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Turnbull, Geoffrey K.; van der Vlist, Arno J.

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Foreclosures and housing prices: does neighborhood configuration matter?

Geoffrey K. Turnbull[1] **· Arno J. van der Vlist**[2]

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Abstract

This paper measures the extent to which effects of foreclosures vary across neighborhoods. It offers a simple empirical framework for decomposing the spillover effects on neighboring property prices. Data from Orange County, Florida, reveal that the effects systematically vary across neighborhoods by morphology. The results indicate that older, homogeneous age structure, and non-gated neighborhoods with high vacancy rates are most in jeopardy when foreclosures are present, as these neighborhoods show the greatest neighborhood house price effects.

JEL Classification R31

1 Introduction

Some neighborhoods in the USA were hit hard, but unevenly, by foreclosures in the aftermath of the 2008 housing market crash.[1] The prevailing view has been that the uneven distribution of foreclosures is largely responsible for the uneven price effects observed across neighborhoods, as greater concentrations of foreclosures increase marginal price effects of additional foreclosures. But this perspective ignores the possibility that foreclosure price effects on surrounding properties may depend not only on the localized concentration of foreclosures, but also on the physical and

[1] Campbell et al. (2011) report for Massachusetts that 92 percent of the sellers do not observe foreclosures within one-tenth mile, while 81 percent within a quarter of a mile do not observe foreclosures during the year before sale. Data for Orange County, FL, the subject of this study, shows similar patterns.

✉ Arno J. van der Vlist
a.j.van.der.vlist@rug.nl

Geoffrey K. Turnbull
geoffrey.turnbull@ucf.edu

[1] Department of Finance. Dr. P. Phillips School of Real Estate, University of Central Florida, P.O. 161991, Orlando, FL 32816-1991, USA

[2] Real Estate Centre, Department of Economic Geography, University of Groningen, Postbox 800, 9700 AV Groningen, The Netherlands

structural characteristics of neighborhoods. The nature of the built environment may matter; the age and uniformity of the neighborhood and the physical proximity to neglected or vacant foreclosed properties are determined by structural density and street configuration. The questions addressed here are straightforward: Does the surrounding built environment influence foreclosure price effects? And, if so, to what extent?

Most reviews of empirical studies on foreclosure effects suggest that neighboring property prices tend to be anywhere between one to two percent lower in neighborhoods with foreclosures.[2] The literature recognizes two mechanisms driving neighboring property prices lower. One is the negative foreclosure externality arising from poorly maintained or vacant foreclosed property.[3] The second is the supply effect arising from the fact that foreclosures increase the supply of housing for sale (Anenberg and Kung 2014; Hartley 2014; Mian et al. 2015; Gerardi et al. 2015).[4] Both mechanisms lead to lower neighborhood property values, the source of distress to residents and local governments.

The prevailing focus on foreclosure externality and supply effects on prices of surrounding houses overlooks a possibly mediating influence within the neighborhood. For instance, supply of new construction provides positive physical externalities to the neighborhood (Ioannides 2002; Rosenthal 2008; Helms 2012; Zahirovic-Herbert and Gibler 2014; Coulson et al. 2019; Gonzalez-Pampillon 2022). Buyers may interpret new construction as a signal of improved neighborhood quality, or the arrival of more affluent residents (Gonzalez-Pampillon 2022). In any case, new construction, whether rebuilding teardowns or new infill development, occurs unevenly in the interior of the urban area.[5] We empirically control for differences in the supply of new construction as a source of systematic variation in observed foreclosure price effects across neighborhoods.

It is worth emphasizing at this point that the foreclosure externality argument itself also suggests possible variation in foreclosure effects across neighborhoods. The negative externality arises because foreclosures induce vacancy and underinvestment in maintenance, creating negative physical externalities that reduce neighborhood attractiveness (Harding et al. 2009, 2012; Daneshvary and Clauretie 2012)

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[2] For examples, see Clauretie and Daneshvary (2009), Lin et al. (2009), Rogers and Winter (2009), Campbell et al. (2011), Daneshvary and Clauretie (2012), Anenberg and Kung (2014), Gerardi et al. (2015), Chinloy et al. (2017).

[3] The literature also refers to foreclosure externality as contagion effect (Harding et al. 2009) disamenity effect (Anenberg and Kung 2014), physical externality (Fisher et al. 2015) and investment externality (Cheung et al. 2014).

[4] The literature also refers to supply effect as competition effect (Anenberg and Kung 2014) or pecuniary externality (Gerardi et al. 2015).

[5] While it may seem odd to observe new construction in neighborhoods with foreclosures, the lead time required to obtain land, permits and complete new construction explains some of the new units being sold during the latest market downturn despite nearby foreclosures. Regardless, new construction continued, although at a much lower rate, throughout the market crash and slow subsequent recovery in hard-hit Orange County, Florida, even in neighborhoods with foreclosures. For Orange County, Florida, new construction of single family residential homes dropped from 6,124 in 2007, to 2,039 in 2009, and 2,620 in 2012 (OCPA 2017).

as well as external social costs in the form of reduced social interaction and community involvement (Harding et al. 2009) or increased crime (Immergluck and Smith 2006). Foreclosures may be the source of negative shopping externalities as well; potential buyers may interpret the presence of foreclosures as a signal of a greater risk of neighborhood instability or secular decline, which prompts them to focus their search efforts elsewhere. All of these factors reduce property values of surrounding non-distressed property. Not all neighborhoods, however, are equally vulnerable to these risks (Anenberg and Kung 2014; Ihlanfeldt and Mayock 2016). This study focuses on how foreclosure price effects vary by neighborhood configuration. To do so, we use geocoded administrative data to allow more explicit models of how foreclosure effects vary across neighborhoods.

This paper makes two contributions to the empirical housing market literature. First, we propose a simple framework for sorting neighborhood property price effects into foreclosure externality, new construction externality, and supply or pecuniary externality effects. Most previous work struggles with how to empirically separate these externality and supply effects and so tends to avoid distinguishing them explicitly. Studies that do distinguish externality and supply effects use supply measures that count numbers of foreclosures at greater distance (Harding et al. 2009), nearby foreclosures of different property types (Hartley 2014; Fisher et al. 2015), or precise timing of distressed and non-distressed properties listings (Anenberg and Kung 2014). It seems appropriate to identify supply effects using measures of competing or substitute properties that are on the market at the same time as the subject property. To that end, we incorporate measures of both foreclosed and similar open market (non-foreclosed) properties for sale in the surrounding neighborhood at the same time as the subject property.

Second, we examine whether foreclosure price effects vary with neighborhood configuration. Foreclosure effects may vary across neighborhoods due to differences in underlying economic vitality (Rosenthal 2008), housing market segmentation (Gerardi et al. 2015; Cheung et al. 2014; Zhang and Leonard 2014) as well as the neighborhood structure (Schuetz et al. 2008). Ellen and O'Regan (2010) argue that neighborhood configuration matters for market outcomes in general. Applying that notion to this case, a foreclosure may be more visible or physically closer to more surrounding properties in some neighborhoods than in other neighborhoods, and as a result, generate stronger price responses. To take these neighborhood differences into account, we also investigate foreclosure effects across built environments in terms of their urban density, neighborhood mix of homes, development period, vacancy rate, and whether the subdivision is gated or non-gated.

