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# Neighborhood Effects of Concentrated Mortgage Foreclosures

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## Abstract

As the national mortgage crisis has worsened, an increasing number of communities are facing declining housing prices and high rates of foreclosure. Central to the call for government intervention in this crisis is the claim that foreclosures not only hurt those who are losing their homes to foreclosure, but also harm neighbors by reducing the value of nearby properties and in turn, reducing local governments' tax bases. The extent to which foreclosures do in fact drive down neighboring property values has become a crucial question for policy-makers. In this paper, we use a unique dataset on property sales and foreclosure filings in New York City from 2000 to 2005 to identify the effects of foreclosure starts on housing prices in the surrounding neighborhood. Regression results suggest that above some threshold, proximity to properties in foreclosure is associated with lower sales prices. The magnitude of the price discount increases with the number of properties in foreclosure, but not in a linear relationship.

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## Section 1: Introduction

As the national mortgage crisis has worsened, an increasing number of communities are experiencing declining housing prices and high rates of foreclosure. Central to the call for government intervention in this crisis is the claim that foreclosures not only hurt those who are losing their homes to foreclosure, but also harm neighbors by reducing the value of nearby properties and in turn, reducing local governments' tax bases. The extent to which foreclosures do in fact drive down neighboring property values, and how those impacts vary according to neighborhood characteristics and local housing markets, are thus critical questions for policy-makers as they struggle to address the rising tide of foreclosures throughout the country.

In part due to the difficulty of obtaining the necessary data, until recently few empirical studies have examined the relationship between foreclosures and surrounding property values. Moreover, those that have addressed the issue have typically relied on cross-sectional sales data and thus have been unable to control for pre-existing differences between neighborhoods with different prevalence of foreclosures. Without such baseline controls, any estimated negative association between foreclosures and property values may simply reflect the fact that foreclosures tend to occur in neighborhoods with lower-valued homes rather than demonstrating that they actually drive down property values. In this paper, we bring new, longitudinal data to bear that can shed new light on the impact that the filing of a foreclosure notice (a "*lis pendens*", or LP) has on the sales prices of nearby properties.<sup>1</sup> With six years of foreclosure starts and sales prices, we are able to control for initial differences between the prices of properties that are near to foreclosures and other nearby properties *before* the bulk of the foreclosures occur. Our work

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<sup>1</sup> There is some inconsistency in the literature about whether the term "foreclosure" refers to completed foreclosures (i.e. properties sold at auction) or any stage in the foreclosure process. Because we only have data on the beginning of the process, the filing of the *lis pendens*, in this paper we will use the terms "foreclosure" and "foreclosure start" interchangeably to refer to a property on which a *lis pendens* has previously been filed.

also differs from prior studies in that we examine the impacts of foreclosures in a rapidly appreciating housing market: New York City between 2000 and 2006. We expect that the impact of foreclosure starts may be lower in areas that have enjoyed such rapidly increasing property values.

Results of our regression analysis show that properties in close proximity to foreclosures sell at a discount. There may be a threshold effect, however: being near to fewer than three LPs does not appear to consistently depress property values. And while the magnitude of the impact increases with the number of LPs, it does not do so in a direct linear relationship. Results also suggest that housing prices are significantly lower in neighborhoods in which foreclosures will occur, even before foreclosures, suggesting that estimates of foreclosure effects that fail to control for pre-existing differences across neighborhoods will suffer from selection bias. Because our analysis examines the effects of foreclosures in a rapidly appreciating housing market, our results are likely to provide a conservative estimate of the impacts of foreclosure in other markets.

The remainder of this paper is organized as follows. Section 2 briefly reviews other empirical studies on the spillover effects of foreclosures; Section 3 describes the foreclosure process in New York State; Section 4 lays out specific research hypotheses. In Section 5, we describe our data sources and empirical strategy. Section 6 presents regression results and Section 7 concludes.

## **Section 2: Previous empirical research on neighborhood effects**

Until quite recently, few empirical studies had attempted to quantify the effect of foreclosures on surrounding neighborhoods. Several studies that use similar methodologies –

hedonic regression models combined with data on the number of foreclosures within specified time and distance intervals from recent sales – have been released within the past two years. Each of these studies examines a different housing market within the U.S. and varies somewhat in the details of the methodology (for instance, in the choice of distance and time intervals); the methodological differences reflect differences in both the availability of data and the characteristics of the underlying housing markets. Below we review in some detail the most relevant studies.

The earliest and most frequently cited study, by Immergluck and Smith (2006), attempts to estimate the effects of foreclosures of one- to four-family homes on the property values of surrounding one- to four-family homes in Chicago and finds that each additional foreclosure within one-eighth of a mile is associated with roughly a one-percent decline in property value. Their study is the first to use hedonic regression models to estimate the impacts of foreclosure on surrounding property values, but their data only include sales prices for one year (1999) shortly after the period of foreclosures (1997-98). Therefore they are unable to control for pre-existing price trends in the micro-neighborhoods where foreclosures occur, raising the concern of reverse causality. They also cannot observe any longer-term effects. Their use of a relatively short time interval after foreclosures could lead either to over- or under-estimates of the effects; it may be that foreclosures cause a sudden dip in property values, but that the neighborhood reverts to the mean over the next several years, or it may be that foreclosures cause a decline which then leads to further neighborhood degeneration. Immergluck and Smith also do not consider non-linear relationships between the number of foreclosures and property values, although it seems quite likely that such threshold points might exist.

Leonard and Murdoch (2007) use hedonic models to estimate the effects of foreclosures on single family home sales in Dallas County in 2006.<sup>2</sup> They find that in neighborhoods with homeownership rates below 80%, each additional foreclosure within 250 feet of a sale is associated with approximately 1% decrease in sales price. Lin, Rosenblatt and Yao (2008) focus on the impacts foreclosures have on neighboring property values through the appraisal mechanism; assuming that foreclosed properties sell at a discount, and that the discounted sales prices are used as comparables, foreclosures will lead to reduced appraised values of nearby houses. They test this hypothesis using cross-sectional, hedonic regression models on home sales in the Chicago PMSA in 2003 and 2006, including indicators of the number of foreclosures in 425 different time and distance intervals from the sale. Their regression results suggest that foreclosures have a significant negative effect up to 0.9 kilometers away from the sale, and up to five years after the foreclosure.

As suggested, a key limitation of all these studies is that they estimate cross-sectional regressions on just one year of sales prices. Therefore they are unable to control for pre-existing price trends in the micro-neighborhoods where foreclosures occur, raising the concern of reverse causality. Our key contribution is that we utilize longitudinal data and control for these pre-existing price differences.

Another notable difference with our work relates to housing markets. The characteristics of the housing markets examined in each of these studies – the City of Chicago, the Chicago metropolitan area and Dallas County – differ from one another and from the area we examine, New York City, in several ways that are likely to matter for the impact of foreclosures. For instance, the higher the housing density surrounding foreclosed properties, the smaller the

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<sup>2</sup> Although they estimate a cross-sectional model, they add controls for recent trends in prices in the near proximity of the sale.

geographic area that is likely to be affected. New York City has approximately 17 housing units per acre, compared to about 8 units per acre in the City of Chicago and 1-2 units per acre in Dallas County and the Chicago PMSA, according to the 2000 census. In addition, housing prices in New York City are considerably higher and appreciated more rapidly than in any of the other markets examined during the time periods studied, which should affect the likelihood that foreclosed units remain vacant or sell at a discount.

