3 I remove the controls for monthly delinquency status. I still find no consistent evidence that properties owned by borrowers with higher levels of equity are more or less likely than those owned by borrowers with low (or even negative) equity to be the subject of a complaint. In other words, I find no support for the hypothesis that reduced "ownership incentives" lead low-equity borrowers to take worse care of their properties than borrowers with more equity do, although my results on maintenance may not generalize to all forms of home improvement, particularly larger-scale investments in property features. Perhaps more importantly, the CoreLogic data on loan-to-value ratios reflect only the "best guess" about an owner's indebtedness and contemporaneous home value, and even if the data are accurate, borrowers may be unaware of their true levels of equity. A borrower's perceived equity may, in fact, have greater influence on his maintenance and investment decisions than a more objective estimate of his equity.[27]

[25]The TrueLTV data seem to be highly accurate estimates of borrower debt. A preliminary analysis of mortgage originations and discharges from Massachusetts' Middlesex North Registry of Deeds shows a very high correlation with TrueLTV measures of borrower indebtedness.

[26]See Willen (2012) for a thorough discussion of double triggers and mortgage default.

[27]Melzer (2012), for example, uses homeowners' self-reported property value estimates when calculating equity, which could explain why he finds a relationship between negative equity and lower home maintenance, in contrast with my finding.

5.3 Short sales

Given that property conditions appear to suffer most when properties are REO—but do not necessarily fare poorly when a home is held by an owner with negative equity—a natural question is whether properties sold short suffer less disinvestment than properties sold through foreclosure. One way to address this question is by determining whether owners take better care of their properties while trying to sell them short. One step in the short sale process is to list the property for sale. I use active short sale listings as a proxy for the owner's interest in selling short in a particular month. These owners may differ from those who do not attempt short sales in unobservable ways that could be correlated with the property upkeep indicator. So long as these ways that the owners differ are not correlated with the model predictors, the random-effects estimation strategy, will help to account for the property's (and owner's) underlying propensity to receive a complaint each month, which should help offset this potential selection bias.

At first glance, it appears from the results in Model 1 of Table 10 that properties are more likely to generate complaints if they are in the short sale process. Specifically, owners who have listed their properties for short sale are about 1.4 times as likely to receive a complaint during the active listing than are owners who are not pursuing a short sale. But owners who are attempting to sell their properties short do not seem to be representative of the full sample of distressed borrowers. As shown in the upper panel of Table 11, of the 368 owners in the sample who defaulted on their mortgages and attempted a short sale, 14 percent ultimately lost their properties through foreclosure by the end of 2011. In contrast, only 8 percent of those who had not listed their properties for short sale lost their properties through foreclosure. This seems to indicate that borrowers attempting short sales are particularly distressed, facing imminent danger of foreclosure. Even after restricting the sample to just those borrowers whose lenders have started foreclosure proceedings, there is still a disparity in foreclosure rates between those who did and did not attempt short sales (17 percent and 13 percent foreclosure rates, respectively).

After re-estimating the regression model based on a restricted sample of just those severely distressed owners whose properties end up being sold through short sales or foreclosures, it becomes clear that borrowers who are attempting short sales are equally likely to be the subject of complaints as those who have not listed their properties for short sale (Table 10, Model 2). The odds ratio falls to 0.91, and it is statistically indistinguishable from 1.0.

Does this mean that short sales and foreclosures are equally harmful to neighborhoods? Probably not. Among borrowers who default, the delinquency period for owners—from the time of the last payment to the time the borrower loses ownership of the property—is somewhat longer for completed foreclosures than short sales, with average durations of 25

and 21 months, respectively (Figure 3). Furthermore, foreclosures are held by lenders for an average of eight months,[28] meaning that in the typical foreclosure, properties spend a year longer in "ownership limbo" than in the typical short sale. Add to this the fact that properties appear to suffer worse upkeep when they are bank owned, and it is reasonable to expect foreclosures to be associated with substantially worse property maintenance outcomes than short sales.

6 Limitations and robustness checks

A central limitation of this paper is that the CRM data are based on voluntary constituent reports about property conditions. The random-intercepts model helps correct for time-invariant unobserved heterogeneity in a property's likelihood of being reported in a particular month, which should partially account for disparities in neighborhood use of the Citizens Connect system. Alternative specifications controlling for the census tract of the property and the borrower's mortgage servicer give consistent results, as displayed in the appendix. But if use of the system is changing over time in a way that is correlated with changes in mortgage distress—for example, if a neighborhood's propensity to report problems increases as its stock of REO properties grows—then the results presented could be biased. Moreover, it is possible that not all complaints necessarily represent actual, serious problems, and certainly not all problems are tied to the financial distress of the owner or the status of a property as REO. Ultimately, however, each complaint is a case that the City must, at a minimum, investigate, and usually cases reflect problems that City staff must solve. So in this way, complaints are a truly relevant measure of the drain on public resources correlated with mortgage distress and foreclosure.

It is also reassuring that these results are consistent with other recent studies of foreclosure impacts. The finding that property upkeep falters when owners are in foreclosure, well before banks take over ownership, is consistent with Gerardi et al. (2012), who find that price spillovers peak while borrowers are in the foreclosure process. Also recently, Ellen, Lacoe, and Sharygin (2012) provide compelling evidence that foreclosures are correlated with increased crime rates in neighborhoods, particularly when properties are in foreclosure (approaching the time of the foreclosure auction) and are bank owned. Finally, these results are consistent with Daneshvary, Clauretie, and Kader (2011)'s findings that short sales are less detrimental than foreclosures to neighboring properties' sale prices.

[28]This is an underestimate, as over 12 percent of the foreclosures in the sample are right-censored in bank ownership. Further, the average time spent in bank ownership is longer, 11 months, when only foreclosures resulting in REO periods—not foreclosures resolved at auction—are included.

A final issue to note is that this analysis is based on nonprime mortgage borrowers whose loans were originated between 2003 and 2007. While these borrowers make up a disproportionate share of defaulting borrowers in Boston, their properties make up less than 5 percent of the city's housing stock, and there may be concern that these results would not generalize to prime mortgage borrowers. However, as discussed in the appendix and summarized in Table A-5, the results are consistent for a much broader sample of owners in Boston, based on a similar, but more limited, analysis, in which foreclosure starts are used as a proxy for mortgage distress.

7 Conclusion and policy implications

This paper is the first of its kind to use constituent requests for local government services as an indicator of foreclosure externalities. While other recent studies have found small or nonexistent spillovers of foreclosures on neighboring property values, this could reflect the fact that having a nearby property in foreclosure typically poses only a temporary threat to a neighborhood. In many cases, the types of complaints captured in my dataset reflect issues that certainly impact neighboring owners' and tenants' quality of life for a period of time, but may not have a material effect on the prices of housing (a long-lived asset). This could explain why Fisher, Lambie-Hanson, and Willen (2012) find no price spillover effects from single-family foreclosures, despite the fact that these properties are far more likely (over nine times as likely) to receive complaints while REO than before the borrowers defaulted.