The geographic concentration of foreclosures in certain neighborhoods suggests that, for some neighborhood configurations, the foreclosure effect might be nonlinear in the number of foreclosures (e.g., in the case of rather uniform neighborhoods with many similar properties). If so, even a few neighboring foreclosures relative to non-distressed sales will have significant value effects on surrounding non-distressed transactions. Hanson et al. (2012) show that households tend to spatially sort by credit quality, creating conditions ripe for geographic concentration of foreclosures. The question remains whether the resultant concentrations of foreclosures in certain neighborhoods lead to increasing marginal price effects, exhibiting deeper and more enduring neighborhood price effects than would otherwise be expected if foreclosures were instead more evenly distributed across the market area. Schuetz et al. (2008) and Harding et al. (2009) both find no evidence of nonlinear foreclosure effects. In contrast with the samples used in those studies, our sample covers a period of intense foreclosure activity in one of the most active foreclosure markets in the US, which allows us to probe more deeply into how an unprecedented level of foreclosures affects property prices.

The remainder of the paper is organized as follows. Section 2 explains the empirical framework to sort out the channels through which foreclosures may influence surrounding property values. Section 3 describes the data. Section 4 reports the empirical results. We first report on foreclosure spillover effects and then consider whether these spillover effects vary with neighborhood configuration. Section 5 concludes.

2 Empirical framework

The empirical framework maps local foreclosures, open market sales and new construction onto neighboring house prices. In estimating these local effects we face the following challenge. Neighborhood effects such as foreclosure externalities (Campbell et al. 2011; Towe and Lawley 2013), crime risk (Linden and Rockoff 2008) or externalities associated with new construction (Ioannides 2002; Helms 2012) may be associated with endogenous social effects (Manski 1993; Rossi-Hansberg et al. 2010; Ross 2011; Ioannides 2011). These social effects arise when a household's foreclosure or new construction decision spillover to neighbors. Ideally, one would like to control for these effects using instrumental variables that are correlated with the local measure but not with price.[6] We take the alternative approach used by Linden and Rockoff (2008) and Campbell et al. (2011), which relies on the impact of extremely local neighborhood measures and very small time windows, and compares the relevant coefficients pertaining to neighborhood measures before and after each property sale to control for the state of the local economy in the micro-neighborhood.

We estimate separate localized externality effects of foreclosures, supply or pecuniary externality effects, and new housing construction[7] on other non-distressed property sales. We control for neighborhood market externalities by including

[6] Harding et al. (2009) proposed instruments such as mean loan originating credit score and mean loan originating loan-to-value at the neighborhood level. We applied the AHS data and, like Campbell et al. (2011), find no feasible instruments. In measuring neighborhood effects of housing renovation, Helms (2012) reports similar difficulty in alleviating the identification issue. Helms then proposes a spatial lag model in which all time-varying data are collapsed into one cross-section. Given the importance of timing in foreclosure effects, we follow Campbell et al. (2011) by comparing the effect of foreclosures before and after each property sale.

[7] It is possible that we miss some of the neighborhood effects as major home improvements are not registered consistently by our data source. While we do not have information on renovation, existing evidence implies that the positive externality effect of new construction is stronger than those from renovations (Helms 2012).

number of foreclosures, number of open market sales and, number of newly constructed houses that are on the market at the same time as the subject property.

The model we estimate specifies the log of price of house transaction i in neighborhood r and year t as a linear function of property characteristics and neighborhood market conditions:

$$\begin{aligned}\ln P_{irt} = \beta_X X_{it} + \beta_{\mathrm{FS}}^{\mathrm{before}}\mathrm{FS}_{it}^{\mathrm{before}} + \beta_{\mathrm{FS}}^{\mathrm{after}}\mathrm{FS}_{it}^{\mathrm{after}} + \beta_{\mathrm{MS}}^{\mathrm{before}}\mathrm{MS}_{it}^{\mathrm{before}} + \beta_{\mathrm{MS}}^{\mathrm{after}}\mathrm{MS}_{it}^{\mathrm{after}} \\ + \beta_{\mathrm{NC}}^{\mathrm{before}}\mathrm{NC}_{it}^{\mathrm{before}} + \beta_{\mathrm{NC}}^{\mathrm{after}}\mathrm{NC}_{it}^{\mathrm{after}} + \mu_t + \eta_r + \varepsilon_{irt},\end{aligned} \tag{1}$$

where P_{irt} is the selling price; $\boldsymbol{X}_{it}$ the vector of house characteristics; FS_{it} the number of nearby foreclosures, MS_{it} the number of nearby open market sales, and NC_{it} is the number of nearby newly constructed houses, all within distance d and within timeframe τ *before* or *after* the subject property transaction. Equation (1) also includes location and (interaction) time fixed effects to reduce unobserved heterogeneity and omitted variable bias.[8] Further, ε_{irt} is the error term clustered at the location fixed effects-level. Davis (2004) argues that using location fixed effects and clustered errors together also serves as nonparametric spatial correlation control.

Cast this way, the FS, MS, and NC variables control for nearby foreclosed houses, open market (non-foreclosure) houses, and new construction in the neighborhood at the same time the subject property is for sale. The timeframe windows *before* and *after* are included to capture other properties on the market at the same time as the subject property, some of which sell before and some after the subject sells.[9] The estimated coefficients for local market conditions variables provide important information regarding the extent of possible foreclosure and new construction externalities. FS captures the effect of foreclosures increasing the supply of existing houses on the market plus the negative foreclosure externality. MS captures the increasing supply associated with open (non-foreclosure) market sales of new construction and existing houses. The coefficient on the NC variable measures any externality associated with new construction (holding the total supply of houses constant).

These variables may include endogenous responses to neighborhood market conditions. Our identification strategy hinges on comparing short-run changes in values within very small areas arising from changes in the local or neighborhood housing market context. Following the procedure in Campbell et al. (2011), the externality effect estimate is the difference between the coefficient for foreclosures before the subject property transaction and the coefficient for foreclosures after the transaction, $[\beta_{\mathrm{FS}}^{\mathrm{before}} - \beta_{\mathrm{FS}}^{\mathrm{after}}]$. The standard error of the estimate can be calculated using the delta method. If foreclosure spillovers are present, then we should observe a negative impact as the largest negative impacts of foreclosure on property values are prior to the sale. The same identification strategy applies to the new construction and

[8] We use several location (zip code, census tract and census block group) and time fixed effect-levels (year, year-month).

[9] In the case of foreclosures, the lead window also picks up properties in the foreclosure process before they are formally put on the market. Harding et al. (2009), Campbell et al. (2011) and Gerardi et al. (2015) note that what we identify as the foreclosure externality effect may begin early in the foreclosure process.

open market sales variables. To the extent that local economic shocks impact house prices, we include in one of the models also past and future foreclosures slightly farther away (between one-tenth and a quarter of a mile) as controls (Linden and Rockoff 2008; Campbell et al. 2011).