Differences in state laws may shape the neighborhood impacts of foreclosures too. Differences in foreclosure laws can affect the length of time between initial foreclosure filing and the completed foreclosure; for example, both New York and Illinois are judicial process states in which foreclosure proceedings may last for a year or more, while in Texas most foreclosures are non-judicial and may be resolved in as little as three months (Bergman 1996; 735 ILL. COMP. STAT. ANN. 5/15/1405; Nelson and Whitman 2004). The differences in foreclosure process and local housing market conditions suggest that even studies using comparable data and methods may reach different conclusions when applied to different parts of the country. Moreover, most of these studies have obtained data on foreclosure filings from different sources, so it is unclear whether even the count of foreclosures is truly comparable across studies. This could lead to problems such as confounding the effects of mortgage-related foreclosures with those of tax liens, or simply an inaccurate count of the number of foreclosures within the time-distance intervals.

Besides the studies on housing prices reviewed above, several studies have examined the effects of foreclosures on other neighborhood outcomes. Immergluck and Smith (2005b) use a similar cross-sectional methodology to examine the effects of single-family foreclosures on crime rates in Chicago, and conclude that foreclosures increase violent crime but not property

crime. In a set of related studies, Baxter and Lauria (Lauria 1998; Baxter and Lauria 1999 and 2000) find that foreclosures accelerated racial transition in New Orleans by depressing housing prices and creating opportunities for lower-income black households to move into formerly white-occupied homes. They also find that higher foreclosure rates were associated with higher vacancy rates and lower proportions of owner-occupied housing. Apgar, Duda and Gorey (2005) estimate that in the City of Chicago, foreclosures impose substantial costs upon the municipal government, ranging from under \$30 for properties that are never vacant and are sold at auction to upwards of \$30,000 for a property that is vacant for a lengthy period, and thereby attracts criminal activity or squatters, requires physical maintenance and/or incurs structural damage from fire or abandonment.

### **Section 3: Foreclosure process in New York City**

The mechanisms through which defaulted loans can generate negative spillovers into their neighborhoods, and the point in time these spillovers occur, depend on the details of the foreclosure process. Because the foreclosure process differs considerably across states, we begin with a review of how foreclosures work in New York City, focusing particularly on points during the process when information becomes available to third parties.

The first stage of loan distress, mortgage default, occurs when the borrower fails to make mortgage payments on the schedule required by the mortgage contract. Once a borrower defaults on the mortgage, lenders then have several options, including restructuring the loan, forbearing enforcement of the contract terms for some time in the hope that the borrower will resume payments, or beginning the process to reclaim the property, described below. We are not able to observe when a borrower initially defaults or any actions taken by the lender prior to the

*lis pendens* filing, because no public notice or third party involvement occurs in the initial stage of default. Thus, for the purposes of our analysis, we treat the date of the *lis pendens* filing as the starting point for the foreclosure process.

After a mortgage has gone unpaid for a minimum of three consecutive months, the lender can file a *lis pendens*, essentially a notice of the intention to sue the property owner and reclaim the property if the loan is not repaid.<sup>3</sup> The *lis pendens* (LP) is filed with the county clerk's office and is therefore a public record. A number of private data vendors collect and sell information on LP filings, which prospective real estate investors use to identify properties for potential purchase.

After the *lis pendens* has been filed, the borrower may attempt to prevent the property from being foreclosed by restructuring the loan with the existing lender, refinancing the property with a different lender, or selling the property to a third party and satisfying the loan. The borrower may also turn over the deed to the property to the lender in lieu of paying off the loan.

In the third and final stage, if the borrower and lender do not reach an agreement to satisfy the outstanding loan after the filing of a *lis pendens* notice, then the lender may request that the court appoint a referee (an attorney who ultimately conducts the foreclosure sale) and schedule an auction. The judge then signs a Judgment of Foreclosure and Sale that directs a Notice of Sale to be published. According to New York State law, a notice of the property's pending sale – including the date, time, and location of the auction, the property address, and the names of the borrower and lender – must be published in newspapers or other media for four successive weeks prior to the auction.<sup>4</sup> The announcements of foreclosure auctions are thus

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<sup>3</sup> *Lis pendens* can be filed for a number of reasons other than default on mortgage loan, including unpaid taxes, unpaid condominium fees, or mechanic's or contractor's liens. We include only *lis pendens* filings that result from mortgage default.

<sup>4</sup> N.Y. REAL PROP. ACTS. LAW § 231(2)(a)

available to any party that chooses to search the papers; several data vendors also collect and sell this information.

At the auction itself, the property will be sold to the highest bidder. The original lender will generally purchase the property if no private investor bids higher than the amount of the outstanding loan. The winning bidder must pay 10% of the purchase price immediately after the auction, and is required to pay the balance within 30 days.

If the lender takes ownership of the property, either through an agreement with the borrower during pre-foreclosure or at the foreclosure auction, the lender will typically re-sell the property to recover the unpaid loan amount in what is known as a “Real Estate Owned” (REO) sale. The transfer of property ownership back to lender, as well as the subsequent REO sale price, is recorded as part of the public record.

#### **Section 4: Research Hypotheses**

There are several channels through which foreclosures might have a negative impact on surrounding housing prices. First, property owners who receive foreclosure notices may be less likely to maintain or upgrade their properties, either because they have less incentive to maintain property they may lose or because they cannot afford regular maintenance. Properties may start to show visible signs of neglect, which may make the surrounding homes less desirable. Second, after completion of foreclosure proceedings and eviction of the delinquent borrower, the property may sit vacant and suffer further physical decline. Vacant properties are likely to depress surrounding property values because they contribute to neighborhood blight, may attract vandalism and crime, and more generally signal that the neighborhood is not stable. Even if the vacant properties are well maintained and do not attract criminal or other undesirable activities,

they add to the local supply of available units, and will thus depress property values. Third, distressed properties sold either at foreclosure auctions or pre-foreclosure sales may be more likely to be sold to investors and become renter-occupied, which may lead to lower levels of maintenance even after the properties are re-occupied. Finally, properties with distressed loans are likely to sell at a discount – both at pre-foreclosure sales and at foreclosure auctions – thus affecting the price of “comparables” used to estimate neighboring property values (Lin et al. 2008).

Because there is a range of possible outcomes for any given foreclosure start – loan workout, pre-foreclosure sale, sale at auction – and because the time to reach those outcomes will likely vary across properties, it is difficult to forecast exactly the length of time that LPs may affect surrounding properties. However, based on the timeline discussed above, we assume that any negative impacts of foreclosures will last for 18 months after the filing of the LP then will diminish gradually; Figure 1 shows a simplified model of the change in property value over time. We also assume that property values will be more negatively impacted by LPs that occur at closer geographic distance, and that the negative impacts will increase with the number of nearby LPs. The possibility of multiple LPs occurring at various times and distances relative to a given property raises some complications for identifying the effects of any one LP on that property. As illustrated in Figure 2, the property value that we observe at any given time may reflect the impacts of several past LPs. If foreclosures are highly clustered by neighborhood, it will be difficult for us to observe the marginal impact of a marginal LP within a given distance. Further, the size and duration of these effects are likely to differ according to the strength of the local housing market. Foreclosed properties are less likely to remain vacant for long periods in appreciating markets than in stable or declining housing markets. In hot markets, investors who

buy foreclosed properties are also more likely to resell the property rapidly through conventional channels, and less likely to sell at a discount.