The findings suggest that distressed properties are most problematic when held by banks, both before and during lenders' attempts to sell the properties. Lenders often work to bring properties up to code to enable sales to buyers who require FHA mortgage financing (Sinnock 2012), although perhaps greater bank accountability for properties is needed. Finding the parties responsible for REO property upkeep can be challenging, even when properties have a designated real estate agent. Zillow, a self-described "home and real estate marketplace," recently began providing open access on its website to property records and valuation information for foreclosed properties that have not yet been listed—and in some cases, properties on which foreclosures have not even been completed. The introduction of this type of publicly accessible information may have the supplementary benefit of increasing public awareness about the ownership status of nearby properties and lessening banks' abilities to "hide in the shadows" while their properties become community nuisances.

In February 2008, the City of Boston passed a foreclosure registration ordinance, which requires that lenders holding foreclosed properties register them with the City each year and

pay a $100 fee. The purpose of the ordinance is to help the City track contact information for the stewards of foreclosed properties, in case these properties become unsafe, unsecured, or poorly maintained. More City inspections and code enforcement in distressed neighborhoods may help, although according to the results in this paper, in order to be most effective, these efforts would need to begin before properties become REO—and so before they are registered under the ordinance, a daunting task. Having a large student population, Boston devotes a significant share of its inspectional services resources to routine inspections of rental housing following occupant turnover. This leaves limited resources for ISD to respond to foreclosure-related disinvestment in neighborhoods.

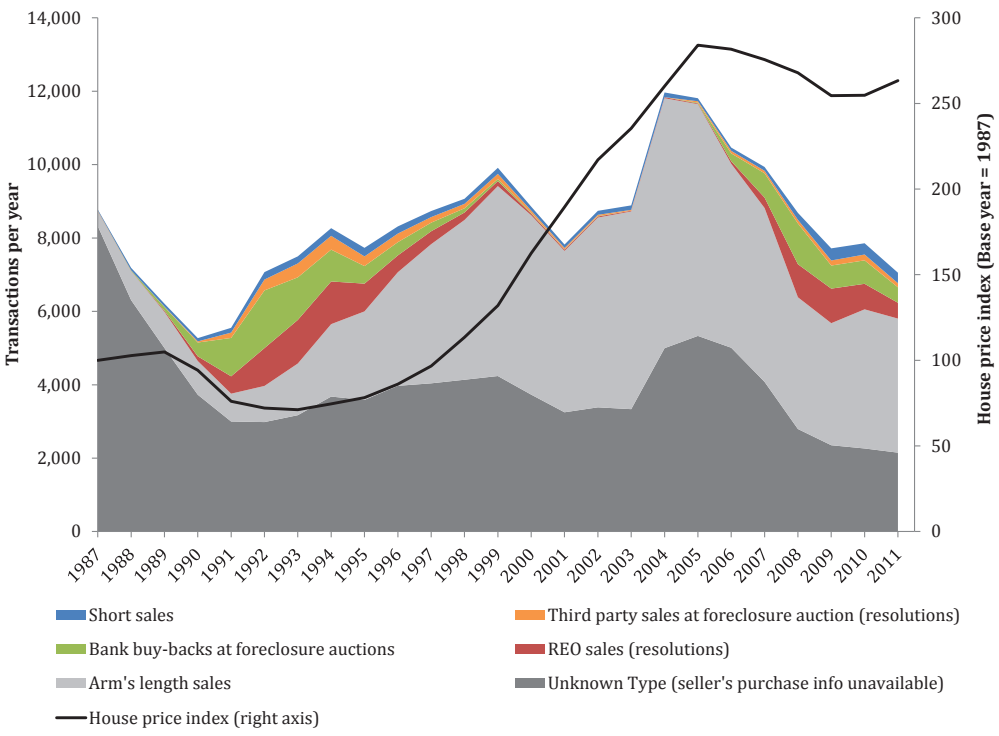
Longer periods in serious delinquency and foreclosure generate negative externalities for neighbors, as demonstrated by this study and by Ellen, Lacoe, and Sharygin (2012) and Gerardi et al. (2012). I show evidence that properties are nearly twice as likely to be the subject of a constituent complaint once the owners are in foreclosure. Policymakers should consider this finding when designing well-intentioned policies that lengthen the foreclosure timeline. As discussed by Gerardi, Lambie-Hanson, and Willen (2013), judicial foreclosure proceedings and state-specific right-to-cure periods lengthen the average foreclosure timeline but do not improve the probability that borrowers self-cure their mortgage defaults or receive mortgage modifications. Policies that lengthen the foreclosure process extend the time properties are in ownership limbo, which could result in more problems from deferred maintenance.

Short sales, which are gaining steam nationally and are the most common form of "aid" lenders grant distressed borrowers (Berry 2012), are shown in this paper to result in shorter durations that properties spend in "ownership limbo" (owned by a bank or a borrower who is not making mortgage payments). Even though properties do not appear to receive better upkeep when owned by a borrower pursuing a short sale, the shorter duration spent in uncertain ownership should make properties sold through short sales less detrimental to their neighborhoods than foreclosures. Of course, short sales can pose problems of their own, particularly fraudulently low prices. A growing share of short sales have been followed by quick resales, at suspiciously high prices (CoreLogic 2011).

Contrary to expectations, my results also indicate that owners are not more susceptible to property complaints if they have less equity. In order to verify the robustness of these results, a potential next step is to analyze code violations and building permit data from the City of Boston, and to devise ways of capturing more accurate measures of equity levels and borrowers' perceptions of their equity. Finally, this paper leaves open the question of how properties fare after being resold to third-party buyers. More information is needed on this topic, particularly to improve our understanding of the role of investors and homeowners in

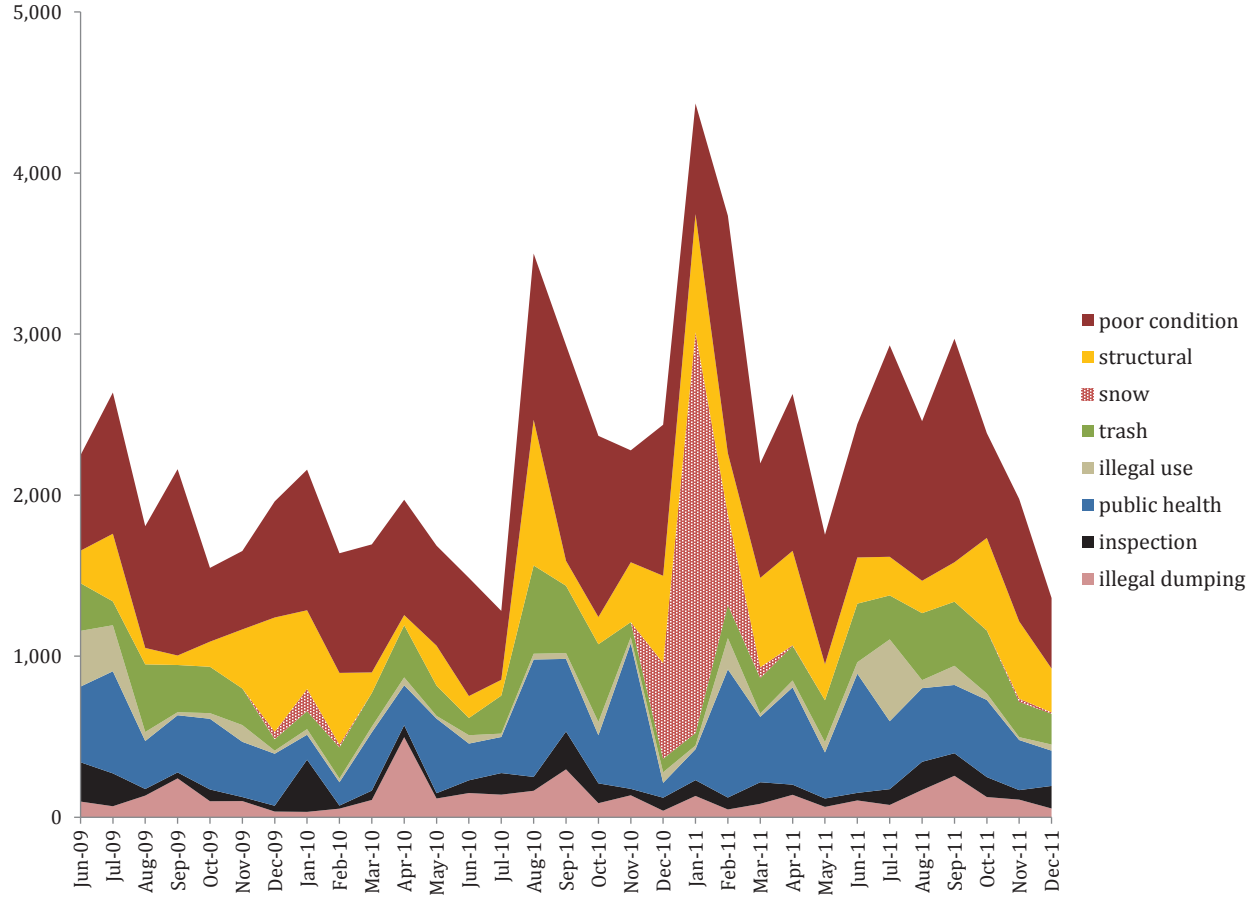
purchasing foreclosed properties and stabilizing neighborhoods.