Second, because foreclosures generate both negative externality and supply effects (or pecuniary externality), we follow Anenberg and Kung (2014) and Hartley (2014), and use the difference in estimates relative to market sales to remove the supply effects of foreclosures on price, which in our application reduces to[10]

$$\text{Foreclosure externality} = [\beta_{\text{FS}}^{\text{before}} - \beta_{\text{FS}}^{\text{after}}] - [\beta_{\text{MS}}^{\text{before}} - \beta_{\text{MS}}^{\text{after}}]. \quad (2)$$

The above calculation measures the combined effect of increasing nearby foreclosures by one, while decreasing the number of non-distressed properties on the market by one, to arrive at the net externality effect of an additional foreclosure.

Finally, to the extent that new construction creates a positive spillover in the neighborhood, the difference in the before and after coefficient estimates for the new construction variables should reflect the new construction externality:

$$\text{New construction externality} = [\beta_{\text{NC}}^{\text{before}} - \beta_{\text{NC}}^{\text{after}}]. \quad (3)$$

In this case, there is no need to remove a supply effect because the number of non-distressed properties for sale (which includes new houses) is already being captured by the market sales variables (which includes new houses). The estimated new construction effect reflects the effect of increasing the number of new houses for sale by one, while simultaneously decreasing the number of existing houses for sale by one.

If the (negative) FS coefficient is algebraically less than the MS coefficient, then increasing the number of foreclosures while holding neighborhood supply constant reduces the prices of surrounding properties. This result is consistent with a negative real externality effect from neighboring foreclosures. If, on the other hand, the FS and MS coefficients are not significantly different, neighboring foreclosures have no real externality effect on surrounding properties. Finally, if the (negative) MS coefficient is less than the FS coefficient, then increasing the number of foreclosures while holding neighborhood market supply constant increases the prices of surrounding properties. Although it may seem counter-intuitive at first blush, this outcome is nonetheless consistent with foreclosed properties generating a stronger shopping externality for the neighborhood than open market properties. In this case, the presence of nearby foreclosures for sale is a stronger draw for potential buyers than open market properties; the resultant increases in buyer arrival rates increase the probabilities of higher priced matches for nearby sellers, including sellers of open market properties. It is important to remember that the coefficients on the new construction variables (NC) do not capture supply effects and instead solely pick up the neighborhood quality signaling or the housing investment externality effect arising from new construction.

[10] This assumes foreclosures and market sales have identical supply effects on the subject property price.

To provide evidence on the extent of variation in foreclosure effects by neighborhood configuration, we estimate separate models by the built structure of the neighborhood. The neighborhood configuration is often defined in terms of streets, lots, and buildings.[11] Along with physical elements, the social aspects of urban morphology have also been deemed important (Nedovic-Budic et al. 2016). We summarize neighborhood configuration using a set of simple dimensions of urban form: urban density, neighborhood mix of homes, development period, vacancy rate, and whether the property is in a gated or non-gated neighborhood subdivision.

3 Data

The data are drawn from property assessment records of Orange County, Florida, covering all of the 426,021 parcels in the county as of August 24, 2012. Orange County is part of the Orlando-Kissimmee-Sanford Metropolitan Statistical Area (MSA), and has been experiencing long-term population growth from 896,344 (2000 Census) to 1,145,956 (2010 Census). Orange County is an interesting case study to explore whether foreclosure price effects vary across neighborhoods. Orange County is one of the epicenters of the foreclosure crisis. While so, foreclosures were not evenly distributed across neighborhoods. We focus on how foreclosure price effects vary by neighborhood configuration.

Local assessor records in Florida have been used as the primary data source in a number of studies and have several advantages (Ihlanfeldt and Mayock 2012; Turnbull and Van der Vlist 2023). One advantage of local assessor records over multiple listing service (MLS) data for broker-assisted transactions is that tax records provide information on the entire stock of existing properties, not just those that sell. Another is that MLS data do not cover all public transactions and, most important for the question addressed here, likely underreport foreclosure transactions (Daneshvary and Clauretie 2012; Chinloy et al. 2017)—which may be critically important in this sample, as increasing numbers of foreclosed properties in Orange County were sold directly to investment firms and other organized investors without first being offered to individual buyers through traditional channels like the MLS.

Conversely, a disadvantage of tax assessment records is that they provide no direct information about liquidity or time-on-the market for sold properties (although most existing foreclosure studies using MLS data also have not exploited liquidity data). Krainer (2001) shows that changes in buyer willingness-to-pay is reflected in both selling price and liquidity in search markets; recent empirical studies provide evidence of price-liquidity capitalization for both individual property and neighborhood characteristics (Turnbull et al. 2013; Turnbull and Zahirovic-Herbert 2011). Therefore, the absence of marketing time measures in this study means that the price effects of foreclosures identified here, as well as in most of the foreclosure literature, may reflect only one dimension of the possible capitalization effects.

[11] Measuring urban form remains an important topic in the field of urban studies, as we refer to Whitehand (1992), Anas et al. (1998), Song and Knaap (2003; 2004; 2007), and Nedovic-Budic et al. (2016).

The tax records yield detailed information on property characteristics as well as addresses, transaction prices, transaction dates, and deed types (which allows us to identify foreclosed properties).[12] We focus on built-up areas of the county, excluding the sparsely settled northwestern and eastern parts of the jurisdiction. The single family detached house (SFD) data cover 266,897 separate properties during the sample period of January 2007 through August 2012.

The data include transaction price, transaction date, and deed type. The structure of the data source allows us to observe the transaction history over 2007-to mid-2012. This sample period captures the declining market over 2008–2010 and the weak recovery starting in early 2012. The dependent variable is the transaction price. The control variables measure property characteristics and location and time fixed effects. The analysis focuses on single family detached houses (SFD). Living area indicates the square feet of air-conditioned/heated area. Other property characteristics include number of bedrooms and bathrooms, presence of a private swimming pool, house age, and type of exterior walls. Total land acreage is the measure of parcel size and encompasses both upland and any submerged area lying within the parcel legal boundary. The data allow us to construct GIS-based neighborhood housing market conditions indicators based on the number of FS, MS, and NC in the neighborhood within distance d (one-tenth, a quarter of a mile) taking place within time frame τ before and after transaction time t (90, 180 days) of each subject property.

We define neighborhood configuration using a set of simple dimensions of urban form. First, we measure urban density, development period, and vacancy at the neighborhood census blockgroup-level, using the 2000 American Community Survey (ACS). Next, at a more granular level, we measure neighborhood mix of homes (variation in development period, and size of living area) at the census block-level, using the administrative parcel-level data for the year 2000. Last, we identify for each transaction whether a property lies within a private gated or publicly accessible non-gated subdivision, using administrative information on subdivisions.[13] We use these measures to examine how foreclosure effects vary with neighborhood configuration.

The sample consists of open market transactions transferring warranty deeds, and excludes all legal administrator's deed, tax deed, and quit claim deeds (all for administrative non-arm's length transaction purposes), including all transactions for \$100, the usual indicator of a non-market transfer of property interest. Following Daneshvary et al. (2011), we trim the lower and upper 1 percent of the distribution of price and living area to control for outliers. Furthermore, we define the maximum spatial extent of the surrounding neighborhood for each property as one mile, so

[12] We use deed information to identify foreclosed properties as follows: Florida is a judicial foreclosure state which means that the clerk of court must file a Certificate of Title after a foreclosure auction takes place. The Certificate of Title instrument allows lenders to take back their properties and subsequently sell it either through auction or listing. We use Certificate of Titles to identify (the flow of new) foreclosures. A Warranty deed instrument refers to open market sales. New construction refers to open market sales of new properties (for a discussion, see Turnbull and Van der Vlist 2023).

