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Abstract

In the U.S. real estate market, around 30 percent of listed properties remain unsold. We examine whether unsold property listings exert externalities in the housing market. Our study builds on a comprehensive dataset that encompasses residential property listings in Orange County (California) from 2000 to 2020. We find that listed properties often remain unsold because speculative owners (also referred to as essayers) make attempts to sell properties for prices far above fair market value (on average, by $59,576 or 8.1 percent). Our results show that overpriced (unsold) listings exert spillover effects that distort and inflate housing prices. They increase other properties' list prices on average by $40,180 (5.5 percent) and increase sale prices by $37,268 (5.2 percent). We find that sale prices further increase with spillover effects for homes with specific housing and neighborhood attributes (such as large house size, high-income areas, and close proximity to beach, coastal, and central city areas). Overpriced unsold properties cause annual extra earnings (or extra spending) of almost $1 billion in Orange County (California) alone. We also find that the extent of overpricing depends on the economic environment, that is, overpricing is higher (lower) during booms (busts).

JEL-Codes: R300, L100, L600, O300.

Keywords: essayers, hedonic pricing, housing market, spillover effects, unsold properties.

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1) Introduction

More than 30 percent of all home listings in the U.S. go unsold (see Topel and Rosen (1988), Anglin, Rutherford, and Springer (2003), and Feldstein (2007) for related contexts).[1] One might think that additional property listings on the market represent additional supply, which would result in price reductions.[2] However, most of the additional supply does not eventually sell and so the effect on the housing market is not obvious.

We investigate why these property listings went unsold and whether they cause any externalities in the market that could possibly distort home values. More specifically, we evaluate the implications of unsold property listings on list and sale prices of other properties that sell in the market. We are unaware of any other studies that investigate the impact of unsold property listings on the price discovery process. Against the background of dramatically rising prices in recent years, housing affordability has become a priority among aspiring property owners, policy makers, and financial institutions. Therefore, this topic deserves much more attention.

List prices are usually chosen by property owners with input from real estate agents. The choice of list prices is critically important since it can reveal information regarding a seller's perceived private home value among other asymmetric information.

There are several reasons why list prices can deviate from a property's fair market value.[3] One reason is that owners are uncertain about the exact market value and prefer setting a higher price rather than taking a risk on setting the price too low. A further reason is that owners are motivated to sell their property only if they earn a sufficiently large surplus, so they intentionally set supra normal list prices in an attempt to catch a buyer with a high willingness to pay (see Gordon and Winkler (2017)).[4] These speculative owners are also referred to as *essayers* since they make a

[1] Several studies have identified a large number of unsold properties in their databases as will be discussed later.
[2] Unsold property listings are defined as listings that were either entirely withdrawn from the market, or were withdrawn and newly relisted, or had their listing agreements expired.
[3] A property's market value is defined as the price that a specified property should sell for in a competitive market (see Gordon and Winkler (2017)). The Dictionary of Real Estate Appraisal defines a property's market value as: "The most probable price that the specified property of interest should sell for in a competitive market after a reasonable exposure time, as of a specified date, in cash, or in terms equivalent to cash, under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeable, for self-interest, and assuming neither is under duress." (See, The Dictionary of Real Estate Appraisal, 5th edition, The Appraisal Institute).
[4] Buyers hold different preferences and are characterized by differential willingness to pay depending on their income and specific needs or preferences (location preferences, house preferences, etc.).

proposal or an attempt to sell their property for prices above market value.[5] The presence of consumers characterized by a high willingness to pay provides opportunities for essayers to list and sell properties above fair market value. The drawback in choosing a list price that strongly exceeds market value is the risk of not being able to sell the property. However, essayers are not particularly motivated sellers. They are patient and willing to wait for the "right" offer.[6]

An economically relevant question is whether overpriced property listings can affect other property prices. One argument that supports this possibility is that housing is beset with the difficulty in determining a true market value. Agents (appraisers, real estate agents, buyers, sellers, and institutions) form expectations on prices by learning from other properties' list prices. Therefore, overpriced comparable property listings can serve as reference cases and increase other properties' list prices above their true market value via information spillovers. Overpriced property listings also become reference cases when real estate platforms estimate home values of other properties; one prominent example is Zillow's Zestimate. In sum, *essayers'* overpriced listings can influence other properties' expected market values and prices via learning spillovers.[7]

The purpose of this study is to empirically examine whether overpriced unsold properties have an effect on list and sale prices of other properties via spillover effects.[8] We are especially interested in learning if particular homes or regions are more susceptible to spillover effects. More specifically, we compare realized price outcomes with two benchmark cases. First, we compare the existing outcome of realized list and sale prices with the corresponding prices when essayers' overpriced unsold properties had been listed at fair market values. Second, we conduct a more general evaluation and compare realized prices with prices in a perfectly functioning market in which all (sold and unsold) properties are priced according to fair market value, that is, where no properties are overpriced.