## Section 5: Data and Empirical Strategy

To identify the effect of foreclosure starts on neighboring property values, we use a variation of hedonic regression analysis, controlling for property and neighborhood characteristics. The general form of the regression is shown in Equation 1 below:

$$(1) LPRICE_{ijt} = \beta_0 + \beta_1 LP_{ijt} + \beta_2 PropChars_{ij} + ZIP_j + Boro * quarter * year$$

in which  $LPRICE_{ijt}$  is the log per unit sales price of property  $i$  in ZIP code  $j$  in quarter  $t$ ;  $LP_{ijt}$  is a vector of variables indicating the number of LP filings within a given time and distance interval of property  $i$ ;  $PropChars_{ij}$  is a vector of characteristics describing property  $i$ , including size, age, and building class;  $ZIP_j$  is a set of ZIP code area fixed effects that control for time-invariant amenities and characteristics of the local neighborhood. ZIP codes are quite small geographic areas in New York City, so are useful approximations of neighborhoods.<sup>5</sup> Finally, we also include a set of borough-quarter-year time fixed effects,  $Boro * quarter * year$ , to control for time-varying economic trends that may differ by borough. Data sources and brief descriptions of each variable are shown in Table 1; summary statistics are shown in Table 2.<sup>6</sup> Our sample size is roughly 90,000 property sales.

Our dependent variable is the actual per-unit sales price of residential properties in New York City, provided by the City's Department of Finance.<sup>7</sup> Because we assume that spillover

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<sup>5</sup> A few ZIP codes are excluded because they have a very small number of sales or because other geographic information is missing; results are robust to including all ZIP codes.

<sup>6</sup> Note we define and show summary statistics for our count variables of LPs; in the regressions, we also use alternative measures of LP prevalence.

<sup>7</sup> We exclude non-residential property sales and sales of coops, which are counted as shares in a corporation.

effects may occur up to 18 months after the LP is filed, we restrict the sales to 2002-2005, since these are the years in which we have data on LPs during the prior 18 months. As noted above, the regressions include a number of variables standard to hedonic price analysis, specifically physical property characteristics, fixed effects for ZIP codes and fixed effects for quarter and borough of sale. Property characteristics include the square footage of the lot, building and unit, unit age and structure type. We also include measures of the distance to the nearest subway stop and whether the closest subway is an express train.

To identify whether each sale is likely to be affected by *lis pendens* filings, we draw upon property-level LP filings between 2000 and 2005 in four of the five NYC boroughs, or counties (Staten Island does not report LP data in a comparable fashion). Data on LPs from Bronx, Kings, New York and Queens Counties were purchased from Public Data Corporation, which collected these data from the county court registers. We exclude all LPs that are not related to mortgage foreclosures (such as tax liens, mechanics liens and housing code violations) and LPs filed on non-residential properties.<sup>8</sup> It is fairly common for multiple LPs to be filed on the same property in a short period of time; we assume that the first filing indicates the beginning of the period of financial distress and drop any subsequent LPs filed on that property within 365 days by the same plaintiff. We assume that one of the mechanisms through which LPs create spillover effects is physical deterioration; because condominium units that enter foreclosure are less likely to display signs of distress that will be visible outside the building, we also exclude LPs on condominiums. (While it would be interesting to analyze whether foreclosures in condominiums have a smaller impact, we do not have enough observations in our dataset to test

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<sup>8</sup> Some LPs are dropped from our analysis because they are missing the geographic indicators needed to match with sales locations, but these are quite small numbers and are unlikely to affect our results.

this hypothesis.) Over 80 percent of the properties on which LPs were filed are 1-4 family buildings, with a small number of multifamily or mixed residential-commercial buildings.

We create a number of measures of proximity to foreclosures, discussed in more detail below. The distance intervals of interest are 0-250 feet (approximately the length of a north-south block in Manhattan),<sup>9</sup> 250-500 feet, and 500-1000 feet. Because the foreclosure process may last up to 18 months in New York State, we identify the number of LPs filed within each of those distance bands during the 18 months prior to the sale. We also identify the number of LPs filed within each of these distance bands more than 18 months prior to the sale (to test if impacts last longer) and control for the number filed at any time during our period of observation, before or after the sale (2000-2005) to control for systematic differences between the micro-neighborhoods where many foreclosures occur and those where they do not.

As shown in Table 3, the average number of LPs near each sale varies considerably across those time-distance intervals. Only about one-third of the sales in our dataset are within 250 feet of one or more LPs in the 18 months prior to the sale, and very few sales had more than two LPs within that narrowest time-distance interval. By contrast, approximately three-fourths of our sales had at least one LP within 500-1000 feet in the 18 months prior to the sale, and many sales had 10 or more LPs in that range. In some specifications we use a simple count of the number of LPs in each time-distance interval, but because the distribution of data within several intervals is highly skewed, and because we do not expect that impacts are linear, in most specifications we use one or more dummy variables indicating the number of LPs in the interval (i.e. 1-5 LPs, 6 or more).

As shown in Table 4, annual foreclosure starts during our study period ranged between 5,735 and 6,779, with over 80 percent occurring in Brooklyn and Queens. The relatively low

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<sup>9</sup> Across the city as a whole, the average block is 500 feet long.

number of foreclosure starts in Manhattan and the Bronx likely reflects the composition of the housing stock – primarily large multifamily buildings – and the very low rate of owner-occupancy. Within the boroughs, as shown in Figure 3, LPs are highly concentrated. In particular, they are concentrated in neighborhoods with low incomes, high shares of minority residents, and high incidence of subprime lending (Furman Center 2008). This raises concerns about the direction of causality: do foreclosures reduce property values, or do foreclosures occur more frequently in lower-income and minority neighborhoods that typically have lower property values?

We employ several techniques to try to correct for selection bias. First, because of the large volume of sales and high density of housing in New York City, we are able to include ZIP code fixed effects in our models, essentially allowing us to control for neighborhood characteristics at a fairly small geographic level. Second, because we have data on foreclosures over a fairly long period of time, we can control for LPs that occurred not just before the sale but also at any time during a six year period (2000 to 2005). When we include both LPs prior to sale and LPs filed at any time during the period, the coefficient on LPs filed at any time captures the association of prices with the number of LPs that occur *after* the sale, or in other words, any baseline price differences between neighborhoods that are vulnerable to foreclosures and those that are not (similar to treatment group, pre-treatment effect). Both of these techniques should reduce the likelihood of selection bias in regression coefficients, but do not completely eliminate it.

The geographic concentration of LPs in our data creates some empirical challenges to identifying the effect of LPs. Ideally we would like to be able to get a clean estimate of a foreclosure start within 250 feet. The problem is that virtually every sale that had one or more

LPs within 250 feet of a foreclosure in the past 18 months is also between 250 and 1,000 feet away from at least one property that entered foreclosure in the past 18 months. Specifically, as shown in the first row of Table 5, of the 29,000 sales (about one-third of the sample) for which one or more LPs took place within 250 feet in the past 18 months, 96 percent also experienced one or more LPs at slightly farther distances (between 250 and 1000 feet of the sale) during that same period of time. The challenge is compounded by the fact that fairly large shares of transacting properties also experienced one or more LPs more than 18 months prior to the sale, at various distances, which could continue to have a lingering impact on sales prices. Figure 4 presents a stylized illustration of the typical sale in our dataset that is near to a property entering foreclosure.

As noted, we ideally want to control for baseline differences between prices of properties in neighborhoods that are vulnerable to foreclosure and properties in neighborhoods that are not. The concentration of foreclosure activity poses something of a problem here too. Indeed, of the 89,814 sales in our dataset, only 2,870 were not within 1,000 feet of at least one property entering foreclosure between 2000 and 2005. We have very few sales, that is, in micro-neighborhoods that were completely unaffected by foreclosures. (Note that this is not such an issue within 250 and 500 feet of a sale. There are many sales that do not experience any foreclosure activity within 250 feet, and a reasonable number that do not experience any foreclosure activity within 500 feet.) Thus, rather than simply controlling for baseline differences in price between sales for which there is any foreclosure activity within the 500-1,000 foot band of a sale and the few sales for which there is not, we control for baseline price differences between sales that will be exposed to substantial foreclosure activity within the 500-1,000 foot band and those that will not be.