[13] Note that membership of a subdivision association is mandatory in the case of a gated subdivision.

while observations within one mile of the county boundary are used to construct instruments for total number of properties, foreclosed sales, market sales, and new construction, they are not otherwise included in the price equation sample. Similarly, observations in the first six-month time frame are excluded from the model estimation to construct the proper burn-in period for our instruments. The number of observations in the sample for estimating the price equation is 39,913 open market transactions.[14] Variable definitions are given in Appendix 1.

Table 1 reports the descriptive statistics. The table indicates a mean price of almost $235,000 and a median of $185,000, thus reflecting a distribution skewed to the right. We therefore use the natural logarithm of transaction price in the empirical analysis. Structural property characteristics indicate the type of building construction material (63% have walls made of stucco covered concrete block versus wood frame construction), number of bedrooms (3.45 average), living area (2,040 square feet average), number of bathrooms (2.32 average), presence of a private pool (27%), lot size (40,079 square feet average), and actual age of the house (22.6 years). Location controls include the (quadratic) distance to the Orlando CBD (8.98 miles linear distance average) and zip code fixed effects. Over 70 percent of the transactions lie within the City of Orlando, the largest and most populous municipality in Orange County.

A further decomposition of descriptive statistics by neighborhood configuration is found in Appendix 2. The descriptive statistics report some structural differences in average property characteristics across type of neighborhood. Low density neighborhoods have lower mean house prices ($206,809) than high density neighborhoods ($281,254). Also, older neighborhoods (in terms of mean building age) have lower mean house prices ($165,234) relative to newer neighborhoods ($311,275). The typical property in these older neighborhoods is smaller in terms of living area, and of less quality in terms of construction materials, but they generally have larger parcels. Note further that house prices are higher in neighborhoods with more heterogeneous housing stock measured in terms of property age or property size.

The lower panel of Table 1 provides summary statistics for the constructed variables measuring neighborhood market conditions including the number of foreclosures (FS), the number of market transactions (MS), and the number of newly constructed properties (NC). The data reveal that a large majority of sales occur in areas with no surrounding foreclosures. This is consistent with Campbell et al. (2011) although the overall incidence of foreclosures in Orange County is greater. In total, 82.6 percent of sellers do not have any foreclosure within one-tenth mile and 180 days. Multiple nearby foreclosures are even less frequent. The data reveal that 95.7 percent of the sellers do not observe two or more foreclosures, while 98.8

[14] The original data cover 54,553 open market sales of which 7,542 are administrative warranty deeds with a price of $100 which we remove from the sample. We then trim the lower and upper 1% of living area (removing 581 observations), transaction price (removing 91 observations), and properties whose construction date is listed as occurring after the transaction date (removing 604 observations). We also lose 5,802 observations for the burn-in space and time period when constructing the *FS*, *MS*, and *NC* variables. The resultant data set has 39,913 observations.

percent of the sellers do not observe three or more foreclosures, all within one-tenth mile and 180 days.[15]

The mean number of nearby foreclosures is 0.235 but varies across neighborhood types. Likewise, one observes differences in the number of market sales and in the number of newly constructed properties. Looking at the number of newly constructed properties within the indicated geographic area and time frame, the average new construction (0.542 for the pooled sample) varies between 0.117 and 4.522 across neighborhood types. These transactions can be interpreted relative to the density or mean total property which varies across neighborhood types between 19.59 and 36.76. Overall, the *FS*, *MS*, and *NC* measures all show substantial variation across neighborhood configuration.

4 Empirical results

4.1 Foreclosure spillover effects

Table 2 reports the results for the pooled models of Eq. (1). The models indicate joint significance of the specification. The estimates for the structural characteristics of the property are as expected. Property value decreases with distance to the CBD and the effect becomes less pronounced at greater distances. House structure quality and exterior construction matter. Concrete block construction covered with stucco exhibits higher market value relative to wood frame construction. In addition, larger houses in terms of number of bedrooms, living area and number of bathrooms are associated with higher property values. A pool has a significant positive effect on property value in this market, as does parcel size.

The lower panel in Table 2 reports associated estimates for the price effects of surrounding foreclosures on property prices based on Eqs. (2) and (3). The estimates reveal that foreclosures within one-tenth mile and 180 days before the sale of a given subject property have significant negative effects on surrounding open market sales.[16] The marginal effect of a foreclosure before a sale is significantly stronger than the coefficient of a foreclosure after a sale, a result consistent with Campbell et al. (2011). Note that sales of some properties occurring after the subject property sells are also on the market before the subject sells. Also observe that the foreclosure coefficient is stronger than the coefficient on open market or non-distressed sales, which implies that the negative foreclosure externality effect dominates its associated supply effect. In our model 1, the foreclosure externality effect calculated using Eq. (2) is -0.0152 with a standard error of 0.005 and is significant at the 1 percent

[15] For a wider time window of 360 days before sale, the statistic is 72.27 percent within 1/10 mile. For multiple foreclosures the statistic is 89.54 percent within 1/10 mile for two or more foreclosures, or 95.70 percent for three or more.

[16] We also test whether these effects are driven by structural density using auxiliary regressions that control for total number of properties within one tenth of a mile. These results confirm that our effects are not driven by density.

Table 1 Descriptive statistics

	Mean	St. dev
Property controls		
Price	234,425	176,698
CBD distance (miles)	8.979	4.207
Walls concrete stucco (1 = yes)	0.632	
Number of bedrooms	3.448	0.790
Living area (in sq. ft.)	2,040	830.2
Age of property (in years)	22.61	20.50
Number of bathrooms	231.6	79.05
Pool (1 = yes)	0.265	
Parcel size (in sq. ft.)	40,079	39,637
Neighborhood configuration		
Low density	0.258	
High density	0.274	
Low vacancy	0.231	
High vacancy	0.283	
Old neighborhood	0.251	
New neighborhood	0.235	
Homogeneous in age SFD	0.244	
Homogeneous in age SFD	0.239	
Heterogeneous in living area SFD	0.253	
Homogeneous in living area SFD	0.247	
Local housing market controls		
Number of foreclosure sales (near, before)	0.235	0.595
Number of foreclosure sales (near, after)	0.205	0.543
Number of foreclosure sales (far, before)	0.626	1.183
Number of foreclosure sales (far, after)	0.628	1.144
Number of foreclosure sales = 1 (near, before)	0.131	
Number of foreclosure sales = 2 (near, before)	0.031	
Number of foreclosure sales > 2 (near, before)	0.012	
Number of market sales (near, before)	1.633	2.474
Number of market sales (near, after)	1.096	1.410
Number of market sales (far, before)	3.915	4.373
Number of market sales (far, after)	2.971	2.910
Number of new construction (near, before)	0.542	2.428
Number of new construction (near, after)	0.806	3.650
Number of new construction (far, before)	0.273	1.325
Number of new construction (far, after)	0.441	1.902