[5] An essayer is someone who attempts to do something, tries or tests something out. It refers to an initial attempt or endeavor, especially a tentative attempt (see www.collinsdictionary.com, www.wordnik.com, and www.thefreedictionary.com).

[6] There is an analogy to frogfish that could be made. They are known as the most patient hunters of the sea. They blend into an environment, look like other fish around them, but they are predators.

[7] Thanos et al. (2016) mention that the list price of properties can affect other properties' prices.

[8] Note, an existing listing that experienced price changes it is not classified as an unsold listing as long as it has not been withdrawn or the listing contract expired. Note also that the study considers last listed price prior to when a property has been sold or withdrawn. Therefore, any arguments that relate to incomplete or incorrect beliefs regarding a property's market value that resulted in an overcharged original list price, but met market value in consecutive list price changes, will not serve as an explanation for overpriced property listings here.

Our study closely relates to two branches of literature: external spillover effects and overpricing of homes. Historically high levels of foreclosures spurred interest in measuring external spillover effects that foreclosed homes have on immediate neighboring houses and neighborhoods (see Campbell, Giglio, and Pathak (2011), Mian, Sufi, and Trebbi (2015), and Siebert (2022)). For example, Anenberg and Kung (2014) find strong spillover effects in low-price neighborhoods. Campbell, Giglio, and Pathak (2011) found support for strong local spillovers. Autor, Palmer, and Pathak (2014) measure housing market externalities in Cambridge, Massachusetts and find that the elimination of stringent rent controls exert spillover effects on units in surrounding properties and neighborhoods. The nature of local spillover effects is also found in studies that focus on urban revitalization see Rossi-Hansberg, Sarte, and Owens III (2010) and Guerrieri, Hartley, and Hurst (2012).

Our study also closely relates to overpricing of houses, defined as the relation of a house's list price to its expected (true) market value. Most studies use a hedonic model when estimating expected market values and find that overpricing is associated with higher final sale prices (see also Anglin, Rutherford, and Springer (2003), and Beracha and Seiler (2014)). Levitt and Syverson (2008) show that real estate agents sell houses owned by themselves for higher prices than comparable houses that they sell on behalf of other owners.

Our study on overpricing and spillover effects also contributes to the efficient market hypothesis as it applies to the housing market. The efficient market hypothesis states that houses sell for a market value determined by housing attributes and market forces (see Case and Shiller (1989)). Hence, in an efficient market, overpriced listings and spillovers should not have an impact on other properties' list and sale prices.

We established a comprehensive database that includes residential properties listed for sale in Orange County (California) from 2000 to 2020. Our data confirm that more than 30 percent of the real estate listings do not sell. Summary statistics also show that unsold properties are posted at extraordinarily high list prices. On average, list prices of unsold properties exceed those of sold properties by more than $181,000 (25 percent). This comparison, however, is an unconditional comparison of averages, and differential property characteristics must be accounted for. For example, unsold properties are, on average, 10 percent larger by home size and lot size, and many unsold properties are located in close proximity to beaches and/or in coastal areas. Accounting for

the heterogeneity of properties, we conduct preliminary dummy variable regressions. Results show that owners of unsold properties (*essayers)*, post their properties at prices that strongly exceed their market value. Unsold properties have been listed, on average, for an additional $56,726 (or 7.7 percent of the average list price) compared to properties that sold. It is noteworthy that owners of unsold properties do not more drastically reduce their list prices over time compared to other property owners, which supports the notion that unsold properties are often posted by *essayers*.

We proceed with our main empirical model to examine the spillover effects of overpriced properties on other homes' prices. The empirical approach considers several aspects. First, overpricing and spillovers are unobserved to researchers and need to be estimated. Regarding overpricing, the empirical approach needs to consider that property listings are individual choices where over-(pricing) is subject to local market, housing, and neighborhood attributes as well as idiosyncratic aspects such as seller's motivation, urgency of sale, etc. Therefore, overpricing is a phenomenon that is realized at a property-specific level and the empirical approach should provide individual overpricing estimates for properties. Moreover, overpricing is not limited to unsold property listings but can also apply to sold properties. The empirical approach also needs to provide an estimate on spillovers that describes the variation of overpricing across properties and local markets. Second, overpriced listings can occur at any time period and are not a result from a general policy that would affect properties at the same time period.

These aspects make it difficult to using difference-in-difference and other generalized synthetic control methods as they create problems with forming control groups and can result in confounded effects.[9] Our study addresses these aspects by building on a hedonic approach (see Rosen (1974), Anglin, Rutherford, and Springer (2003), Levitt and Syverson (2008), and Gordon and Winkler (2017)). We adopt a two-stage estimation procedure where we first estimate fair market values to empirically evaluate overpricing and spillovers. We then estimate the causal effects of spillovers on home prices.

Our main estimation results on the first benchmark case (that is, evaluating the effects of overpriced unsold properties only) shows that unsold properties are listed for $59,576 or 8.1 percent above prices of comparable properties that have been sold.

[9] Further details are provided later.