To obtain a more precise identification of the effects of LPs, in some specifications we limit the sample to ZIP codes in which at least one sale is near zero LPs within the specified time-distance intervals and at least one sale is near one or more LPs – essentially selecting ZIP codes with both treatment and control sales. The regressions using only ZIP codes with treatment and control sales may allow a cleaner identification of the effects of LPs within ZIPs, but these areas may be less representative of the city as a whole.

In addition to the econometric difficulties described above, identifying the effects of LPs is complicated by limited information about the intermediate and final outcomes of the distressed property and the length of time needed to resolve each LP. As described in Section 3, the magnitude and duration of spillover effects depends on the extent and timing of visible signs of deterioration, when and to whom the property is sold, when and by whom it is occupied, etc. Unfortunately we do not have data that allow us to determine the outcomes of individual LPs and so cannot examine differential effects by outcomes, but this is an area that we hope to pursue in future research.

## **Section 6: Regression results**

In general, our regression results provide some evidence that properties in close proximity to foreclosures sell at a discount. Column 1 of Table 6 presents the results of a somewhat naïve specification, including the number of LPs in each of nine time-distance intervals.<sup>10</sup> The main advantage of this model is that the coefficients can be interpreted as the marginal effect of an additional LP in each interval; however, given the highly skewed distribution of the data within a number of these categories, the coefficients are likely to be

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<sup>10</sup> Coefficients on the hedonic variables are shown in Appendix Table 1.

biased upwards.<sup>11</sup> The most robust results from this model are the coefficients on LPs filed at any time in the six-year period; an increase in the number of LPs at any time is associated with a decrease in sales price for all three distance bands (0-250 feet, 250-500 feet and 500-1000 feet). The magnitude of the coefficient on the “anytime” variables decreases as the distance from the sale increases, suggesting that properties that will be near to more proximate foreclosures sell at a greater discount than properties that will experience foreclosure activity further away.

The results also show that a larger number of LPs within 500-1000 feet of the sale at both time intervals prior to the sale are associated with lower sales prices, suggesting that foreclosure starts reduce prices of surrounding properties. The coefficient estimates do not provide statistically significant evidence that LPs within 500 feet of the sale at a time prior to the sale decrease property values; indeed, the coefficient on LPs in the most immediate time-distance interval (0-250 feet, 0-18 months) is positive and significant. However, this coefficient is likely biased by the fact that virtually all sales within 250 feet of a recent foreclosure start are also within a somewhat larger distance of other foreclosure activity. Moreover, it may also be affected by a few reflects the skewed distribution of the data, specifically the small number of sales near a large number of LPs in that interval.<sup>12</sup> The lack of significance on the other coefficients within 500 feet may either reflect the small degree of variation in the number of LPs in those intervals, or the fact that being near a small number of LPs does not significantly depress property values.

The second regression shown in Table 6 presents the results of a more refined functional form. Using dummy variables to indicate whether the sale had a given number of LPs in each

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<sup>11</sup> An alternate specification using the log of LPs in each interval is shown in Appendix Table 2, column 1. Even taking the natural logarithm does not fully correct the skewness of the distribution, and the interpretation of the coefficients is less intuitive.

<sup>12</sup> Dropping these few observations, sales with 4 or more LPs within 250 feet and 18 months, causes the coefficient to become statistically insignificant, as shown in Appendix A, Column 2.

time-distance interval should yield more robust and intuitively straightforward estimates. Sales that are within 250 feet of one or more LPs during the 18 months prior to the sale sell for an average of 0.5% less than sales near zero LPs in that time period, all else constant, significant at the ten percent level. Being within 250 feet of at least one LP more than 18 months before the sale is associated with a drop in sales price of 1.4%. Perhaps surprisingly, the estimated effect on the “anytime” variable in the 0-250 foot ring is larger than either of the pre-sale measures (0.018) and strongly statistically significant. This suggests that neighborhoods in which foreclosures will occur in the future have significantly lower property values than neighborhoods that will continue to be unaffected by foreclosures, even before the LPs have been filed.

Looking at the effect of LPs in the next largest ring, 250-500 feet, the results do not suggest that having had any LPs occur prior to the sale significantly decreases prices, but they do suggest large baseline differences in price between properties that will be near to substantial foreclosure activity and those that will not. Specifically, sales that will be near to a total of six or more LPs in this distance range over the course of six years sell for approximately 3.9% less than sales that will be near to fewer than six LPs in that time. Moving to the largest distance ring, 500-1000 feet, the estimated coefficients do suggest that properties near six or more LPs prior to the sale sell for significantly lower prices than comparable properties near a smaller number of LPs. Although we cannot directly infer the marginal impact of a single LP from these results, the declining magnitude of the coefficients on the 0-18 month window and more than 18 months (both indicating proximity to six or more LPs), supports the hypothesis that the negative impact of LPs declines over time, at least within this distance.

The strongly significant and relatively large negative coefficients on all the “anytime” variables in Model 2 imply large baseline price differentials across neighborhoods with different

levels of exposure to foreclosure. If that is the case, then failing to control for these differences – which much of the prior literature has done – is likely to lead to overstated estimates of the effects of recent foreclosures on property values. To test the extent of this negative selection bias, we repeat the specification shown in Column 2, but omit the “anytime” variables”. As shown in Column 3, this omission causes all the coefficient estimates on the “prior to sale” variables to become negative and statistically significant, and generally of larger absolute magnitude than the estimates in Column 2. These results suggest that estimates obtained from cross-sectional rather than longitudinal data will suffer from selection bias.<sup>13</sup>

In another robustness check, Column 4 presents results of the same specification as that shown in Column 2, but using only sales in ZIP codes that have both treatment and control sales, to reduce the possibility of selection bias. Approximately one-third of the 163 ZIP codes in New York City are excluded from this model. Although some ZIP codes are excluded because no sales in the ZIP are within 1,000 feet of an LP, more are dropped because all sales are likely to be affected by LPs, so that on average, the sales in the remaining ZIP codes have lower exposure to LPs than in the full sample. All coefficients in Model 4 have the same sign as in model 2, and the magnitude and significance of most coefficients are fairly robust to excluding these ZIP codes, suggesting that the estimates in model 2 do not suffer from much bias by including ZIP codes that contribute less to the identification strategy.

The models shown in Columns 2-4 present a relatively parsimonious specification, with a single dummy variable per time-distance interval. The regression shown in Column 5 offers a more nuanced test for differences in the effects of LPs by the number of LPs in the wider rings, 250-500 feet and 500-1000 feet (there is not enough variation in the number of LPs within the 0-

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<sup>13</sup> Biased estimates will also be obtained from longitudinal analyses that fail control for baseline price differences between properties that will be near to significant foreclosure activity and those that will not.

250 foot ring to parse this distance ring further). The results for the 250-500 foot ring are generally similar to those in Model 2, and suggest that negative effects of LPs prior to the sale do not begin until some threshold level of foreclosure activity is reached (3 or more LPs more than 18 months before the sale, 6 or more over the entire period). The results on proximity to LPs in the 500-1000 foot ring confirm that the size of the price discount increases with the number of LPs (coefficients on 6-10 LPs are smaller than on 11 or more LPs, for both pre-sale periods). However, the magnitude of coefficients within each time period suggests that the increase in the price discount is not linearly related to an increase in the number of LPs. The coefficients are also larger on the variables in the 0-18 months prior to the sale, compared to more than 18 months, again supporting the idea of declining effects over time.