Figure 1. Types of sales and house prices in Boston, 1987–2011.



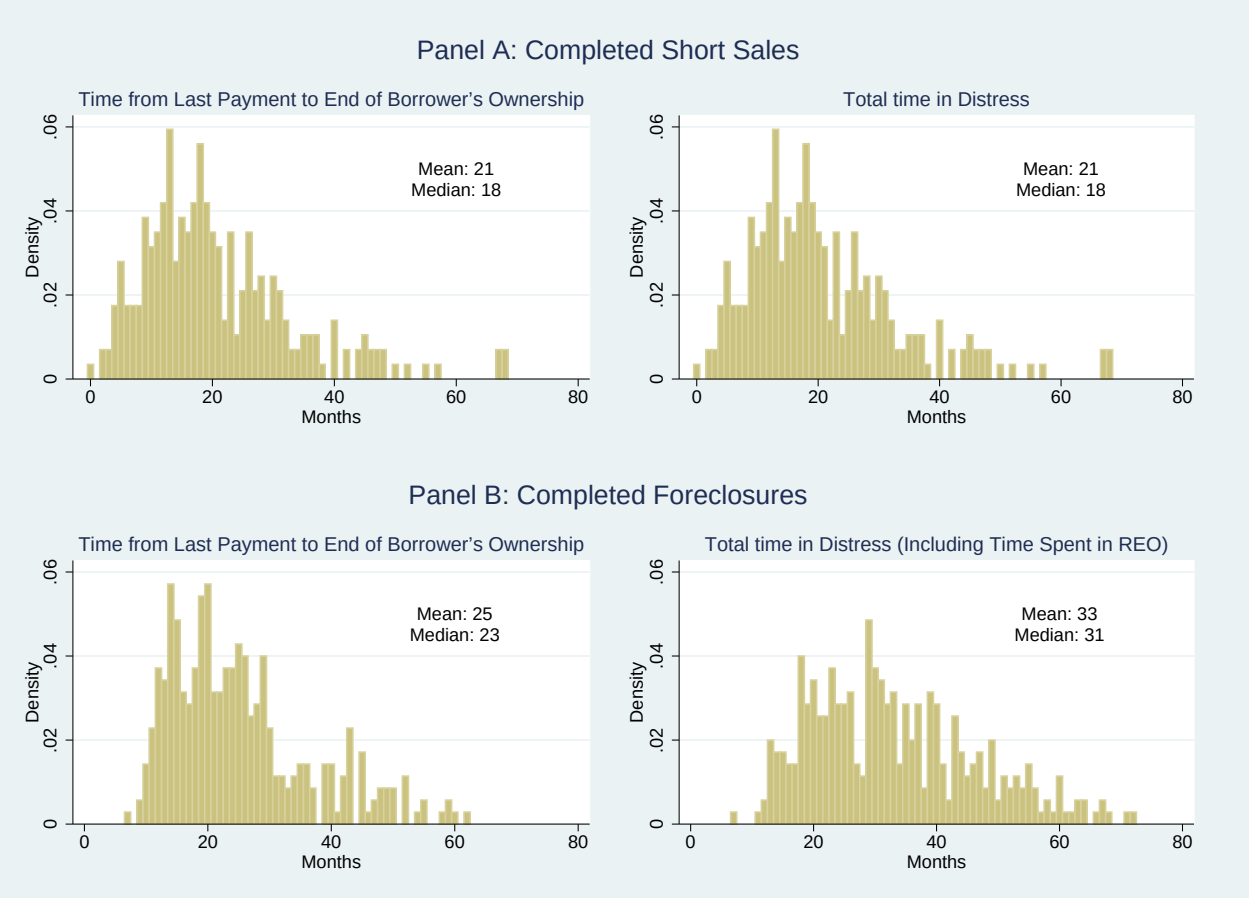
Source: Author's calculations, based on Warren Group data.
Note: Sales of unknown type are either arm's-length or short sales. Because these sellers often purchased their properties before 1987 (when data collection begins), purchase price and loan-to-value information, which is used to identify likely short sales, is not available.

Figure 2. Constituent complaints by type, June 2009–December 2011.



Source: City of Boston Constituent Response Management System, Inspectional Services Department. Cases tabulated by author.

Figure 3. Distribution of durations from last month current on mortgage to resale, for completed short sales and foreclosures.



Sources: Author's calculations, based on data from the City of Boston, the Warren Group, and CoreLogic. *Note:* The sample includes 287 short sales and 350 completed foreclosures. The charts on the left show the months that elapsed from the borrower's last payment to the time the borrower loses the property at foreclosure auction or a short sale transaction. The charts on the right include the total duration from the last payment to the time a third-party buyer purchases the property. For short sales, the left and right charts are identical, since the borrower sells directly to the third-party buyer, with no interim REO period. Note that total durations for foreclosed properties (lower right panel) are lower bounds, since this measure includes 43 properties (12 percent) right-censored in REO.

Table 1. Percentage of owners with one or more complaint.