Our estimation results also provide evidence that overpriced unsold properties exert spillover effects and increase list prices of other properties by more than $40,180 or 5.5 percent of the average list price. Overpriced unsold properties also increase other properties' sale prices via spillover effects by more than $37,268 or 5.2 percent of the average sale price. Furthermore, we show that overpriced unsold properties can trigger property value distortions via spillover effects. Spillover effects on sale prices are more susceptible among properties that are larger in size, paid for cash, and located in neighborhoods with higher incomes. Foreclosed and buyer-occupied properties experience smaller overcharges. Overpriced properties more drastically increase list and sale prices of other properties that are in close proximity to beach, coastal, and central city areas. The estimation results based on the second benchmark case (that is, evaluating the effects of all overpriced properties) provide further support that overpriced properties exert spillover effects on list and sale prices.

Our study shows that *essayers'* behavior—that is, listing properties at extraordinary high prices—is a serious concern, which can have drastic implications on the housing market, cause market value distortions, and inflate prices. Therefore, essayers introduce a wedge between observed prices and equilibrium prices in the market.

Importantly, we also find that the number of unsold listings and the extent of overpricing drastically decline during the economic crisis. That is, during the economic downturn the amount of overpricing diminished by two-thirds. Our study suggests that economic crisis can be considered as a mechanism to revert essayers' prices closer to market value.

From a welfare perspective, it should be noted that overpriced listings exert positive externalities on other property sellers and elevate prices. In contrast, they cause negative externalities on buyers. The calculated welfare effects amount to annual extra earnings/extra spendings of almost $1 billion in Orange County (California) alone.

This study is organized as follows: Section 2 provides an overview of the related literature. Section 3 introduces the data sources and presents summary statistics. A theoretical motivation is relegated to the Appendix. Section 4 introduces the empirical model and discusses the estimation results on list prices and sale prices. Section 5 evaluates how overpricing evolves with changes in economic environments. We conclude in Section 6.

2) Related Literature

Several studies have recognized that a large number of listed properties remained unsold. For example, Anglin, Rutherford, and Springer (2003) use a dataset encompassing residential properties in Arlington (Texas) that were listed in 1997. They find that 1,663 properties (out of 3,685) were withdrawn from the market. They also show that sold properties were posted for lower list prices (about 10 percent less) and were older (17 versus 14 years), and smaller in size (1,860 versus 2,000 sq. ft.). Neither study examines the effects of unsold properties on list and sale prices.

List and sale prices in the residential real estate market have been the focus of many research studies. List prices represent valuable information to potential buyers as most buyers narrow their search to specific price ranges.

Several studies focus on overpriced properties and identify reasons for property owners to overprice a property (see also Anglin, Rutherford, and Springer (2003)). Relatedly, List (2003) shows that individuals change their valuation of an object once it is in their possession.

Real estate studies emphasize that properties are heterogeneous commodities. Due to a property's unique character, it is difficult to determine the true market value (see Burdett and Judd (1983) and Siebert and Seiler (2022)). Agents (sellers, buyers, and other agents) form expectations on market value by learning from comparable listings that serve as reference cases (see Tversky and Kahneman (1974)). Therefore, comparable property listings can exert an externality on other properties' list price via learning spillovers. Our study examines whether overpriced properties can increase list prices of other properties via spillover learning.

The idea of learning spillovers having an effect on prices has been a major topic of economic research over the last few decades. Economic studies have shown that learning spillovers can have drastic effects on market behavior and market performance. Examples include the semiconductor industry (Irwin and Klenow (1994), Liu and Siebert (2022)), the shipbuilding industry (Thornton and Thompson (2001)), and the aircraft industry (Benkard (2000) among many others).

Real estate studies sometimes address the efficient market hypothesis, which predicts that setting a list price too high has no effect on sale price since true market value is independently determined. Empirical results are mixed: Anglin et al. (2003) find that overpricing has no effect on sale price,

providing support for the efficient market hypothesis. Gordon and Winkler (2017) find that list price changes lower final selling prices, which speaks against market efficiency. Case and Shiller (1989) find that price increases in one year tend to be followed by increases in the following year.

A number of studies in macroeconomics and growth consider unsold properties and focus on measurements of liquidity and forecasts of market prices (see Feldstein (2007), and Topel and Rosen (1988)). The literature also identifies a number of factors that would imply an increase in the number of unsold properties, such as sociodemographic conditions, poor location and inferior infrastructure, fewer employment opportunities, and builders facing financial constraints (see Feldstein (2007) for further information). We are not aware of any study that examines the effects of overpriced properties on list and sale prices of other properties.

3) Data Sources and Summary Statistics

We establish a comprehensive dataset that includes detailed information on the residential real estate market in Orange County (California) from 2000 to 2020. Figure 1 shows a map of Orange County, which is located in Southern California. The figure illustrates several urban, suburban, and beach areas in the county.

Figure 2 shows that Anaheim, Santa Ana, and Irvine are among the largest cities in this county. The west side has several beaches including Huntington Beach, Newport Beach, and Laguna Beach. The east to southeast side is characterized by parks, lakes, and forest areas.