See Appendix 1 for variable definitions. *N* is 39,913

Table 2 Estimation results pooled model

	(1)			(2)		
	Coefficient		Std. error	Coefficient		Std. error
Property controls						
CBD distance (miles)	– 0.0279	***	(0.0079)	– 0.0276	***	(0.0078)
CBD distance squared	0.0013	***	(0.0003)	0.0013	***	(0.0003)
Walls concrete stucco	0.0692	***	(0.0062)	0.0672	***	(0.0061)
Number of bedrooms less than 3	– 0.0274	***	(0.0103)	– 0.0256	**	(0.0104)
Number of bedrooms more than 3	– 0.0233	***	(0.0052)	– 0.0233	***	(0.0052)
Log living area	0.6620	***	(0.0121)	0.6670	***	(0.0121)
Log age	– 0.0457	***	(0.0024)	– 0.0475	***	(0.0024)
Number of bathrooms is 1	– 0.1630	***	(0.0116)	– 0.1620	***	(0.0116)
Number of bathrooms is 1.50	– 0.1320	***	(0.0152)	– 0.1310	***	(0.0149)
Number of bathrooms is 2.50	0.0058		(0.0058)	0.0069		(0.0059)
Number of bathrooms more than 2.5	0.0689	***	(0.0071)	0.0691	***	(0.0071)
Pool	0.1290	***	(0.0047)	0.1280	***	(0.0047)
Log parcel size	0.3160	***	(0.0066)	0.3120	***	(0.0065)
Local housing market controls						
Number of foreclosure sales (near, before)	– 0.0206	***	(0.0032)	– 0.0143	***	(0.0030)
Number of foreclosure sales (near, after)	– 0.0042		(0.0033)	0.0007		(0.0033)
Number of foreclosure sales (far, before)				– 0.0183	***	(0.0022)
Number of foreclosure sales (far, after)				– 0.0051	***	(0.0017)
Number of market sales (near, before)	– 0.0013		(0.0012)	– 0.0019	*	(0.0012)
Number of market sales (near, after)	– 0.00002		(0.0015)	0.0004		(0.0015)
Number of market sales (far, before)				0.0034	***	(0.0007)
Number of market sales (far, after)				0.0004		(0.0009)
Number of new construction (near, before)	– 0.0076	***	(0.0013)	– 0.0029	**	(0.0014)
Number of new construction (near, after)	– 0.0122	***	(0.0016)	– 0.0084	***	(0.0015)
Number of new construction (far, before)				– 0.0061	***	(0.0009)
Number of new construction (far, after)				– 0.0071	***	(0.0013)
Number of observations	39,913			39,913		
R-squared	0.807			0.808		
Spillover effects						
Foreclosure externality	– 0.0152	***	(0.0049)	– 0.0127	***	(0.0048)
New construction externality	0.0046	**	(0.0019)	0.0054	***	(0.0019)

The dependent variable is log transaction value. The reference category include Number of Bedrooms equals 3, Number of Bathrooms equals 2.00. All models include location fixed effects for ZIP code, and time fixed effects for year and quarter. Clustered standard errors at Census block level are in parentheses with ***, **, * indicating significance at 1%, 5%, and 10%, respectively. Spillover effects are determined using Eqs. (2) and (3) with implied standard errors using delta method. *N* is 39,913 level.[17] For model 2, where we control for local housing market conditions by adding local housing market measures of number of foreclosure sales, market sales, and new construction within one-tenth and a quarter of a mile, the foreclosure effect on surrounding property remains economically significant and, not surprisingly, negative.[18] Note further that the foreclosure externality effect within one-tenth and one quarter of a mile (denoted with 'far') is −0.0162 and statistically not significantly different from the obtained foreclosure externality effect nearby.[19]

The new construction coefficient before a sale relative to the coefficient after a sale indicates that new construction has a positive externality effect on neighborhood housing. This finding is consistent with the notion that potential buyers regard new construction as a positive signal of neighborhood stability or growth (Ioannides 2002; Helms 2012; Zahirovic-Herbert and Gibler 2014; Gonzalez-Pampillon 2022) or that new construction generates positive shopping externalities for surrounding existing properties. The associated new construction externality effect calculated using Eq. (3) is 0.005, with a standard error of 0.002 and is significant at the 2 percent significance level.

It is interesting to compare the negative foreclosure externality and the positive new construction externality in detail. Our estimates indicate that the negative externality effect of a foreclosure outweighs the positive externality effect of new construction. A linear test on equality of the parameters of Eqs. (2) and (3) gives an F value of 14.0 and is beyond the critical value at the 1 percent significance level. Hence, while new construction provides a positive signal to the neighborhood, the marginal effect of the (negative) foreclosure externality dominates.

Table 3 reports key estimates for various location and time (interaction) fixed effects. Pulling these results together we find foreclosure externality effects anywhere between −0.0156 and −0.0096. These estimates are similar to our main results. For new construction externality effects we find estimates between 0.001 and 0.0055, which for some fixed effects specifications are not significantly different from zero.

4.2 Foreclosure spillover effects and neighborhood configuration

We turn now to the variation in foreclosure effect by neighborhood configuration. What we have obtained thus far is an average effect of foreclosure on property prices. But we have argued that foreclosure effects may vary across neighborhoods. We probe more deeply into urban morphology and how foreclosure effects vary with a set of simple dimensions of urban structure, viz. urban density, neighborhood mix

[17] The foreclosure externality calculated using (2) equals ((−0.0206–−0.0042)—(−0.0013–0.00002)) or −0.0152.

[18] The foreclosure externality calculated using (2) equals ((−0.0143—0.0007)—(−0.0019–0.0004)) or −0.0127.

[19] The foreclosure externality far calculated using (2) equals ((−0.0183–0.0051)—(0.0034–0.0004)) or −0.0163. The F-test on equal foreclosure externality effects near equals far yields a statistic of 0.48 and does not favor the alternative hypothesis of unequal foreclosure effects.

Table 3 Summary of results for models with varying fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Local housing market controls							
Number of foreclosure sales (near, before)	− 0.0213*** (0.0038)	− 0.0214*** (0.0035)	− 0.0135*** (0.0029)	− 0.0125*** (0.0032)	− 0.0202*** (0.0034)	− 0.0099*** (0.0029)	− 0.0082** (0.0036)
Number of foreclosure sales (near, after)	− 0.0057* (0.0031)	− 0.0063* (0.0032)	0.0007 (0.0036)	0.0014 (0.0043)	− 0.0066** (0.0032)	6.50e-05 (0.0036)	− 0.0012 (0.0044)
Number of market sales (near, before)	− 0.0014 (0.0022)	− 0.0008 (0.0017)	0.0006 (0.0014)	0.0011 (0.0017)	− 0.0014 (0.0015)	− 0.0004 (0.0012)	0.0004 (0.0015)
Number of market sales (near, after)	0.0011 (0.0023)	0.0009 (0.0019)	0.00071 (0.0016)	− 0.0006 (0.0021)	0.0001 (0.0017)	− 0.0005 (0.0015)	− 0.0022 (0.0020)
Number of new construction (near, before)	− 0.0070*** (0.0024)	− 0.0076*** (0.0022)	− 0.0052*** (0.0019)	− 0.0062*** (0.0022)	− 0.0064*** (0.0018)	− 0.0035** (0.0016)	− 0.0046** (0.0019)
Number of new construction (near, after)	− 0.0121*** (0.0036)	− 0.0127*** (0.0035)	− 0.0108*** (0.0031)	− 0.0085*** (0.0032)	− 0.0111*** (0.0033)	− 0.0086*** (0.0027)	− 0.0056*** (0.0027)
Fixed effect	Zip + Year	Tract + Year	Tract × Year	Tract × Month-Year	Block group + Year	Block group × Year	Block group × Month-Year
Observations	39,913	39,913	39,913	39,913	39,913	39,913	39,913
R-squared	0.804	0.810	0.837	0.88	0.816	0.849	0.915
Spillover effects							
Foreclosure externality	− 0.0131*** (0.0050)	− 0.0134*** (0.0057)	− 0.0139*** (0.0052)	− 0.0156*** (0.0060)	− 0.0121** (0.0050)	− 0.0101** (0.0048)	− 0.0096* (0.0054)
New construction externality	0.0050 (0.0051)	0.0051 (0.0033)	0.0055* (0.0030)	0.0023 (0.0031)	0.0047 (0.0030)	0.0051* (0.0030)	0.0010 (0.0029)