Column 6 presents results of the same specification shown in Column 5, again excluding ZIP codes that do not have both treatment and control sales. The results of this model are less robust to dropping observations, most likely because the larger number of dummy variables within each time-distance interval reduces the number of sales in each category, making coefficient estimates more vulnerable to bias from a few outliers. The overall patterns are still quite similar, however.

## **Section 7: Conclusions and policy implications**

In general, our regression results provide some evidence that properties in close proximity to foreclosures sell at a discount. There is some evidence of a threshold effect; being near a very small number of LPs does not appear to consistently depress property values. The magnitude of the price discount increases with the number of nearby LPs, although not in a direct linear relationship, suggesting some diminishing marginal impacts. Our results also

suggest that housing prices are significantly lower in neighborhoods in which foreclosures will occur, even before foreclosures. Therefore estimates of foreclosure impacts that fail to control for pre-existing price differences across neighborhoods will suffer from selection bias.

These results offer some useful implications for policymakers attempting to cope with the rising tide of foreclosures. First, our results provide some evidence that the effects of foreclosures extend to neighboring property owners as well as the distressed borrowers themselves, which may offer a stronger justification for government intervention, despite concerns over moral hazard problems resulting from such intervention. Second, the evidence of the threshold effect may help guide decision about which neighborhoods could benefit the most from intervention. We find little evidence that being near a small number of foreclosures has a significant negative impact on prices, but beyond the threshold, the size of the price discount is larger with proximity to larger number of LPs. Therefore rather than treat all foreclosures equally, it may be more efficient to target prevention effects in neighborhoods that have not yet had large numbers of foreclosures and prevent them from reaching the threshold for harm. Moreover, in determining how to scale the allocation of resources, policymakers should remember that the relationship between price discounts and numbers foreclosures is not linear, with some evidence of diminishing marginal effects.

The evidence on significant differences in prices even before foreclosures occur is interesting for policy reasons as well as methodological ones. This strongly suggests that neighborhoods with lower housing values are more vulnerable to higher concentrations of foreclosures in the future. It may be that residents living in these neighborhoods are more likely to experience events that result in foreclosure, such as job loss, health problems or marital dissolution or that they simply are less able to weather such problems due to lower assets and

income. It may also be that residents in these neighborhoods were more likely to take out subprime mortgages with loans terms that increase the probability of default. But whatever the reason, our results provide strong evidence for pre-existing differences in property values and the importance of controlling for them.

Finally, it should be noted that our research examines the impacts of foreclosures in a more rapidly appreciating housing market than previous studies have examined. We would anticipate that in hot housing markets, foreclosed properties may sell at less of a discount and may be less likely to remain vacant for long periods of time, thus mitigating the negative spillover effects on neighboring properties. Therefore our results should be viewed as a conservative estimate of the magnitude of those effects.

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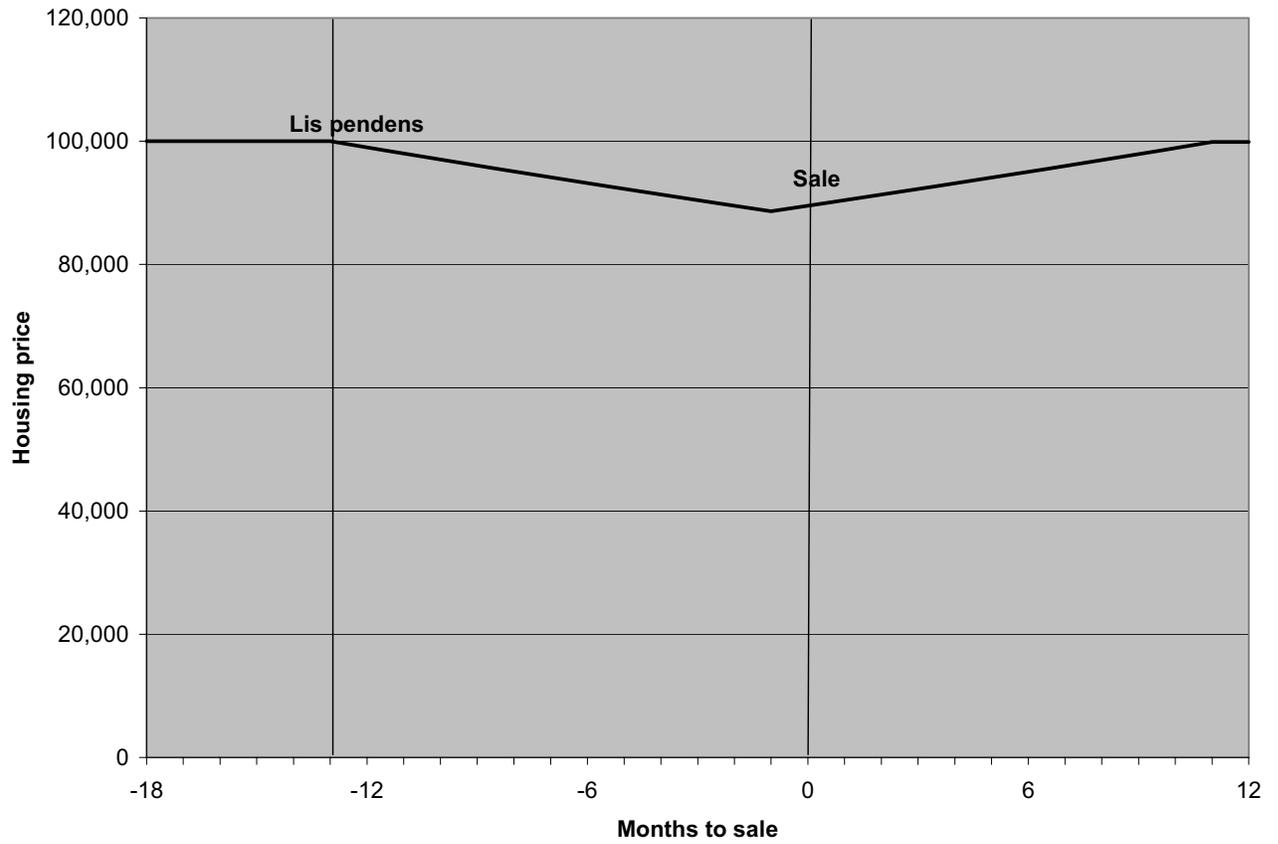
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**Figure 1: Impact of single LP on nearby property value**