Figure 3 displays the distribution of dominant industries. In the coastal, central, and southern areas, professional and technical services are predominant, while in the northern part, most manufacturing services can be found.

Table 1 shows that Orange County is populated with more than 3 million people. The population has grown by 8 percent since 2000. Hence, the population growth rate is lower than the national average rate of 12 percent. Seventy-one percent of the population is White, 21 percent is Asian, and 2 percent is Black, the remainder includes American Natives and Multiple Races. There are more than 1 million housing units and 57 percent of the properties are owner-occupied. Sixty-six

percent of the population above 15 years of age is employed, and the median household income amounts to $90,234, which is well above the national median household income of $67,521.

Figure 4 displays several economic and financial indicators over time. The unemployment rate in Orange Country strongly varied over time. It drastically increased from 3.4 percent in 2006 to 10 percent in 2010 and then gradually declined to 2.8 percent in 2019. The number of fire sales in the region (as measured by the number of real estate-owned properties listed) also sharply increased during the financial crisis in 2007 and declined drastically until 2014. Finally, the 30-year mortgage rate almost monotonically declines over time.

Figure 5 shows the population density of the county separated by census tracts.[10] The figure shows large differences in population density across the county. Highly populated areas are found mostly in the larger cities located in the center of the county. The beach and lake/forest areas are less populated.

It should also be noted that Orange County is a natural fit for our research purpose since it is characterized by stability in the housing and labor markets. Stable housing prices are certainly beneficial for our purposes, as we examine price differentials between sold and unsold properties.

We consider residential properties that have been posted on the Multiple Listing Service (MLS) system and processed by the county assessor's office. The dataset is procured from CoreLogic, and it includes detailed information, such as original listed prices, last listed prices, sale prices, transaction dates, further property characteristics, and buyer information. It also contains information as to whether a property has been sold or not. We supplement this dataset with neighborhood demographics categorized at the disaggregate census tract level, taken from the U.S. Census Bureau.

We eliminate outliers and remove the bottom and top two percentiles of list price, sale price, property size, lot size, number of rooms, bathrooms, and garage distributions.[11] We remove properties that have been listed for more than 365 days. All prices are expressed in 2020 U.S. dollars using the consumer price index taken from the Bureau of Labor Statistics.

[10] We include demographics from around 570 census tracts in our dataset.

[11] Most outliers relate to extraordinary high value that are most likely explained by typos and incorrect entries. We eliminate those since they represent extreme outliers that can have severe impacts on regression results. Note also that observations with zero entries for any rooms were deleted, while observations with zero entries for garages remained in the dataset.

Table 2 shows that 615,421 listed properties were sold from 2000 to 2020. It is noteworthy that a large number of listed properties—275,281 (or 31 percent)—did not sell.

A closer look at unsold listings shows that 138,970 observations refer to expired contracts and 136,204 observations relate to terminated contracts.[12] Out of the 275,174 unsold listings, 187,466 were not relisted, while 87,708 were relisted. Of the relisted properties, 51,213 eventually sold; out of the sold properties, the list price was reduced in half the cases. In 36,495 cases, properties remained unsold. The fact that relisted properties sold provides strong support that essayers make initial attempts to sell too high.

We turn to a comparison of housing and neighborhood characteristics between both types of properties—that is, sold and unsold properties.[13] Table 3 shows that the average original list price (*OLP*) of sold properties amounts to $748,847, while the average original list price of unsold properties is $932,275. Hence, unsold properties are posted for about $183,000 more (about 25 percent) than sold properties. In terms of list prices, note that sellers sometimes reduce property list prices over time. Therefore, a property can be characterized by multiple list prices. We adopt a conservative approach and use the last listed price (which is usually the lowest list price) before the listing was removed.[14] Table 3 shows that the average last list price (*LP*) of sold properties is $736,367, while the average last list price of unsold properties is $916,978.[15] A closer look at housing and buyer characteristics reveals that unsold properties are larger than sold properties by 207 square feet (or 11 percent). The price per square foot for sold properties is 11 percent less than it is for unsold properties ($332 versus $368). The average lot size of unsold properties is around 8 percent larger. Unsold properties are characterized by a small mortgage to list price ratio measuring liquidity and wealth effects among buyers. Both types of properties have about the same number of bedrooms and bathrooms and are about the same age. Moreover, ethnicity, employment, and seasonal effects are similar across both property types.

[12] Contracts were withdrawn in only 83 cases. Due to the low number of observations, we assume withdrawn contracts do not play a critical role and we eliminate those.
[13] A legend for the variable description is relegated to Appendix 1.
[14] Using an earlier list price than the last list price would result in larger impacts and higher spillover effects of unsold listings on other property prices. Note that conditioning unsold listing to multiple listing entries (and using an entire history of list prices) would result in too few observations that could be use in the regression analysis later.
[15] Last list price (*LP*) before the property has been sold.