The dependent variable is log transaction value. The reference category include Number of Bedrooms equals 3, Number of Bathrooms equals 2.00. Clustered standard errors at respective location fixed effect-level are in parentheses with ***, **, * indicating significance at 1%, 5%, and 10%, respectively. Spillover effects are determined using Eqs. (2) and (3) with implied standard errors using delta method. N is 39,913 of homes, and development period, vacancy rate, and whether the property is in a gated or non-gated neighborhood subdivision.

First we consider urban density based on the premise that foreclosures in low density neighborhoods may have stronger price effects because they are more visible than in high density neighborhoods. We test for this effect by examining foreclosure price effects for subsamples partitioned by density. We partition the data into low density and high density and re-estimate the basic model on the resultant subsamples.[20]

In order to probe more deeply into how foreclosures may depend more subtly on the neighborhood mix, we use a variety of ways to measure differences between neighborhoods. One way to control for type of neighborhood is to segment by mean vacancy rate (low and high vacancy rates[21]) or mean age of the neighborhood (new and old neighborhoods[22]). We use these measures of between-neighborhood variation to identify the extent to which differences in the foreclosure externality arise across neighborhoods. Table 4 reports the key estimates.

Looking at the results summarized in Table 4, the point estimates of the foreclosure externality effect, as measured by the difference in before and after *FS* and *MS* coefficients, indicate a somewhat stronger impact in the lowest density neighborhoods. The implied pattern of the foreclosure signaling/density relationship is consistent with that suggested by Schuetz et al. (2008).

Another way to control for type of neighborhood is to use the coefficient of variation to measure within-neighborhood variation in terms of age or size of house (homogeneous versus heterogeneous neighborhoods[23]). Overall, the results indicate strongest effects for homogeneous neighborhoods, both in terms of age or size of the housing units. We interpret this as strong evidence of a signaling effect of neighborhood stability. The estimates suggest two factors at work. First, the foreclosure externality varies with the physical structure of the neighborhood as measured by density and (variation in) age and size of houses. Second, the foreclosure externality varies with the specific neighborhood housing market conditions as measured by vacancy rate.

We next turn to the possibility that the main effect of foreclosures on prices might be nonlinear. Figure 1 depicts the structure by mapping the parameter estimates for the various neighborhood types. These results are based on models that employ a set of foreclosure dummy variables as a flexible structure to capture any nonlinear effects associated with the number of foreclosures. The effects are consistent with

[20] Low and high density refers to p(25) and p(75) of the probability density function of number of units per census block group, or 1117 and 3613 units, respectively.

[21] Low and high vacancy refers to p(25) and p(75) of the probability density function of vacancy rate per census block group, or 8.5 and 17.4) percent, respectively.

[22] New and old neighborhood refers to p(25) and p(75) of the probability density function of age per census block group, or 6 and 36 years, respectively.

[23] Homogeneity and heterogeneity are based on the within census-block neighborhood coefficient of variation of, for example, age or size of house. Homogeneity refers to a low coefficient of variation (p(25) of the probability density function across all neighborhoods), whereas heterogeneity refers to a high coefficient of variation (p(75) of the probability density function across all neighborhoods).

the basic models examined earlier. There appears to be a cumulative negative real externality from additional foreclosures varying by neighborhood configuration. Summarizing the results, we find that older, homogeneous neighborhoods with high vacancy rates are most in jeopardy when foreclosures are present.

Table 4 also reports the key estimates when comparing neighborhoods in gated versus non-gated subdivisions. Gated subdivisions in this market are private communities that offer their residents amenities which are unavailable to the general public. Properties in gated communities are also typically subject to stricter controls regarding maintenance and use than are properties in non-gated neighborhoods. The community associations governing gated neighborhoods often have legal powers to compel maintenance or undertake actions to maintain the neighborhood character. It is therefore not surprising that results reported in Table 4 show that foreclosure and new construction externalities vary significantly across gated and non-gated neighborhood types. Legal governing powers used by community associations in gated

Table 4 Summary of results for models by neighborhood type

Neighborhood type	Spillover effects						*N*	F—statistic	
	Foreclosure externality			New construction externality					
Density									
Low number of units	– 0.0428	***	(0.0151)	0.0268	***	(0.0092)	10,284	15.02	***
High number of units	– 0.0047		(0.0047)	0.0013		(0.0021)	10,943	1.60	
Vacancy rate									
Low vacancy rate	– 0.0139		(0.0094)	0.0050		(0.0041)	9,216	3.58	*
High vacancy rate	– 0.0177	**	(0.0081)	0.0111	***	(0.0038)	11,282	10.30	***
Neighborhood age									
New neighborhood	– 0.0038		(0.0054)	0.0054	***	(0.0018)	9,361	3.04	*
Old neighborhood	– 0.0359	**	(0.0177)	0.0046		(0.0701)	9,999	0.30	
Within neighborhood variation in age of houses									
Homogeneous in age of SFD	– 0.0229	*	(0.0121)	0.1214	*	(0.0642)	9,719	4.70	**
Heterogeneous in age of SFD	– 0.0150	*	(0.0082)	0.0066	***	(0.0019)	9,522	6.67	**
Within neighborhood variation in size of houses									
Homogeneous in living area of SFD	– 0.0308	***	(0.0089)	0.0110	*	(0.0058)	10,103	15.00	***
Heterogeneous in living area of SFD	– 0.0197		(0.0119)	0.0054	*	(0.0039)	9,855	4.05	**
Subdivision									
Gated	– 0.0070		(0.0067)	0.0026		(0.0030)	6,445	2.30	
Non-gated	– 0.0170	***	(0.0056)	0.0062	**	(0.0024)	33,468	13.90	***

Table summarizes the results for the spillover effects, based on model specification (1) in Table 2. The dependent variable is log transaction value. The reference category include Number of Bedrooms equals 3, Number of Bathrooms equals 2,00. All models include location fixed effects for ZIP code, and time fixed effects for year and month. Clustered standard errors at Census block level are in parentheses with ***, **, * indicating significance at 1%, 5%, and 10%, respectively. The last column gives the *F*—statistic of a linear test on foreclosure externality equals new construction externality neighborhoods appear to obviate both types of externalities, in contrast to the significant effects observed for non-gated neighborhoods.