**Figure 2: Impact of multiple LPs on nearby property sale**

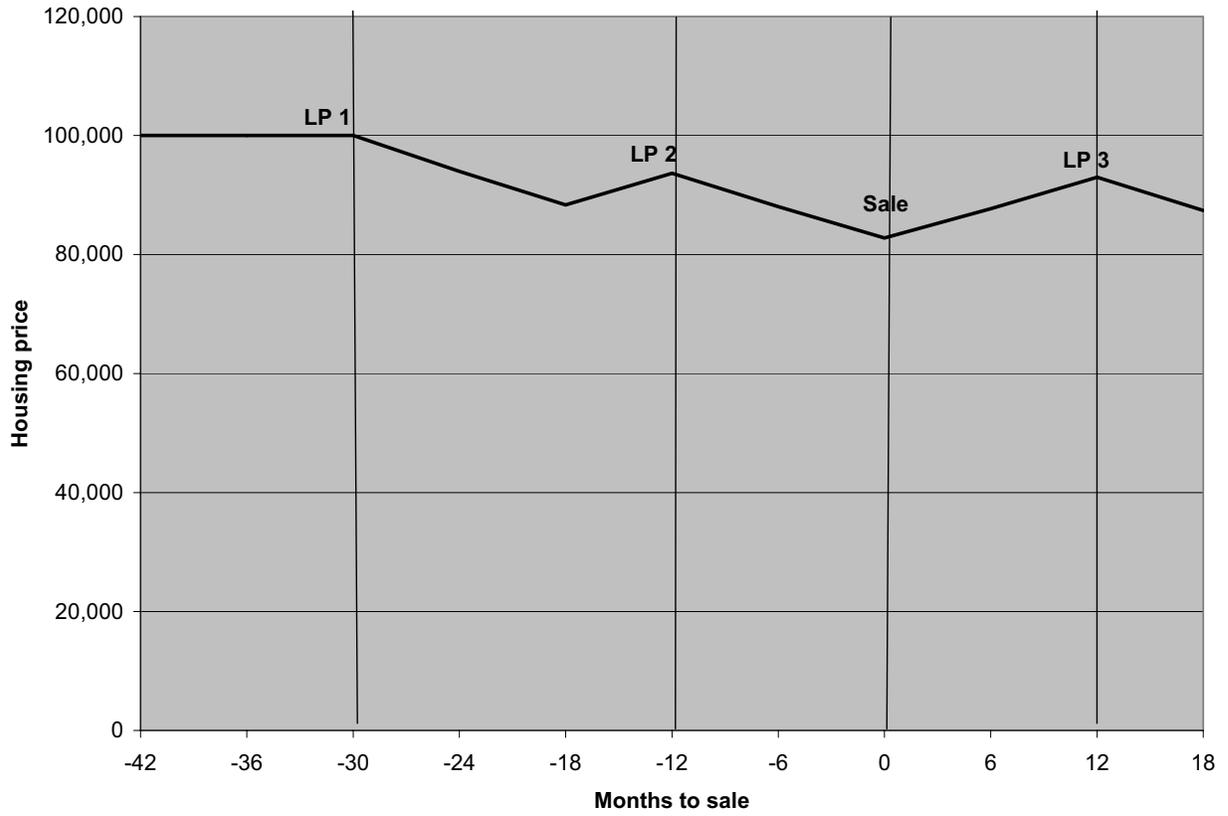
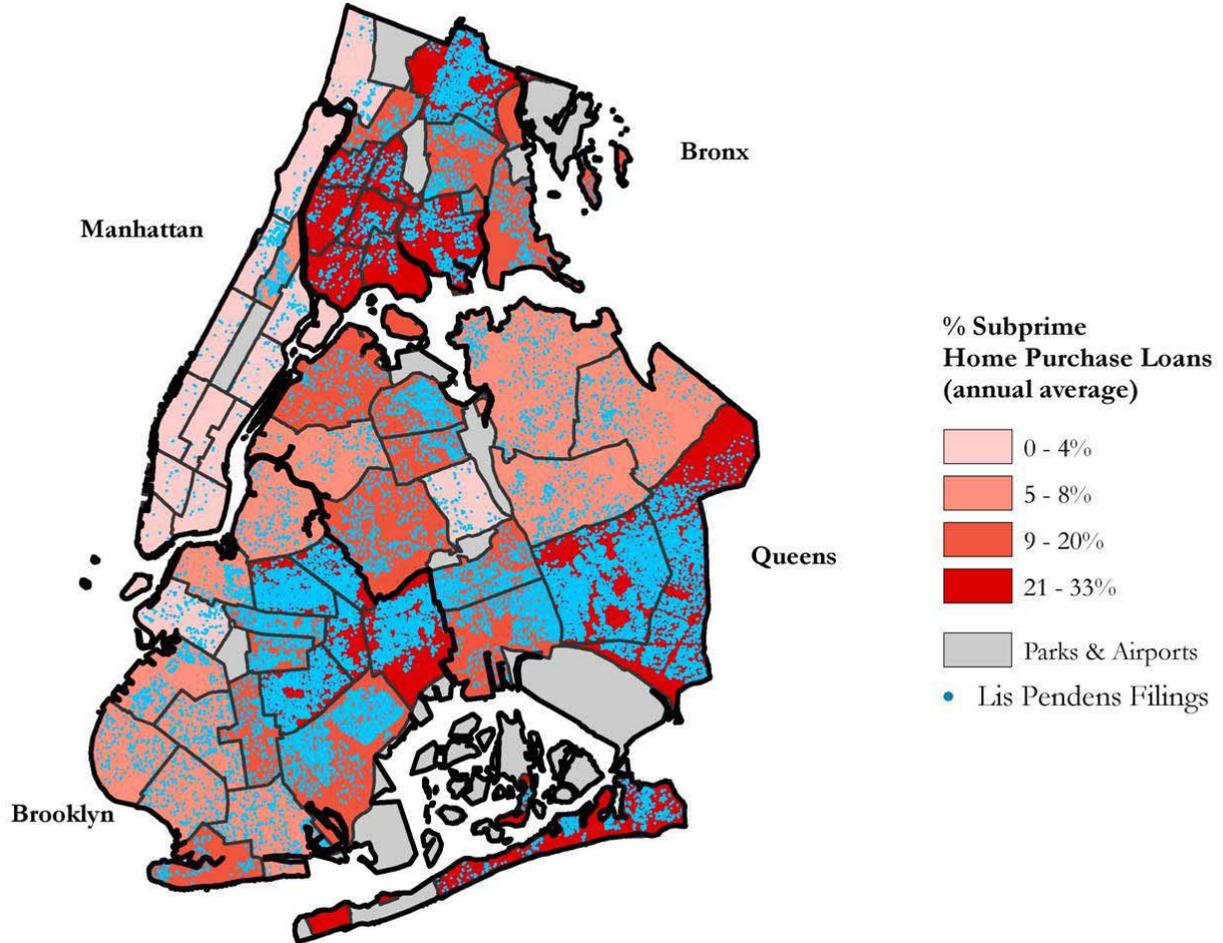
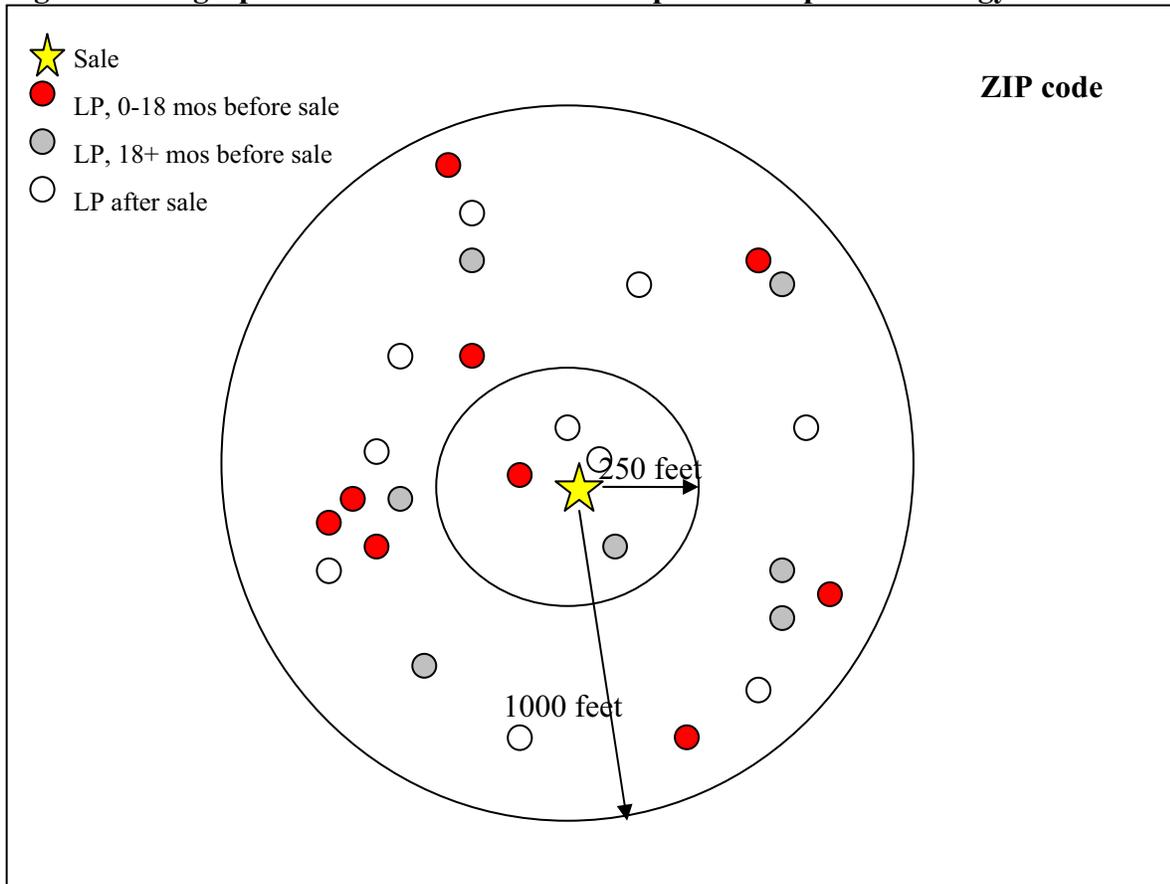