	No petition	Petition no foreclosure	Foreclosure	REO	All owners
Poor Condition	12.4	16.8	16.0	17.2	12.7
Structural	7.0	7.4	7.4	8.2	7.0
Public Health	8.0	7.3	6.0	7.4	7.9
Illegal Use	1.6	3.1	2.5	1.8	1.6
Trash	5.7	4.1	3.9	2.4	5.6
Snow	3.2	2.4	1.7	1.7	3.2
Inspection	2.7	2.8	3.7	2.4	2.7
Illegal Dumping	3.2	2.4	2.0	1.8	3.2
Any	**26.7**	**28.9**	**26.9**	**24.2**	**26.7**
Owner-month observations	97,795	3,477	1,322	2,291	104,885

Source: Author's calculations, based on Warren Group and City of Boston Constituent Response Management data. This table displays the percentage of owners whose properties were the subject of one or more complaints between June 2009 and December 2011. The universe is all owners in Boston who held their properties at some time during this period. Bank owners are classified as REO. Other owners are categorized by the last observed status of their property, as of the time they sold or January 1, 2012.

Table 2. Distribution of complaints across owners, by owner's level of distress.

	No petition	Petition, no foreclosure	Foreclosure Completed	REO	All owners
Poor Condition	90.0	4.4	1.5	4.0	100
Structural	95.7	2.3	0.6	1.3	100
Public Health	93.9	2.8	0.8	2.5	100
Illegal Use	90.8	5.4	1.5	2.2	100
Trash	95.6	2.4	0.9	1.1	100
Snow	95.7	2.3	0.6	1.3	100
Inspection	93.1	3.4	1.6	2.0	100
Illegal Dumping	95.4	2.6	0.8	1.2	100
Any	92.7	3.5	1.2	2.7	100
Distribution of Owners	93.2	3.3	1.3	2.2	100
Mean months of data†	24	27	13	10	24

Source: Author's calculations, based on Warren Group and City of Boston Constituent Response Management data. This table displays the share of total complaints between June 2009 and December 2011 that were experienced by owners of different types. The universe is all owners in Boston who held their properties at some time during this time. Bank owners are classified as REO. Other owners are categorized by the last observed status of their property, as of the time they sold or January 1, 2012. †"Mean months of data" reflects, for each owner group, the average number of months a property owner held the property between June 2009 and December 2011 (when the CRM data are available).

Table 3. Summary of datasets used in complaints analysis.

Public records data on mortgage and sale transactions ***Sources:*** **Warren Group and Suffolk Registry of Deeds** Mortgage date, origination amount, lender, interest rate (for adjustable-rate mortgages), property type, foreclosure deeds and petitions, buyer purchase and sale dates and prices, auction date and name of buyer (if applicable), property location (address, census tract, and parcel number)
Loan-level data on mortgage characteristics and monthly performance ***Source:*** **CoreLogic** Mortgage date, monthly balance and paymentstatus, origination amount, mortgage purpose (purchase vs. refinance), lender, servicer, interest rate, borrower's FICO score at origination, estimated contemporaneous equity, lender's loss amount (if applicable)
Constituent complaints and requests for public services ***Source:*** **City of Boston** Date of case, location of problem/request (address and parcel number), detailed description of case, type of issue (standard categories in Table 1), department to which case is referred
Real estate sale listings ***Source:*** **MLS Property Information Network** Date of listing, current status type and date (e.g., sold, canceled, etc.), listing price (original and current), short sale flag, REO flag, location (address), book and page of recent sale deed

Table 4. Raw categories of complaints to City of Boston departments and agencies.

Raw Category (1–34)	Freq.	Raw Category (35–68)	Freq.	Raw Category (69–102)	Freq.
Schedule a Bulk Item Pickup	48,255	Parking Enforcement	1,824	★No Utilities Residential - Water	330
General Request	44,925	Work without a Permit	1,680	Zoning	325
Request for Recycling Cart	17,483	Major System Failure	1,665	Protection of Adjoining Property	310
Street Light Outages	16,675	General Comments For An Employee	1,643	Illegal Parking on Front/Back Yards	296
Request for Snow Plowing	15,529	★Unsafe Dangerous Conditions	1,590	Requests for Traffic Signal Studies or	290
Missed Trash/Recycling/Yard Waste/Bulk	14,614	Street Light Knock Downs	1,378	★Construction Debris	283
Request for Pothole Repair	10,499	New Tree Requests	1,072	Illegal Posting of Signs	260
Park Maintenance Requests	9,308	Roadway Repair	1,033	Big Buildings Online Request	237
★Unsatisfactory Living Conditions	8,884	Contractor Complaints	1,013	★Abandoned Building	234
Highway Maintenance	8,205	Notification	941	Big Buildings Enforcement	232
Traffic Signal Repair	7,298	Public Works General Request	925	Work Hours-Loud Noise Complaints	229
Graffiti Removal	6,820	Space Savers	913	Request for Litter Basket Installation	219
Tree Maintenance Requests	6,238	★Bed Bugs	904	Food Alert - Unconfirmed	214
Abandoned Vehicles	6,141	Unsanitary Conditions - Establishment	832	★Lead	212
Tree Emergencies	5,153	Transportation General Request	799	★No Utilities Residential - Electricity	212
General Comments For a Program or Policy	5,003	★Mice Infestation - Residential	778	Working Beyond Hours	210
Sticker Request	4,816	★Maintenance Complaint - Residential	777	Maintenance - Homeowner	206
Sidewalk Repair	4,389	Request for Snow Plowing (Emergency Residential)	772	★Unsatisfactory Utilities - Electrical,	205
Pick up Dead Animal	4,007	★Electrical	752	Big Buildings Resident Complaint	203
★Improper Storage of Trash (Barrels)	3,907	General Lighting Request	736	Parking Meter Repairs	198
★Snow Removal	3,698	Illegal Occupancy	724	★Plumbing	198
★Rodent Activity	3,501	Empty Litter Basket	671	Exceeding Terms of Permit	178
Requests for Street Cleaning	2,682	Cross Metering - Sub-Metering	654	Contractors Complaint	161
Recycling for Multi-Unit Housing	2,616	Recycling Cart Return	635	PWD Graffiti	149
Sign Repair	2,528	★Breathe Easy	591	★Sewage/Septic Back-Up	149
★Heat - Excessive, Insufficient	2,486	Unsanitary Conditions - Food	542	Yardwaste Asian Longhorned Beetle Affec	135
☆Illegal Dumping	2,375	★Chronic Dampness/Mold	541	★Squalid Living Conditions	128
★Poor Conditions of Property	2,367	Parks Lighting Issues	519	Unsanitary Conditions - Employees	117
Utility Call-In (non-ISD)	2,236	★Overflowing or Un-kept Dumpster	498	Illegal Auto Body Shop	114
☆ Building Inspection Request	2,013	★Illegal Rooming House	462	★Illegal Use	113
Sidewalk Repair (Make Safe)	2,008	★Trash on Vacant Lot	437	Pedestrian Safety Issues	113
Missing Sign	1,880	Pavement Marking Maintenance	416	★Overcrowding	112
New Sign, Crosswalk or Pavement Marking	1,853	★Pest Infestation - Residential	372	Food Alert - Confirmed	101
Misc. Snow Complaint (non-ISD)	1,827	Parks General Request	355	★Miscellaneous (< 100 cases)	2168

Source: Author's calculations, based on City of Boston Constituent Response Management data for 2009–2011. Excludes categories marked as internal reports. ★ indicates complaints that are included in the summary statistics and regression models, while ☆ indicates related complaints assessed in summary statistics only. When a category's relevance was unclear, I looked at a random sample of the raw case descriptions to determine whether to include the complaint. Miscellaneous types included in the analysis were: pigeon infestation, rat bite, mosquitoes (West Nile), carbon monoxide, student overcrowding, rental unit delivery conditions, egress, and poor ventilation.