5 Conclusion

Foreclosures influence nearby property values, but the marginal effects vary significantly across neighborhoods. Our approach estimates the foreclosure effects across neighborhoods while controlling for the increasing supply of housing for sale as erstwhile foreclosed owners are removed from the market. We also introduce new construction into the empirical framework to control for possible externality effects arising when buyers interpret new construction as a signal of neighborhood stability or future growth, removing these possibly confounding influences on the estimated foreclosure externality effects across neighborhood types.

Data from an epicenter of the US foreclosure experience, Orange County, Florida, reveal that nearby foreclosures appear to reduce property prices by 1.43 percent overall. Removing the supply effect, these estimates imply a foreclosure externality of − 1.27 percent. The new construction externality is 0.5 percent.

Turning to the main point of this paper, we find that foreclosure spillover effects systematically vary across types of neighborhoods, exhibiting almost tenfold variation in some cases. For example, the marginal foreclosure externality ranges from − 0.38 percent for newer neighborhoods to −3.59 percent for older ones. Overall, the strongest foreclosure effects are found in low density neighborhoods, structurally homogeneous neighborhoods, and non-gated subdivisions. We also find that nonlinear foreclosure effects vary across types of neighborhoods, with older, structurally homogeneous neighborhoods with high vacancy rates most in jeopardy in this regard.

Admittedly, urban morphology includes more dimensions than the ones we have considered, including street connectivity and accessibility. Likewise, as foreclosures force affected households to move, foreclosures may well have long-term implications for the composition and social stability of urban neighborhoods. Hawley and Turnbull (2019) show that the built environment affects household behavior, but at the same time households choose neighborhoods with built environments conducive to pursuing lifestyles they prefer. Taking this type of endogenous household sorting into account, while we find that neighborhood built environment does matter for foreclosure price effects on surrounding properties, the Hawley and Turnbull (2019) conclusions suggest a need for future work to identify the extent to which these effects are specifically related to the built environment or to the mix of residents attracted to neighborhoods with those characteristics.

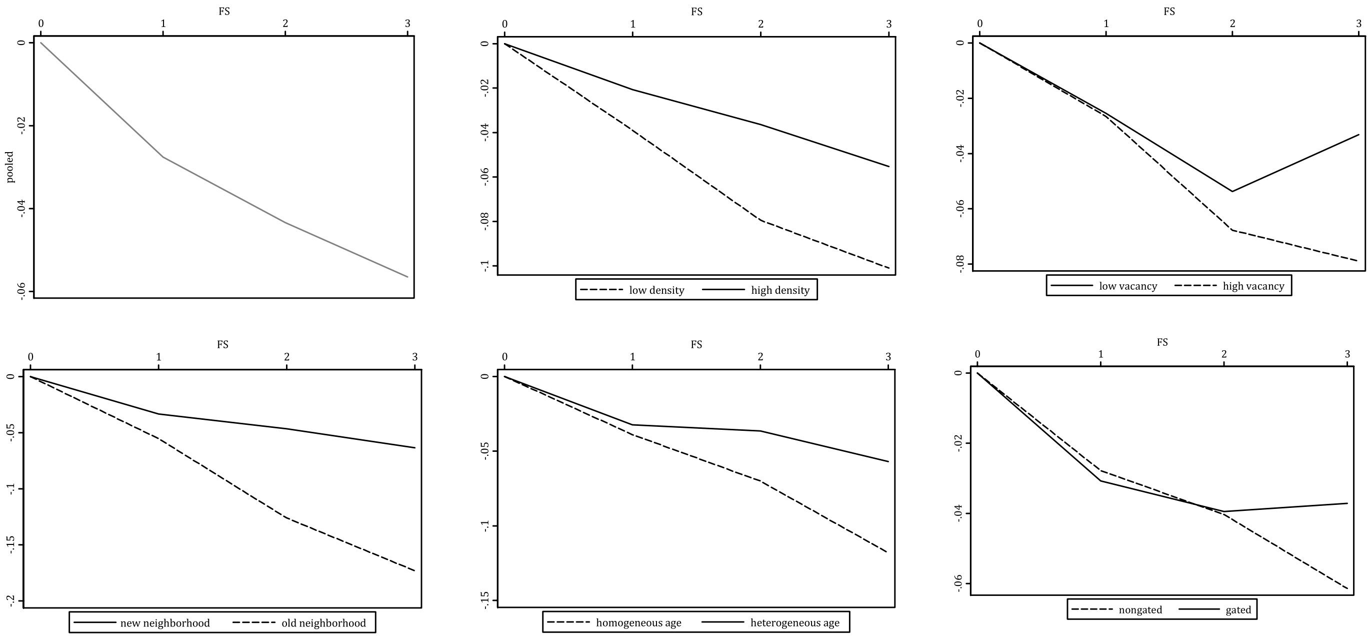

Fig. 1 Nonlinear foreclosure effects across neighborhood types, number of foreclosures FS (near, before). *Note* Graphs plot coefficient for I1 (FS = 1), I2 (FS = 2), and I3 (FS = 3 or more), based on model specification (1) in Table 2. The dependent variable is log transaction value. The reference category includes Number of Bedrooms equals 3, Number of Bathrooms equals 2.00. All models include location fixed effects for ZIP code, and time fixed effects for year and month

Appendix 1: Data appendix

Variables	Definition
Price	Sales price property *i* at time *t*
Number of foreclosures (near, before)	Number of foreclosures within 1/10 mile and 180 days before the sale of property *i*
Number of foreclosures (near, after)	Number of foreclosures within 1/10 mile and 180 days after the sale of property *i*
Number of foreclosures (far, before)	Number of foreclosures within (1/10–1/4) mile and 180 days before the sale of property *i*
Number of foreclosures (far, after)	Number of foreclosures within (1/10–1/4) mile and 180 days after the sale of property *i*
Number of market sales (near, before)	Number of warranty deeds within 1/10 mile and 180 days before the sale of property *i*
Number of market sales (near, after)	Number of warranty deeds within 1/10 mile and 180 days after the sale of property *i*
Number of market sales (far, before)	Number of warranty deeds within (1/10–1/4) mile and 180 days before the sale of property *i*
Number of market sales (far, after)	Number of warranty deeds within (1/10–1/4) mile and 180 days after the sale of property *i*
Number of new construction (near, before)	Number of new constructed properties—based on building date—within 1/10 mile and 180 days before the sale of property *i*
Number of new construction (near, after)	Number of new constructed properties—based on building date—within 1/10 mile and 180 days after the sale of property *i*
Number of new construction (far, before)	Number of new constructed properties—based on building date—within (1/10–1/4) mile and 180 days before the sale of property *i*
Number of new construction (far, after)	Number of new constructed properties—based on building date—within (1/10–1/4) mile and 180 days after the sale of property *i*
Living area	Living area in sq. ft
Bedrooms	Number of bedrooms
Baths	Number of bathroons
Walls of concrete stucco	Dummy 1 if made of concrete stucco, 0 otherwise
Pool	Dummy 1 if private pool, 0 otherwise
Age	Age of property in years
Parcel size	Parcel size in acres
CBD distance	CBD distance relates to distance to Intersection of Central Blvd. and Orange Ave. Orlando, Fl