The questions that arise are: (1) Do unsold properties remain overpriced once they are related to *comparable* properties that sold?; and (2) Do overpriced unsold properties have an impact on list and sale prices of sold properties via spillovers?

Figure 6 shows the number of sold and unsold property listings over years. The number of listings is relatively stable with the exception of the financial crisis period. Listings of sold properties declined in 2007, but quickly recovered and began to raise again thereafter. In contrast, while listings of unsold properties also declined in 2007, they continued gradually declining until 2012.[16] In sum, the figure suggests that the number of sold and unsold listings remained relatively stable over time. Moreover, the number of unsold listings has been more negatively affected by the financial crisis.

One interesting observation that emerges from Figure 6 is that the financial crisis has a strong and long-lasting effect on unsold property listings. To relate this effect to sold properties, we illustrate the shares of listed properties (unsold listings/sold listings) over time. Figure 7 shows that the share of unsold to sold property listings drastically increased prior to the financial crisis from around 0.3 to 1.1 and then gradually started declining until it reached its original level of 0.3 in 2012.

Figure 8 shows the evolution of list prices of sold and unsold properties over time. The figure shows that list prices follow a positive trend with the exception of the financial crisis when prices drastically declined. The price reduction of unsold property listings is more intense and longer lasting than those of sold property listings. The figure also shows that list prices of unsold properties remain higher than list prices of sold properties throughout all periods. Moreover, sale prices of unsold properties dominate list prices of unsold properties by a margin that is roughly constant over time.[17]

Figure 9 shows the evolution of the prices per square foot for sold and unsold properties. The patterns mirror the description of the list price evolutions as shown in Figure 8.

Figure 10 shows similar patterns in the evolution of original list prices.

[16] On a side note, rentals continuously increased over time.

[17] As a robustness check, we also considered the original list price when the listing entered the MLS system. Figure 14 in Appendix 2 shows that the original list prices for sold and unsold properties follow the same patterns.

Figure 11 provides insights into potential seasonal effects that would produce differences in list prices of unsold and sold properties. The figure shows that list prices of unsold properties are higher than those of sold properties across months, and we do not observe strong seasonal changes.

We now provide insights into the number of listings of sold and unsold properties across census tracts in Orange County. Figure 12, left panel, shows that a large number of sold properties were listed in the center (Irvine and Santa Ana) and southern parts of the county. The right panel of Figure 12 shows that the same areas are characterized by a large number of unsold property listings. It is noteworthy that a large number of unsold properties were listed in beach/coastal areas (such as Huntington Beach, Newport Beach, and Laguna Beach) and in central cities (Irvine and Santa Ana).

We now turn to the distribution of list prices for sold and unsold properties across census tracts in Orange County. Figure 13, left panel, shows that list prices of sold properties are higher in beach and coastal areas as well as in the center and south side of the county, while the northwest part of the county shows lower list prices. The right panel of Figure 13 illustrates list prices of unsold properties. List prices follow a similar pattern as those for sold properties with the exception that unsold properties in central cities (Irvine and Santa Ana) are listed remarkably high.

4) The Empirical Model

Summary statistics show that unsold properties' list prices exceed those of sold properties. Since properties strongly differ in housing and neighborhood attributes, the question is whether list price differentials persist between sold and unsold properties once we condition on housing attributes. To provide further insights into price comparisons, we begin with estimating a dummy variable model that builds on the hedonic price function approach (Rosen (1974)).

4.1) List Price Regression using Dummy Variable Approach

We adopt a dummy variable approach where the dummy variable takes a value of one if a property is unsold. We test if unsold properties list for higher prices conditioning on attributes. We then

discuss several empirical issues and proceed with an estimation approach to evaluate whether overpriced unsold properties exert effects on other property prices.

The last list price (LP_{it}) of a property i in period t is explained by several characteristics:[18]

$$LP_{it}=X'_{it}*\alpha+\beta_1*UnsoldD_{it}+\varepsilon_{it.} \qquad \text{equation (1)}$$

In this equation, vector X_{it} contains several property attributes, neighborhood attributes, and a set of further controls. Following pertinent real estate studies, we include the following housing characteristics: *Property Size, Baths, Bedrooms, Garages, Year Built, and Lot Size.* We add further variables that proxy for the quality of homes such as *Foreclosure, Pool, and Waterfront Indicators.* We also include additional variables that proxy for quality and attractiveness of neighborhoods defined at the census tract level (see also Feldstein (2007) and Cutler, Glaeser, and Vigdor (1999) for further information on the relevance of neighborhood controls). Hence, we add *Number of Households, Median Income, Owner Occupied Housing,* and ethnicity variables, such as *Asian* and *Black*, where *White* is the omitted variable that establishes the reference case. The X_{it} vector also includes location effects using census tract dummy variables that help to especially control for neighborhood amenities and beach, coastal, and downtown city areas that can be significantly more expensive, as shown in Figure 8. We also account for time effects using year dummy variables.