Figure 3

### Subprime Lending & Lis Penden Filings, 2000-2005



**Figure 4: Geographic concentration of LPs complicates empirical strategy**



**Table 1: Variable definitions and data sources**

<b>Variable</b>	<b>Description and source</b>
<i>Dependent variable</i>	
Log(Price/unit)	Log(price per unit), constant 2005 \$. Source: NYC DOF
<i>Proximity to LP measures</i>	
LP_018_250	Number of LPs within 250 feet of sale, 0-18 months before sale
LP_GT18_250	Number of LPs within 250 feet of sale, >18 months before sale
LP_EVER_250	Number of LPs within 250 feet of sale, anytime 2000-2005
LP_018_500	Number of LPs within 250-500 feet of sale, 0-18 months before sale
LP_GT18_500	Number of LPs within 250-500 feet of sale, >18 months before sale
LP_EVER_500	Number of LPs within 250-500 feet of sale, anytime 2000-2005
LP_018_1K	Number of LPs within 500-1000 feet of sale, 0-18 months before sale
LP_GT18_1K	Number of LPs within 500-1000 feet of sale, >18 months before sale
LP_EVER_1K	Number of LPs within 500-1000 feet of sale, anytime 2000-2005
<i>Hedonic characteristics</i>	
unitage	Unit age, years
noyrblt	= 1 if unit age missing
sqftunt	Square feet of unit
lnd_area	Square feet of lot
gr_sqft	Square feet of building
Bldgs	Number of buildings on lot
numunits	Number of units in building
sf_det	= 1 if SF detached (multifamily is omitted category)
sf_att	= 1 if SF attached
twofam	=1 if two-family
Dist_subway	Distance to nearest subway stop (feet)
express	= 1 if nearest subway stop on express line
twostory	= 1 if building has 2+ stories
<i>Fixed effects</i>	
Boro-year-qrtr	Dummy variables for each borough-quarter-year of sale
ZIP	Dummy variables for each ZIP code

**Table 2: Variable descriptive statistics**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
unitpric	351,678	456,507	133	3.10e+07
lp_018_250	0.60	1.14	0	20
lp_gt18_250	0.35	0.97	0	21
lp_ever_250	3.05	4.14	0	60
lp_018_500	1.46	2.24	0	36
lp_gt18_500	0.85	2.01	0	32
lp_ever_500	7.33	8.93	0	112
lp_018_1k	5.25	6.75	0	69
lp_gt18_1k	3.03	6.32	0	78
lp_ever_1k	26.28	29.26	0	198
lnd_area	5012	25,480	0	1,510,315
gr_sqft	2526	8793	0	1,970,736
lsqftunt	7.044	0.527	0	12.014
unitage	61.68	32.61	0	205
noyrblt	0.106	0.307	0	1
dist_subway	5063	5724	11	31,798
express	0.252	0.434	0	1
bldgs	0.998	0.207	0	15
numunits	2.30	10.04	1	2002
sf_det	0.193	0.394	0	1
sf_att	0.125	0.331	0	1
twofam	0.335	0.472	0	1
twostory	0.898	0.303	0	1

**Table 3: Number of Sales with Given Number of LPS by Distance/Time Categories**

	<b>LP 0-18 months</b>		<b>LP &gt; 18 months</b>		<b>LP ever</b>	
	<b>before sale</b>		<b>before sale</b>		<b>Number</b>	<b>%</b>
	Number	%	Number	%	Number	%
<b>0-250 ft</b>						
1-2 LPs	22,702	25.3	12,423	13.8	22,156	24.7
3-5 LPs	5,568	6.2	3,026	3.4	16,953	18.9
6+ LPs	703	0.8	576	0.6	18,235	20.3
<b>250-500 ft</b>						
1-2 LPs	26,617	29.6	15,125	16.8	19,397	21.6
3-5 LPs	13,155	14.6	6,681	7.4	14,852	16.5
6-10 LPs	5,084	5.7	2,830	3.2	14,116	15.7
11+ LPs	735	0.8	714	0.8	23,607	26.3
<b>0-500 ft (combines above groups)</b>						
1-2 LPs	26,047	29.0	15,230	17.0	17,231	19.2
3-5 LPs	15,138	16.9	7,926	8.8	14,303	15.9
6-10 LPs	8,358	9.3	4,226	4.7	12,576	14.0
11+ LPs	2,245	2.5	1,670	1.9	32,198	35.8
<b>500-1000 ft</b>						
1-2 LPs	23,234	25.9	14,744	16.4	8,873	9.9
3-5 LPs	15,726	17.5	9,208	10.3	12,133	13.5
6-10 LPs	13,180	14.7	6,907	7.7	14,396	16.0
11-19 LPs	11,498	12.8	5,363	6.0	11,120	12.4
20+ LPs	4,421	4.9	3,099	3.5	38,735	43.1

**Table 4: Number of LPs by borough and year**

	2000	2001	2002	2003	2004	2005	Total
Bronx	755	967	1,052	979	871	775	5,399
Brooklyn	2,742	2,466	2,944	2,861	2,455	2,504	15,972
Manhattan	268	155	146	123	95	84	871
Queens	2,553	2,556	2,637	2,482	2,330	2,372	14,930
Total	6,318	6,144	6,779	6,445	5,751	5,735	37,172

**Table 5: Confounding influence of multiple LPs near sales**

Time from sale	Distance from sale	Sales with 1+ LPs	
		<i>Number</i>	<i>Pct</i>
0-18 mos before sale	0-250 feet	28,891	na
0-18 mos before sale	250-1000 feet	27,728	96.0%
18+ mos before sale	0-250 feet	10,480	36.3%
18+ mos before sale	250-1000 feet	13,220	45.8%
Ever after sale	0-250 feet	24,692	85.5%
Ever after sale	250-1000 feet	26,604	92.1%