Appendix 2: Descriptive statistics by neighborhood type

	Low density		High density		New		Old		Low vacancy		High vacancy	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Property controls												
Price	206,809	186,390	281,254	157,962	311,275	182,766	165,234	139,648	247,824	185,193	252,909	200,570
CBD distance	5.631	3.999	12.04	2.272	12.26	3.138	4.694	3.055	7.979	3.433	9.008	4.253
Living area	1,695	732.3	2,496	773.5	2,655	737.1	1,490	567.5	2,060	847.5	2,089	876.8
Bedrooms	3.112	0.784	3.832	0.770	3.895	0.728	3.024	0.749	3.476	0.792	3.458	0.777
Baths	199.4	77.48	266.9	74.21	280.1	76.99	177.6	65.73	235.1	81.35	236.7	81.01
Walls concrete	0.352	0.478	0.933	0.251	0.965	0.183	0.169	0.375	0.602	0.490	0.646	0.478
Pool	0.202	0.402	0.329	0.470	0.226	0.419	0.174	0.379	0.304	0.460	0.248	0.432
Age	41.15	22.78	8.27	8.44	3.21	3.30	51.04	14.57	24.07	20.05	20.74	20.86
Parcel size	51,883	51,925	35,871	29,446	37,592	35,383	45,431	43,734	45,410	41,312	43,489	43,869
Local housing market controls												
Number of foreclosure sales (near, before)	0.175	0.485	0.275	0.688	0.282	0.716	0.185	0.484	0.200	0.524	0.262	0.654

	Low density		High density		New		Old		Low vacancy		High vacancy	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Number of foreclosure sales (near, after)	0.142	0.426	0.249	0.638	0.255	0.665	0.146	0.421	0.179	0.487	0.227	0.592
Number of foreclosure sales (far, before)	0.480	1.009	0.695	1.291	0.669	1.346	0.565	1.089	0.587	1.073	0.645	1.235
Number of foreclosure sales (far, after)	0.467	0.966	0.709	1.276	0.688	1.321	0.553	1.049	0.590	1.045	0.644	1.217
Number of foreclosures = 1 (near, before)	0.112		0.133		0.126		0.123		0.123		0.132	
Number of foreclosures = 2 (near, before)	0.023		0.036		0.039		0.023		0.027		0.036	
Number of foreclosures > 2 (near, before)	0.005		0.019		0.021		0.005		0.007		0.017	
Number of market sales (near, before)	1.145	1.500	2.262	3.493	2.963	4.080	1.165	1.400	1.326	1.805	1.918	2.837
Number of market sales (near, after)	0.887	1.218	1.243	1.555	1.356	1.690	0.963	1.287	0.995	1.281	1.228	1.548

	Low density		High density		New		Old		Low vacancy		High vacancy	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Number of market sales (far, before)	3.102	3.144	4.839	5.796	5.540	6.598	3.497	3.374	3.591	3.636	4.150	4.643
Number of market sales (far, after)	2.674	2.857	3.059	2.834	2.955	2.947	3.070	3.144	2.924	2.740	3.036	3.000
Number of new construction (near, before)	0.117	0.866	1.326	3.883	2.123	4.522	0.012	0.127	0.272	1.532	0.748	2.915
Number of new construction (near, after)	0.131	0.797	1.999	5.981	3.067	6.829	0.038	0.298	0.458	2.536	1.029	4.257
Number of new construction (far, before)	0.091	0.785	0.621	2.011	1.049	2.427	0.007	0.096	0.136	0.925	0.367	1.451
Number of new construction (far, after)	0.114	0.751	1.006	2.978	1.622	3.450	0.029	0.274	0.264	1.488	0.567	2.044
Number of observations	10,284		10,983		9,361		9,999		9,216		11,282	

Appendix 2: Descriptive statistics by neighborhood type (continued)

	Homogeneous in age		Heterogeneous in age		Homogeneous in living area		Homogeneous in living area		Gated		Non-gated	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Property												
Price	153,791	106,952	301,148	206,164	219,248	153,210	281,933	239,797	368,293	232,058	208,646	150,832
CBD distance	6.174	3.202	10.87	4.241	8.803	4.154	9.742	4.390	11.6	2.657	8.472	4.260
Living area	1,527	503.3	2,439	873.1	1,977	781.4	2,242	972.2	2,849	794.8	1,884	741.7
Bedrooms	3.090	0.690	3.723	0.831	3.425	0.774	3.507	0.840	4.021	0.727	3.338	0.753
Baths	187.2	56.72	264.3	86.70	226.8	74.81	245.9	91.13	299.7	84.34	218.5	70.84
Walls concrete	0.287		0.822		0.617		0.667		0.981		0.565	
Pool	0.212		0.231		0.248		0.320		0.451		0.229	
Age	41.18	15.08	10.62	17.93	23.38	20.33	20.77	20.79	6.53	5.39	25.71	20.89
Parcel size	35,937	33,550	43,267	45,253	36,581	33,106	49,141	55,508	52,986	48,884	37,594	37,084
Local housing market controls												
Number of foreclosure sales (near, before)	0.241	0.565	0.166	0.528	0.287	0.667	0.158	0.466	0.230	0.605	0.236	0.593
Number of foreclosure sales (near, after)	0.200	0.496	0.155	0.498	0.259	0.605	0.142	0.429	0.211	0.591	0.204	0.534

	Homogeneous in age		Heterogeneous in age		Homogeneous in living area		Homogeneous in living area		Gated		Non-gated	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Number of foreclosure sales (far, before)	0.712	1.213	0.450	1.036	0.708	1.275	0.459	0.939	0.584	1.174	0.634	1.185
Number of foreclosure sales (far, after)	0.698	1.166	0.470	1.030	0.736	1.233	0.453	0.924	0.604	1.172	0.632	1.139
Number of foreclosures = 1 (near, before)	0.146		0.088		0.148		0.102		0.125		0.132	
Number of foreclosures = 2 (near, before)	0.033		0.021		0.040		0.018		0.028		0.032	
Number of foreclosures > 2 (near, before)	0.009		0.010		0.017		0.006		0.015		0.012	
Number of market sales (near, before)	1.341	1.460	2.644	4.041	1.674	2.043	1.284	2.327	1.870	2.871	1.587	2.388
Number of market sales (near, after)	1.121	1.340	1.120	1.587	1.303	1.498	0.834	1.243	1.131	1.419	1.089	1.408
Number of market sales (far, before)	3.989	3.464	4.810	6.402	4.012	3.637	3.144	4.128	4.027	4.526	3.894	4.342

	Homogeneous in age		Heterogeneous in age		Homogeneous in living area		Homogeneous in living area		Gated		Non-gated	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Number of market sales (far, after)	3.546	3.231	2.491	2.690	3.400	3.110	2.290	2.450	2.757	2.635	3.012	2.959
Number of new construction (near, before)	0.003	0.057	2.108	4.477	0.237	1.588	0.563	2.476	0.913	2.979	0.470	2.299
Number of new construction (near, after)	0.028	0.308	2.870	6.610	0.339	1.934	0.840	3.674	1.407	4.248	0.690	3.512
Number of new construction (far, before)	0.003	0.072	1.088	2.501	0.156	1.088	0.259	1.292	0.474	1.653	0.235	1.249
Number of new construction (far, after)	0.019	0.196	1.619	3.489	0.251	1.483	0.414	1.767	0.806	2.476	0.371	1.761
Number of observations	9,719		9,522		10,103		9,855		6,445		33,468	

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