Finally, we include seasonal variables that control for the "thickness" of the market and other seasonal effects, such as labor turnovers, etc. The seasonal dummy variables indicate the quarter of the list year of the property. We establish three dummy variables, *Spring, Summer,* and *Fall*, that refer to the list periods April to June, July to September, and October to December, respectively. The omitted *Winter* period represents the reference case.

Since we are interested in testing whether unsold properties have been posted for higher list prices conditioning on property attributes, we introduce a dummy variable (*UnsoldD*) that takes a value of one if the listing remained unsold, and zero otherwise. The estimated coefficients are represented by α and β_1, and ε is an iid error term.

[18] We concentrate on the last listed price to ensure that no further subsequent list price reductions occurred. Note, the model is specified in units to better reflect unit changes rather than using elasticities.

We use OLS to estimate pricing equation (1). Table 4 column 1 displays the estimation results. The implicit prices for housing and neighborhood characteristics take on highly significant coefficient estimates comparable to earlier studies. Most importantly in our context, the estimated coefficient on the dummy variable *UnsoldD* shows that unsold properties have been listed, on average, for an additional $56,726 or 7.7 percent of the average list price. This result provides further support that unsold properties have been overpriced—that is, priced above fair market value.

4.2) Empirical Model Discussion

In pursuing our main goal—the evaluation of whether overpriced properties exert an effect on other list prices via spillovers—an approach is desired that allows for the estimation of property-specific overpricing and spillover effects. While the dummy variable approach provides initial insights into list price differentials between sold and unsold properties, the main empirical model needs to consider several aspects.

First, property listings are individual choices where (over-)pricing is subject to local market, housing, and neighborhood attributes as well as idiosyncratic aspects such as seller's motivation, urgency of sale, etc. Overpricing is a phenomenon that can apply to unsold and sold properties. Therefore, the empirical model needs to consider that every property listing (sold as well as unsold) could potentially be overpriced. This creates difficulties in identifying non-overpriced properties that could serve as appropriate control in several estimation methods such as difference-in-difference.

Second, overpriced listings occur at different time periods rather than being subject to a general policy that would affect properties at the same time period. The variation in timing creates difficulties with the choice of control groups in difference-in-differences methods and result in confounded effects.

Third, we are primarily interested in estimating the extent to which overpriced unsold property listings affect other home prices via spillovers. Given the fact that nearby home prices would be affected by spillover effects, makes it even harder to find appropriate control groups. That is, properties that are contaminated by spillover effects cannot be members of control groups in difference-in-difference estimation methods; a problem often referred to as "contaminated" control

group problem (see, for example, Duso, Gugler, and Yurtoglu (2011)). Finally, overpricing and spillover effects are unobserved to researchers and need to be estimated. We are especially interested in getting property-specific estimates on overpricing.

Against the background of the above-mentioned issues, specific empirical methods, such as difference-in-differences and other generalized synthetic control methods, are not appropriate in our case. Our study addresses these aspects by following studies that build on hedonic regressions (see Rosen (1974), Anglin, Rutherford, and Springer (2003), Levitt and Syverson (2008), and Gordon and Winkler (2017)). To address these points, we adopt a two-stage estimation procedure where we first estimate fair market values to empirically evaluate overpricing (see Anglin, Rutherford, and Springer (2003) and Gordon and Winkler (2017) and other estimation procedures, such as the Solow residual (see Solow (1957)). The Solow residual is often used to measure productivity growth due to technological innovation. It refers to productivity growth that is independent of input usage.

The property-specific overpricing is used to establish the *Spillover* variable, which is included in the second step of the estimation process. The estimation procedure then provides an estimate on the spillover coefficient.

4.3) Empirical Model for List Prices and Spillover Effects

In the following, we lay out our main empirical model to describe the relationship between list prices and spillovers. The aim is to test whether overpriced properties exert spillover effects on other list prices.

We specify the expected list price as ($E[LP_{it}]$), which reflects the true market value of a property *i,* as follows:

$$E[LP_{it}]=X'_{it}*\gamma+\delta*Spillover_{c(i)t.} \qquad \text{equation (2a)}$$

The expected list price is determined by housing and neighborhood attributes, including quality, seasonal, and economic controls (as summarized in the vector X_{it}).[19] Note that we include neighborhood and time fixed effects to control for heterogeneity across local markets and for economic changes over time. The neighborhood fixed effects absorb unobservables related to location (such as close proximity to beach areas and downtown cities areas as well as neighborhood amenities and architectural style) and other locational and quality attributes. The time fixed effects absorb time-varying unobservables (such as changes in inventory and other market conditions). These fixed effects help mitigate unobserved confounding effects that may affect overpricing (as will be explained later).