Table 5. Summary statistics for matched sample used in complaints analysis

	No Complaints (column %)	1 + Complaint (column %)	Monthly Observations
Borrowers and REO Owners (n=5,812 owners, 151,458 monthly obs.)			
Property Type			
Single-family	25	7	37,072
2-family	24	15	36,185
3-family	23	28	35,440
Condominium	28	51	42,761
Total	100	100	151,458
Mortgage Status			
Current	61	55	91,947
30-to-60 days delinquent	10	7	14,660
90 days delinquent:			
$\leq$ 1 year, pre-foreclosure	9	7	12,916
$>$ 1 year, pre-foreclosure	4	5	6,297
$\leq$ 1 year, in foreclosure	4	5	6,391
$>$ 1 year, in foreclosure	11	16	16,806
REO, not listed	1	4	1,925
REO, listed	0	1	516
Total	100	100	151,458
Borrowers (n=5,567 owners; 149,017 monthly obs.)			
Purchase year			
before 1999	34	29	50,764
1999–2003	20	18	30,275
2004–2007	45	53	67,978
Total	100	100	149,017
FICO score at mortgage origination			
$<$ 620	22	20	33,134
620–679	31	30	46,319
680–720	22	23	32,996
over 720	24	26	35,592
Total	100	100	149,017
Borrowers with TrueLTV data (n=3,522 owners; 121,768 monthly obs.)			
Equity			
$<$ -20%	43	42	52,480
-20% to -10.1%	12	10	14,908
-10% to 10%	20	22	24,936
10.1% to 24.9%	10	10	12,500
25% to 100%	14	16	16,944
Total	100	100	121,768
Short sale listing			
Short sale attempted	1	3	1,725
Short sale not attempted	99	97	120,043
Total	100	100	121,768

Source: Author's calculations, based on constituent reports data from the City of Boston; property type and purchase year from the Warren Group; monthly mortgage status, FICO score, and equity data from CoreLogic, and sale listings data from the MLS Property Information Network. †This total includes an additional 976 monthly observations missing the FICO score at origination, nine of which were associated with a complaint.

Table 6. Examining the impact of delinquency, foreclosure, and listing status on the incidence of constituent complaints.

	M1	M2	M3
seriously delinquent: 1–12 mos.	1.354***		
	(4.12)		
seriously delinquent: 13+ mos.	1.720***		
	(7.24)		
seriously delinquent, pre-foreclosure		1.212*	
		(2.38)	
seriously delinquent, pre-foreclosure: 1–12 mos.			1.173~
			(1.78)
seriously delinquent, pre-foreclosure: 13+ mos.			1.328*
			(2.21)
seriously delinquent, in foreclosure		1.847***	
		(8.26)	
seriously delinquent, in foreclosure: 1–12 mos.			1.716***
			(5.04)
seriously delinquent, in foreclosure: 13+ mos.			1.916***
			(7.79)
REO		3.020***	
		(7.45)	
REO, not listed for sale	2.717***		2.860***
	(6.22)		(6.55)
REO, listed for sale	3.676***		3.855***
	(5.15)		(5.35)
Year	✓	✓	✓
Season	✓	✓	✓
Property Type	✓	✓	✓
Observations (mortgage months)	151,458	151,458	151,458
Chi-square	503.58	514.4	517.08
Log likelihood	-12134.4	-12129	-12127.5

Sources: Author's calculations, based on data from the City of Boston Constituent Response Management system, the Warren Group, MLS Property Information Network, and CoreLogic. The omitted status category is borrowers who are current to 60 days delinquent. Controls for calendar quarter, year, and type of property (single-family, multifamily, or condo) are also included in each model. ***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. Odds ratios are displayed, along with z-statistics in parentheses.

Table 7. Distinguishing between different types of constituent complaints.

	Poor Conditions	Structural	Public Health	Illegal Use	Trash	Snow	Inspection	Illegal Dumping
seriously delinquent, pre-foreclosure	1.506***	1.468*	1.328~	1.224	0.743	0.865	1.21	1.028
	(3.83)	(2.28)	(1.88)	(0.78)	(-1.21)	(-0.43)	(0.65)	(0.09)
seriously delinquent, in foreclosure	2.331***	2.077***	1.513**	2.769***	1.239	0.924	2.182***	1.066
	(8.76)	(4.96)	(2.98)	(5.16)	(1.10)	(-0.27)	(3.55)	(0.24)
REO	4.348***	2.340*	1.967*	1.926	1.525	2.418~	2.817*	3.620**
	(8.03)	(2.57)	(2.18)	(1.27)	(1.09)	(1.85)	(2.26)	(2.97)
Year	✓	✓	✓	✓	✓	✓	✓	✓
Season	✓	✓	✓	✓	✓	❄	✓	✓
Property type	✓	✓	✓	✓	✓	✓	✓	✓
Observations (mortgage months)	151,458	151,458	151,458	151,458	151,458	29,508	151,458	151,458
Chi-square	308.82	191.63	163.33	52.72	114.91	82.29	74.63	88.25
Log likelihood	-7041.34	-2817.44	-3405.51	-1422.31	-2090.32	-689.87	-1094.1	-1134.86
F-test results (p-values), where H_A:								
$\beta_{pre-foreclosure} \neq \beta_{in\ foreclosure}$	< 0.001	0.073	0.469	0.004	0.072	0.875	0.069	0.920
Monthly Incidence of Complaints								
# with 1 + complaint	1,410	460	558	198	325	122	144	157
% with 1+ complaint	0.9	0.3	0.4	0.1	0.2	0.4	0.1	0.1

Sources: Author's calculations, based on data from the City of Boston Constituent Response Management system, the Warren Group, MLS Property Information Network, and CoreLogic. ***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. Odds ratios are displayed, along with z-statistics in parentheses. The omitted status category is borrowers who are current to 60 days delinquent. Controls for calendar quarter, year, and type of property (single-family, multifamily, or condo) are also included in each model, unless otherwise indicated.

❄ Snow complaints are estimated using only winter months.

Table 8. Results of main complaints specification, broken down by property type.

	All Property Types	Single-Family	Small Multifamily	Condo
seriously delinquent, pre-foreclosure	1.052	1.143	1.281*	1.142
	(0.63)	(0.46)	(2.30)	(0.97)
seriously delinquent, in foreclosure	1.606***	3.777***	1.900***	1.425*
	(6.28)	(5.56)	(6.26)	(2.88)
REO	2.742***	9.220***	2.890***	2.281***
	(6.65)	(5.19)	(4.63)	(3.78)
Year	✓	✓	✓	✓
Season	✓	✓	✓	✓
Property Type	✓	✓	✓	✓
Observations (mortgage months)	151,458	37,072	71,625	42,761
Chi-square	132.89	60.66	72.92	65.08
Log likelihood	-12344.67	-1024.4	-5492.54	-5589.13
F-test results (p-values), where H_A:				
$\beta_{pre-foreclosure} \neq \beta_{in\ foreclosure}$	< 0.001	< 0.001	0.002	0.174
Monthly Incidence of Complaints				
# with 1 + complaint	2,765	183	1,185	1,397†
% with 1 + complaint	1.8%	0.5%	1.7%	3.3%†

Sources: Author's calculations, based on data from the City of Boston Constituent Response Management system, the Warren Group, MLS Property Information Network, and CoreLogic. ***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. Odds ratios are displayed, along with z-statistics in parentheses. The omitted status category is borrowers who are current to 60 days delinquent. Controls for calendar quarter, year, and type of property (single-family, multifamily, or condo) are also included in each model. † Complaints are assigned to each unit in a condo association, inflating the number and proportion of owners who receive a complaint in a particular month.