**Table 6: Estimated impact of LPs on nearby sales prices**

Dependent variable: Variable	Log(price)					
	(1)	(2)	(3)	(4)	(5)	(6)
# LPs, 0-250 ft, 0-18 mos	0.0066*** (0.0016)					
# LPs, 0-250 ft, 18+ mos	-0.0004 (0.0021)					
# LPs, 0-250 ft, anytime	-0.0043*** (0.0006)					
# LPs, 250-500 ft, 0-18 mos	0.0002 (0.0010)					
# LPs, 250-500 ft, 18+ mos	-0.0013 (0.0013)					
# LPs, 250-500 ft, anytime	-0.0011*** (0.0003)					
# LPs, 500-1000 ft, 0-18 mos	-0.0019*** (0.0005)					
# LPs, 500-1000 ft, 18+ mos	-0.0015*** (0.0005)					
# LPs, 500-1000 ft, anytime	-0.0004*** (0.0001)					
1+ LPs, 0-250 ft, 0-18 mos		-0.0054* (0.0032)	-0.0139*** (0.0031)	-0.0046 (0.0049)	-0.0036 (0.0032)	-0.0029 (0.0049)
1+ LPs, 0-250 ft, 18+ mos		-0.0144*** (0.0044)	-0.0191*** (0.0043)	-0.0174*** (0.0067)	-0.0108** (0.0044)	-0.0149** (0.0067)
1+ LPs, 0-250 ft, anytime		-0.0181*** (0.0039)		-0.0181*** (0.0044)	-0.0184*** (0.0039)	-0.0178*** (0.0045)
1+ LPs, 250-500 ft, 0-18 mos		0.0024 (0.0034)	-0.0112*** (0.0033)	0.0070* (0.0042)		
1+ LPs, 250-500 ft, 18+ mos		-0.0026 (0.0042)	-0.0094** (0.0042)	-0.0025 (0.0057)		
1-5 LPs, 250-500 ft, anytime					-0.0023 (0.0050)	-0.0073 (0.0052)
6+ LPs, 250-500 ft, anytime		-0.0387*** (0.0043)		-0.0466*** (0.0060)	-0.0330*** (0.0067)	-0.0461*** (0.0082)
6+ LPs, 500-1000 ft, 0-18 mos		-0.0258*** (0.0039)	-0.0387*** (0.0038)	-0.0197*** (0.0065)		
6+ LPs, 500-1000 ft, 18+ mos		-0.0156*** (0.0050)	-0.0182*** (0.0050)	-0.0070 (0.0082)		
11+ LPs, 500-1000 ft, anytime		-0.0381*** (0.0047)		-0.0346*** (0.0051)		
1-2 LPs, 250-500 ft, 0-18 mos					0.0037 (0.0036)	0.0088* (0.0045)
3+ LPs, 250-500 ft, 0-18 mos					-0.0023 (0.0048)	0.0171** (0.0078)
1-2 LPs, 250-500 ft, 18+ mos					0.0010 (0.0044)	0.0022 (0.0059)
3+ LPs, 250-500 ft, 18+ mos					-0.0134** (0.0064)	-0.0228** (0.0106)

6-10 LPs, 500-1000 ft, 0-18 mos					-0.0103**	0.0019
					(0.0044)	(0.0075)
11+ LPs, 500-1000 ft, 0-18 mos					-0.0356***	-0.0416***
					(0.0053)	(0.0099)
6-10 LPs, 500-1000 ft, 18+ mos					0.0031	0.0131
					(0.0057)	(0.0094)
11+ LPs, 500-1000 ft, 18+ mos					-0.0140**	0.0054
					(0.0071)	(0.0126)
11-19 LPs, 500-1000 ft, anytime					-0.0363***	-0.0318***
					(0.0049)	(0.0054)
20+ LPs, 500-1000 ft, anytime					-0.0554***	-0.0584***
					(0.0062)	(0.0079)
Observations	89,814	89,814	89,814	56,590	89,814	56,590
R-squared	0.686	0.686	0.685	0.662	0.686	0.662

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Column 1 includes count of number of LPs in given time and distance bucket (0-250, 250-500, 500-1000 feet). Columns 2-6 include dummies for LPs in given time and distance buckets (0-250, 250-500, 500-1000 feet). Columns 4 and 6 exclude ZIP codes that do not have both treatment sales (1+ sales near LPs) and control sales (not near any LPs ever). All models include a variety of property characteristics, ZIP code fixed effects, and borough-quarter-year time fixed effects.

**Appendix Table 1: Coefficients on hedonic variables**

<b>Dependent variable:</b>	<b>Log(price)</b>
lnLND_AREA	0.00530*** -0.00131
lnBLDNG_AREA	-1.876*** -0.571
unitage	-0.00311*** -0.00029
unitage2	0.0000186*** -2.7E-06
twostory	0.0192*** -0.00692
ldistsub	-0.00511 -0.00384
express	-0.0521*** -0.00684
noyrblt	-0.113*** -0.0119
lsqftunt	2.177*** -0.574
bldgs	0.0501*** -0.0124
lunits	1.483*** -0.573
sf_det	0.430*** -0.0113
sf_att	0.275*** -0.00992
twofam	0.190*** -0.00565
ZIP fixed effects	Y
Boro-quarter-year fixed effects	Y
Observations	56590
R-squared	0.662

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Coefficients taken from Table 6, model 1. The hedonic coefficients do not change substantially across the models shown in Table 6.

**Appendix Table 2: Robustness checks on functional form**

Dependent variable: Variable:	Log(price)		
	(1)	(2)	(3)
Log(# LPs, 0-250 ft, 0-18 mos)	0.0128*** (0.0035)		
Log(# LPs, 0-250 ft, 18+ mos)	-0.0026 (0.0046)		
Log(# LPs, 0-250 ft, anytime)	-0.0264*** (0.0029)		
Log(# LPs, 250-500 ft, 0-18 mos)	0.0012 (0.0031)		
Log(# LPs, 250-500 ft, 18+ mos)	-0.0040 (0.0038)		
Log(# LPs, 250-500 ft, anytime)	-0.0142*** (0.0029)		
Log(# LPs, 500-1000 ft, 0-18 mos)	-0.0137*** (0.0031)		
Log(# LPs, 500-1000 ft, 18+ mos)	-0.0146*** (0.0031)		
Log(# LPs, 500-1000 ft, anytime)	-0.0112*** (0.0033)		
# LPs, 0-250 ft, 0-18 mos		0.0009 (0.0021)	
# LPs, 0-250 ft, 18+ mos		-0.0003 (0.0024)	
# LPs, 0-250 ft, anytime		-0.00459*** (0.0007)	
# LPs, 250-500 ft, 0-18 mos		0.0000 (0.0011)	
# LPs, 250-500 ft, 18+ mos		-0.00254* (0.0014)	
# LPs, 250-500 ft, anytime		-0.00106*** (0.0004)	
# LPs, 500-1000 ft, 0-18 mos		-0.00210*** (0.0005)	-0.00186*** (0.0005)
# LPs, 500-1000 ft, 18+ mos		-0.00174*** (0.0005)	-0.00148*** (0.0005)
# LPs, 500-1000 ft, anytime		-0.000372*** (0.0001)	-0.000357*** (0.0001)
# LPs, 0-500 feet, 0-18 mos			0.00214*** (0.0008)
# LPs, 0-500 feet, 18+ mos			-0.0010 (0.0010)
# LPs, 0-500 feet, anytime			-0.00205*** (0.0003)
Observations	89814	86850	89814
R-squared	0.686	0.684	0.686

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Model 2 excludes sales that have 4+ LPs within 250 feet, 0-18 months prior to sale. Model 3 combines LPs within 0-500 feet. All models include property characteristics, ZIP fixed effects and borough-quarter-year fixed effects.