The list price (LP_{it}) is chosen by the owner and defined as follows:

$$LP_{it}=X'_{it}*\gamma+\delta*Spillover_{c(i)t}+w_{it.} \qquad \text{equation (2b)}$$

The seller has the opportunity to set a list price that deviates from the market value $E[LP_{it}]$ by an amount w_{it}. The seller's chosen list price deviation from the market value depends on the seller's perceived private home value that includes the owner's motivation. For example, if a seller is willing to sell the home only with a sufficiently large profit or if the seller's perceived home value is higher than the market value, then the seller's list price deviation takes a positive value which represents overpricing. If a seller faces time constraints and intends to sell quickly, the seller's list price is set below market value so the price deviation is negative which represents underpricing. We assume zero covariance between w and X.

Turning to the *Spillover* variable, it captures the fact that a seller's list price can be influenced by the list prices of comparable listed properties via learning spillovers. For example, overpriced (underpriced) comparable properties can influence a seller's market price perception via learning spillovers and result in list prices that are higher (lower) than the market value. The definition of the *Spillover* variable is shown in equation (3a). It includes deviations of realized prices from their expected list prices:[20]

[19] From now onward, fair market value is simply referred to as market value.

[20] Note that the spillover variable and average price deviations are unobserved and will be estimated. Details follow later.

$$Spillover_{c(i)t} = \frac{\sum_{i\varepsilon c, i\varepsilon UNS} LP_{it} - E[LP_{it}]}{I_{ct}}, \qquad \text{equation (3a)}$$

where the subscript *c(i)* stands for the corresponding neighborhood (census tract*)* that property *i* is located in, *t* stands for the time period, and $i\varepsilon c, i\varepsilon US$ relates to *i* belonging to the same census tract and to the set of unsold (*UNS*) properties. I_{ct} refers to the number of property listings in census tract *c* at time *t*.

The S*pillover* variable definition exhibits the following features: First, only properties that are comparable to the property under consideration (property *i*) enter the variable to serve as reference cases. A (comparable) listing is declared as a reference case if it is listed in the same neighborhood (census tract) and in the same time period as the property under consideration. Second, we consider that spillover learning is increasing in the magnitude of price deviations and the frequency of observed price deviations. Therefore, the *Spillover* variable is formulated as the average amount of price deviations (in a neighborhood and a specific period).[21]

The coefficient δ on the *Spillover* variable measures the extent to which list prices are influenced by other property listings. If comparable properties are overpriced (underpriced), the seller will adjust its own list price by increasing (decreasing) list price, which results in a positively (negatively) estimated spillover coefficient (δ). If reference cases are priced at market value, the spillover coefficient (δ) is zero.

As mentioned earlier, it is debatable what the appropriate benchmark case would be to which existing market outcomes under spillovers should be compared. We consider two benchmark cases and therefore establish two spillover variable definitions. First, to pronounce the focus on unsold property listings, we consider list price deviations of only unsold properties, as shown in equation (3a). Hence, the benchmark case is a market where unsold property listings would have been priced according to market value. The second benchmark case serves as a robustness check in which we consider price deviations of unsold as well as sold property listings. In this case, we implicitly compare realized price outcomes with a perfectly functioning market—that is, all (sold and unsold) properties would have been listed according to market value. In this case, the *Spillover* variable is defined as:

[21] Note, that overpriced properties exert an effect on other listed properties at the time they are listed on the market. It is, therefore, irrelevant in our case if unsold properties were relisted and eventually sold after relisting.

$$Spillover_{c(i)t} = \frac{\sum_{i \varepsilon c} LP_{it} - E[LP_{it}]}{I_{ct}}. \qquad \text{equation (3b)}$$

Since deviations of realized property-specific list prices from expected prices ($LP_{it} - E[LP_{it}]$) are unobserved, we follow earlier studies and estimate these.

In order to get consistent estimates of property-specific price deviations, it is important to consider several aspects. We are eventually interested in estimating property-specific list price deviations net of the spillover effect—that is, we are interested in price deviations ($LP_{it} - E[LP_{it}/X, Spillover]$) accounting for the fact that expected prices can be influenced by spillovers. We also want price deviations to be subject to unsold as well as sold properties.[22]

We adopt a multistep estimation procedure: In the first step, we estimate property-specific list price deviations to establish the S*pillover* variable. Property-specific list price deviations will be estimated as the unexplained portion of the hedonic shown in equation (2b).[23] Since we do not have any predictions for the price deviations or the *Spillover* variable, we initially set these to zero. One might have concerns about an omitted variable bias since spillovers are initially left out of the equation. However, since the regressors are not correlated with the omitted *Spillover* variable, it will just be another indiscernible influence on the list price without causing any interference on the relation between the list price variable and the regressors.

Moreover, it is important to recognize that the *Spillover* variable is defined as an average of all price deviations in the entire neighborhood, which attenuates existence of a strong correlation between the *Spillover* variable and the property-specific deviation, hence, the independence assumption would not be violated. To eliminate any remaining potential concerns, we adopt a further cautious action. We initially estimate equation (2b) while conditioning on the set of sold properties. Our earlier results have shown that sold properties are less overpriced, which provides further support for considering independence. The estimation returns consistent estimates of implicit prices ($\hat{\gamma}$) of housing attributes. The estimated implicit prices ($\hat{\gamma}$) from the sold property sample are then projected onto the set of unsold properties, property-specific price deviations are

[22] Note that we need the price deviation estimates for sold as well as unsold properties irrespective of whether we consider the first or second benchmark case as mentioned earlier. The reason is that even under the first benchmark case (that considers only overpriced unsold properties) we are interested in evaluating the impact on sold properties that could be overpriced due to spillover effects.