Table 9. Incidence of complaints by borrower's equity.

	M1	M2	M3
seriously delinquent, pre-foreclosure	1.228*	1.253*	
	(2.30)	(2.50)	
seriously delinquent, in foreclosure	1.741***	1.791***	
	(6.44)	(6.63)	
Borrower's equity			
< -20%		0.854~	0.925
		(1.65)	(0.82)
-20% to -10.1%		0.858	0.888
		(1.41)	(1.08)
-10% to 10.1%	*omitted category*		
10.1% to 24.9%		0.753*	0.729*
		(2.39)	(2.65)
25% to 100%		1.118	1.06
		(0.93)	(0.48)
Year	✓	✓	✓
Season	✓	✓	✓
Property Type	✓	✓	✓
Observations (mortgage months)	121,768	121,768	121,768
Chi-square	421.9	432.77	385.84
Log likelihood	-9277.14	-9270.52	-9291.9

Sources: Author's calculations, based on data from the City of Boston Constituent Response Management system, the Warren Group, MLS Property Information Network, and CoreLogic.

***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. Odds ratios are displayed, along with z-statistics in parentheses. The omitted status category, where applicable, is borrowers who are current to 60 days delinquent. Controls for calendar quarter, year, and type of property (single-family, multifamily, or condo) are also included in each model. The models include only borrowers who for whom CoreLogic TrueLTV data are available each month between June 2009 and December 2011.

Table 10. Complaints reported and short sale listings.

	M1	M2
seriously delinquent, pre-foreclosure	1.149	1.57
	(1.45)	(1.07)
seriously delinquent, in foreclosure	1.586***	2.118~
	(4.71)	(1.86)
short sale attempt	1.372~	0.91
	(1.67)	(0.31)
Year	✓	✓
Season	✓	✓
Property Type	✓	✓
Sample	delinquent borrowers	completed foreclosures and short sales
Observations	66,714	4,498
chi-square	240.71	21.7
Log likelihood	-5026.59	-562.82

Sources: Author's calculations, based on data from the City of Boston Constituent Response Management system, the Warren Group, MLS Property Information Network, and CoreLogic.
***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. Odds ratios are displayed, along with z-statistics in parentheses. The omitted status category is borrowers who are current to 60 days delinquent. Controls for calendar quarter, year, and type of property (single-family, multifamily, or condo) are also included in each model. The models include only borrowers who for whom CoreLogic TrueLTV data are available each month between June 2009 and December 2011. Model 2 includes only the subset of borrowers who ultimately lost their properties to foreclosure or short sale between June 2009 and December 2011. Borrowers are considered to have attempted a short sale in a given month if there is an active listing that month in the MLS and: (1) the listing is flagged as a short sale, (2) the borrower lists with more than $20,000 in negative equity, or (3) the list price falls short of the total outstanding mortgage debt (primary and subordinate liens) by $20,000 or more. Transactions are classified as short sales if the lender experienced a loss of at least $5,000 and 5 percent of the most recent principal balance of the loan.

Table 11. Final sale outcomes for distressed owners, by decision to attempt a short sale.

Owners who default				
	#		% (column)	
Outcome as of December 2011	Not Listed for Short Sale	Listed for Short Sale	Not Listed for Short Sale	Listed for Short Sale
Right-censored	1,458	193	90	52
Short sale	13	117	1	32
Foreclosure	122	50	8	14
Arm's length sale	19	8	1	2
Total	1,612	368	100	100
Owners who experience foreclosure starts				
	#		% (column)	
Outcome as of December 2011	Not Listed for Short Sale	Listed for Short Sale	Not Listed for Short Sale	Listed for Short Sale
Right-censored	805	154	85	51
Short sale	10	92	1	30
Foreclosure	122	50	13	17
Arm's length sale	12	7	1	2
Total	949	303	100	100

Sources: Author's calculations, based on data from the City of Boston Constituent Response Management system, the Warren Group, MLS Property Information Network, and CoreLogic.
Note: The non-zero frequencies for short sales among borrowers who do not list are evidence of shortcomings in the matched listings data. These owners either did not list their property with a real estate agent who uses the MLS (for example, they sold the property themselves), their MLS listing did not contain correct property identifies, or the matching algorithm failed to appropriately match the listing.

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Appendix

A1 Robustness to census tract and servicer controls

Model 1 of Table A-1 reflects results from the main model used in the paper. Model 2 shows that the results are robust to adding census tract controls for neighborhood location, which is effectively included in the random intercept. Models 3 and 4 restrict the main sample to borrowers whose mortgages are serviced by larger companies—those that manage at least 100 loans in the dataset. Model 4 adds controls for the identity of the mortgage servicer, demonstrating that the results are robust to including this control. Again, this is to be expected, since the impact of the identity of the servicer, which rarely ever changes for a loan over time in the CoreLogic dataset, should be accounted for in the property-specific random-intercept.

Table A-1. Influences of census tracts and servicer identities in main complaints model.

	M1	M2	M3	M4
Seriously delinquent, pre-foreclosure	1.212*	1.223*	1.282*	1.256*
	(2.38)	(2.49)	(2.18)	(1.96)
Seriously delinquent, in foreclosure	1.847***	1.912***	2.061***	2.064***
	(8.26)	(8.74)	(7.09)	(7.09)
REO	3.020***	3.225***	3.286***	3.324***
	(7.45)	(7.95)	(6.10)	(6.15)
Year	✓	✓	✓	✓
Season	✓	✓	✓	✓
Property Type	✓	✓	✓	✓
Census Tract		✓		
Servicer				✓
Observations (mortgage months)	151,458	151,458	73,283	73,283
Chi-square	514.4	837.21	257.87	262.96
Log likelihood	-12129	-11932.27	-5647.39	-5644.51

Sources: Author's calculations, based on data from the City of Boston Constituent Response Management system, the Warren Group, MLS Property Information Network, and CoreLogic.

***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. Odds ratios are displayed, along with z-statistics in parentheses. The omitted status category is borrowers who are current to 60 days delinquent. Controls for calendar quarter, year, and type of property (single-family, multifamily, or condo) are also included in each model.

A2 Confronting serial correlation

While the random-intercepts model helps account for the time-invariant propensity of a property to receive a complaint in a particular month, autocorrelation may still threaten the validity of the results. Serial correlation within the error term will occur if, say, receiving a complaint in one month makes it more likely that a property will receive a complaint in the next month. As shown in Table A-2, 89 percent of the 5,567 properties in the sample either never received a complaint or received a complaint in just one month. For the remaining 11 percent of properties, serial correlation may be a particular concern.

Table A-2. Number of months properties received 1+ complaint.

Months with	Properties	
Complaints	Frequency	Percent of Sample
0	4,192	75.30
1	761	13.67
2	291	5.23
3	126	2.26
4	87	1.56
5	37	0.66
6	24	0.43
7	14	0.25
8	11	0.20
9	10	0.18
10	2	0.04
11	2	0.04
12	5	0.09
13	5	0.09
Total	5,567	100

Source: Author's calculations, based on data from the City of Boston Constituent Response Management system.

To combat the influence of serial correlation within the panel, I estimate a linear probability random effects model, allowing me to cluster the standard errors at the property level, and ensuring that the standard errors are estimated consistently (Drukker 2003). In Table A-3, I show that the interpretations of the results from this specification do not differ substantively from those of the main model. If one considers that 0.55 percent of monthly observations for borrowers not in foreclosure include one or more complaints, the linear probability model (LPM) results roughly indicate that 0.75 percent of owners in default but pre-foreclosure and 1.45 percent of borrowers in foreclosure would be expected to experience a complaint. For properties in REO, the share expected to receive a complaint is much higher, about 3.25 percent. These results are similar in direction and significance to the results from the main model (the random-effects logit model), although the LPM results

show an even more prominent escalation in the relative odds of receiving a complaint as a property moves through the foreclosure process.

Table A-3. Clustered standard errors in complaints model.

	Main Model	LPM, with Clustered SEs
Seriously delinquent, pre-foreclosure	1.212*	0.002~
	(2.38)	(1.76)
Seriously delinquent, in foreclosure	1.847***	0.009***
	(8.26)	(5.46)
REO	3.020***	0.027***
	(7.45)	(4.36)
Year	✓	✓
Season	✓	✓
Property Type	✓	✓
Observations (mortgage months)	151,458	151,458

Sources: Author's calculations, based on data from the City of Boston Constituent Response Management system, the Warren Group, MLS Property Information Network, and CoreLogic. Controls for calendar quarter, year, and type of property (single-family, multifamily, or condo) are also included in each model. ***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. Odds ratios are displayed, along with z-statistics in parentheses.

A3 Restricting the sample to defaulting borrowers

The results of the models are similar once the sample is restricted to only those borrowers who experienced mortgage distress. In Table A-4 I present results from the main set of models, restricting the sample to borrowers who are observed to default (become 90 or more days delinquent) by May 2012. Using the restricted sample, the omitted mortgage status category is not just "current to 60 days delinquent," but "current to 60 days delinquent *and previously or soon to become seriously delinquent*." This difference in the interpretation of the omitted category explains why the size and significance of the odds ratios for the mortgage status variables decrease somewhat when the sample is restricted.

Table A-4. Examining the impact of delinquency, foreclosure, and listing status on the incidence of constituent complaints for borrowers who default.

	M1	M2	M3
seriously delinquent: 1–12 mos.	1.248**		
	(2.73)		
seriously delinquent: 13+ mos.	1.543***		
	(5.02)		
seriously delinquent, pre-foreclosure		1.12	
		(1.31)	
seriously delinquent, pre-foreclosure: 1–12 mos.			1.096
			(0.97)
seriously delinquent, pre-foreclosure: 13+ mos.			1.204
			(1.38)
seriously delinquent, in foreclosure		1.676***	
		(6.05)	
seriously delinquent, in foreclosure: 1–12 mos.			1.582***
			(4.02)
seriously delinquent, in foreclosure: 13+ mos.			1.734***
			(5.83)
REO		2.709***	
		(6.3)	
REO, not listed for sale	2.426***		2.579***
	(5.24)		(5.61)
REO, listed for sale	3.253***		3.445***
	(4.55)		(4.79)
Year	✓	✓	✓
Season	✓	✓	✓
Property Type	✓	✓	✓
Observations (mortgage months)	81,340	81,340	81,340
Chi-square	294.24	306.72	307.7
Log likelihood	-6677.47	-6671.42	-6670.9

Sources: Author's calculations, based on data from the City of Boston Constituent Response Management system, the Warren Group, MLS Property Information Network, and CoreLogic. The models include observations for only those borrowers who are observed to default (that is, become 90 days or more delinquent). The omitted status category is borrowers who are current to 60 days delinquent. Controls for calendar quarter, year, and type of property (single-family, multifamily, or condo) are also included in each model. ***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. Odds ratios are displayed, along with z-statistics in parentheses.

A4 Incidence of complaints for bank-owned properties

Properties are the most likely to be the subject of constituent complaints while they are REO. This may reflect bank neglect, the increased willingness of neighbors to complain about lenders rather than individual owners in the community, or neighbors and tenants being unable to track down the properties' stewards (and therefore calling the City for assistance as a last resort). However, it is also possible that banks simply inherit poorly maintained properties about which complaints are much more likely, all else being equal. In particular, this could be the case if a protracted foreclosure process means that properties suffer long periods of disinvestment. Under this scenario, we would expect for REO properties to be most likely to generate complaints shortly after the bank takes over ownership, before the bank has time to fix the problems left by the borrower. We would also expect bank-owned properties to generate more complaints if they spent longer in foreclosure (before the auction). Figure A-1 shows the raw monthly incidence of complaints for REO properties, by the number of months the property has spent in REO. It appears that neither of these hypothesized relationships hold. REO properties seem equally likely to receive complaints if they spend a short or long time in foreclosure, and, although noisy, the incidence of complaints is not highest at the beginning of the REO period.

Figure A-1. Monthly incidence of complaints for the first year of bank ownership, by length of time the property spent in foreclosure.

Source: Author's calculations, based on Warren Group, CoreLogic, and MLS Property Information Network data. *Note:* The sample includes 75 properties with short foreclosure durations (less than 18 months from the last on-time payment to the foreclosure auction, 133 properties with moderate foreclosure durations (of 18 to 35 months), and 42 properties with long foreclosure durations (of 36 months or longer)

A5 Robustness to using full population

Although the CoreLogic dataset used for the analysis in this paper includes only nonprime (subprime and Alt-A) mortgages, the results appear to hold for the full population of distressed prime and nonprime borrowers in Boston. Because it is not possible to identify a borrower's mortgage status in the public records data, I rely on a proxy for defaults—foreclosure starts (also referred to as "foreclosure petitions" or "foreclosure complaints") filed by lawyers on behalf of lenders. As discussed in Lambie-Hanson and Lambie-Hanson (2012), after a borrower defaults on the mortgage and the payments are accelerated, a foreclosure petition is filed in court to formally announce that the lender is about to begin foreclosure proceedings, unless the borrower proves himself to be an active military servicemember, thereby invoking protection from foreclosures under the federal Servicemembers Civil Relief Act. Petitions are generally not filed against borrowers who are clearly ineligible for the servicemember protection (for example, borrowers that are limited liability corporations). Similarly, borrowers who are petitioned sometimes cure their mortgage defaults, though it is not possible to tell this from the public records data. Simply put, the petitions data are a flawed proxy for whether a borrower is in mortgage distress in a given month, although they represent the best indicator available in public records data.

I examine all owners who purchased at some point after 2000 and who held their properties in Boston between June 2009 and December 2011.[29] For owners who have experienced a foreclosure start, once the foreclosure petition has been filed, I flag the borrower as "petitioned" for the rest of his ownership experience. To partially account for missing petitions, when I observe a completed foreclosure, I categorize the preceding 12 months of the ownership as petitioned. This is consistent with the 363-day median duration I observe in the dataset for completed foreclosures between the time of the earliest petition and the time of the foreclosure deed. Using the data from Lambie-Hanson and Lambie-Hanson (2012) on auction dates and the incidence of third-party sales, matched with MLS data, I observe whether and when properties become REO.

The findings from this robustness check can be found in Table A-5. The results for petitioned borrowers (odds ratio of 1.16) appear weaker than those for foreclosed borrowers in the CoreLogic matched sample (1.85). However, it is important to remember that the base case is *owners who have not received a petition*, some of whom are in default on their mortgages (rather than being current or fewer than 90 days delinquent, as in the main models in the body of the paper). Similarly, some of the borrowers with foreclosure starts have cured

[29] I remove owners who purchased properties out of foreclosure (REO or at auction), since property conditions may be "contaminated" by the earlier foreclosure.

their defaults, but because this is unobserved in the dataset, they are flagged as "petitioned" indefinitely. Both these factors work to undermine the size and significance of the estimate for petitioned borrowers.

The results for REO properties carry fewer caveats. Although the base case is still the set of owners who have not yet received a petition (rather than borrowers who are current or "minorly" delinquent), the REO categories are observable states. While these odds ratios are smaller than those reported for the CoreLogic matched sample, it is important to remember that the differences are muted by the imperfect proxy of mortgage default and foreclosure.

Table A-5. Results for population of owners, using foreclosure starts as mortgage status proxy.

	All Owners
Borrowers with foreclosure starts	1.164***
	(4.56)
REO	1.843***
	(10.79)
Observations (mortgage months)	518,748
chi-square	129.93
Log likelihood	-130687.7

Sources: Author's calculations, based on data from the City of Boston Constituent Response Management system, the Suffolk Registry of Deeds, the Warren Group, and MLS Property Information Network.
***, **, *, and ~ represent statistical significance at 0.1, 1, 5, and 10 percent levels, respectively. Odds ratios are displayed, along with z-statistics in parentheses. Controls for calendar quarter, year, and type of property (single-family, multifamily, or condo) are also included in each model.

A6 Data matching procedures

In this section I describe the procedures I used to match the public records transactions datasets with data from CoreLogic, the City of Boston, and the MLS Property Information Network.

CoreLogic mortgage-level data

I begin with 7,882 first-lien subprime and Alt-A loans in the CoreLogic dataset, all of which were originated between 2003 and 2007 and were active between 2009 and 2011. As described below, I successfully match 83.4 percent of these mortgages to unique owners in the Warren Group public records data. The merging process is fairly conservative, so as to avoid false positive matches. The matched and unmatched samples of CoreLogic loans are generally similar, particularly on the share of single-family, multifamily, and condos; the share with negative amortization, interest-only, prepayment penalty, and balloon payment features; and the share of borrowers who provided limited or no income documentation at origination. The matched sample has somewhat lower levels of investor ownership (18 percent, as opposed to 28 percent in the unmatched sample), lower refinance rates (63 percent refinance, as opposed to 69 percent), and a greater share of mortgages that are subprime (50 percent, as opposed to 42 percent).

The initial stage of the match produces a Cartesian product between loans in the CoreLogic and public records data, conditional on exact matches between the ZIP code of the property securing the mortgage and the mortgage origination amount (rounded to the nearest $1,000). Further, the date the mortgage was originated (as recorded in CoreLogic) must be no more than 40 days before (and no more than five days after) the mortgage was recorded in the local registry of deeds. The result is a series of possible matches between the loans in the two datasets. To identify the proper one-to-one match, I introduce a series of restrictions to remove likely false positive matches. However, these restrictions are based on other fields in the data that are not as reliable as the ZIP code, origination date, and origination amount fields. The first stage, for example, removes any matches in which the property type (single-family, multifamily, and condo) does not match, unless the loan amount and first four digits of the lender name match or the loan amount and date perfectly match. The remaining steps follow this general process, using information on the origination date, origination amount, property type, purchase vs. refinance status, mortgage interest rate and margin rate, lender's name, purchase price of the property, and whether the mortgage was terminated through foreclosure. Any CoreLogic loans that cannot be uniquely matched to a single mortgage in the public records data are treated as unmatched.

Constituent Response Management System

I begin with a dataset of 347,606 complaints and service requests filed in 2008–2011. I first restrict the complaints to those that are to be overseen by the Inspectional Services Department, since effectively all problems involving the condition of private properties are the purview of ISD. I next remove any complaint types for commercial properties or that seem unlikely to be relevant to foreclosure-related property conditions, such as construction work without a permit. This leaves me with 36,964 records of complaints. Of these, I use the parcel number of the complaint (which I look up manually using the address, when necessary) to match the complaints to the universe of properties in Boston, achieving a match rate of 94.2 percent. There appear to be no substantive differences in the types or timing of the matched and unmatched samples of complaints. To avoid considering multiple reports of the same incident, I exclude duplicate records and complaints that occur within two weeks of a previous report of a similar nature on the same property. Unit information is not available for condominiums, but because most of the complaints appear to focus on exterior conditions of a property or problems that are likely to impact an entire building (like utilities or lead concerns), I match complaints based on a condominium address to each unit within the condo association. I then restrict the complaints to those filed between June 2009 and December 2011.

Multiple listing service data

I restrict the multiple listing service data to listings of properties that are at least one year old, which improves the efficiency of the match but does not impact the sample, since all the borrowers I analyze have owned their properties since at least 2007. There are 49,910 listings from 2007 through 2011 in Boston, and I am able to match 46,240 (over 92.6 percent) to properties in the public records data. The MLS data include a vast array of information, including, but not limited to: address of the property, date the listing was created, initial listing price, status of the listing (including date of termination, if sold, expired, or withdrawn), current listing price, sale price, and book and page of a recent sale deed for the property. I conduct the match in several stages. In the first stage, I use the book and page information, which successfully matches 74 percent of the listings. In subsequent stages, I sequentially merge the datasets based on: exact matches between the standardized address of the property; the x/y coordinates of the property and the street number; the ZIP code, price, and sale date of the transaction (when the listing results in a sale); and the street number, ZIP code, unit number, and first four characters of the street name. The match rate is highest for single-family and multifamily properties (98.0 and 97.2 percent, respectively), but lower for condos (90.2 percent), partly due to the difficulty of matching condo unit numbers. The match ranges from 92 to 93 percent for each listing year.

Foreclosure auction dates and outcomes

Finally, I merge data from the Suffolk Registry of Deeds, collected for the analysis in Lambie-Hanson and Lambie-Hanson (2012). These data, collected for each foreclosure in Suffolk County filed between 2003 and 2011 by visually inspecting each foreclosure affidavit and auction notice that accompanied foreclosure deeds, include the date of the foreclosure auction and a dichotomous indicator for whether the buyer is a third-party purchaser (an investor or homeowner) or whether the bank is buying back the property to resell as REO. When the identity of the buyer was ambiguous (that is, in the case of corporations), my co-author and I examined the purchaser's articles of incorporation in the Massachusetts Corporate Database, hosted by the Massachusetts Secretary of the Commonwealth's Corporations Division (`http://corp.sec.state.ma.us/corp/corpsearch/corpsearchinput.asp`). I merged this dataset with the public records data using the book and page of the foreclosure deed, achieving a near 100 percent match.