[23] See Anglin et al. (2003) and Gordon and Winkler (2017) on real estate applications, which relates to Solow (1957), among many others, in related contexts on production function estimations.

retrieved, and the *Spillover* variable is established based on equation (3a). Once we established the *Spillover* variable, we turn to the second stage of the estimation.

In the second step, we use the *Spillover* variable from the first step and estimate the list price function (as shown in equation (2b)) to estimate the coefficient of main interest ($\hat{\delta}$). This estimation step returns coefficient estimates on the *Spillover* variable ($\hat{\delta}$) and estimates for the implicit prices ($\hat{\gamma}$).[24]

4.4) Results for List Prices and Spillovers

The estimation results of our main empirical model are shown above in Table 4 column 2.[25] The estimated coefficients on housing attributes are similar in sign, magnitude, and significance to the earlier results using the dummy variable approach. Most importantly, the coefficient estimate on the *Spillover* variable is significant and positive confirming that higher magnitudes of overpriced properties increase list prices of properties in the same neighborhood. An overcharge of $1 above market value increases list prices of properties in the same neighborhood by 69 cents. Evaluating these numbers at the sample means shows that overpriced properties increase list prices of other properties due to spillover effects by $40,180 or 5.5 percent of the average list price.

The estimated *Spillover* variable of overpriced unsold properties takes a mean value of $58,231, which is 7 percent of the list price. Figure 14 shows that the *Spillover* variable is high in coastal and beach areas as well as in cities located in the center of the county. The distribution closely resembles the distribution of list prices from Figure 13, which is reasonable since the *Spillover* variable relates to the degree of overpricing (see equation (3a)).

We retrieve the property-specific amount of price deviations. Our results show that unsold properties are overpriced, on average, by $59,576, which amounts to 8.1 percent of their average list price. Sold properties have been overpriced by only $163 on average. The predicted overpriced amounts provide evidence that, on average, unsold properties have been overpriced by a substantial amount compared with sold properties. The estimated overpricing portions are aligned with the

[24] In a multistep estimation procedure, the sampling covariance of the second-step estimator is usually obtained using bootstrap and standard formulas for two-step estimators. We use the method by Newey and McFadden (1994).
[25] The presented results relate to the spillover definition shown in equation (3a). We defer the estimation results using the alternative spillover definition (equation (3b)) to Appendix 4.

previous estimation result from equation (1) that returned a list price difference between unsold and sold properties of $56,726.

Figure 15 (left panel) shows that sold properties close to coastal, beach, and central city areas (Irvine and Santa Ana) are overpriced, while they are moderately priced in northern, eastern, and southern areas. The right panel of Figure 15 shows that unsold properties are strongly overpriced in the beach, coastal, and the central city areas.

Differential Spillover Effects and List Price Increases

There is reason to believe that some homes are more susceptible to overpricing than others. For example, houses in close proximity to attractive locations (beaches, downtown areas) and wealthier neighborhoods could be more heavily overpriced, and experience stronger spillover effects, since owners believe it is more likely that those homes are more attractive to buyers with a high willingness to pay. Therefore, we evaluate differential list price deviations from market value accounting for differential spillover effects. We regress the total list price deviations—LP_{it}-$E[LP_{it}/X_{it},Spillover_{c(i)t})]+\hat{\delta}*Spillover_{c(i)}$—on housing attributes.

Table 4 column 3 shows the estimation results. The coefficient estimates are mostly highly significant at the 99 percent confidence level. The estimation results show that larger and more recently built properties that are located in lower-income neighborhoods and have low owner occupancy are more susceptible to overpricing and spillover effects—that is, they experience higher list price increases. The results also show that list price increases are independent of seasonal effects and foreclosure status.

Figure 16 shows that list price increases and spillover effects are highest in coastal, beach, and central city areas.

4.5) Results for Sale Prices and Spillovers

Our previous results provide evidence that overpriced properties exert externalities on other properties' list prices. Studies have shown that list prices can affect sale prices (see, for example, Gordon and Winkler (2017). Therefore, we investigate whether overpriced properties have an

effect on sale prices via spillovers. We are interested in estimating to what extent sellers sold their properties above market value due to the existence of unsold properties that were overly priced by essayers. We adopt a similar estimation strategy as for the list price and first estimate an equivalent to equation (2b) applied to sale prices:[26]

$$SP_{it}=X'_{it}*\gamma^{SP}+Z'_{it}\,\gamma_2^{SP}+\delta^{SP}*Spillover_{c(i)t}+e_{it}^{SP}, \qquad \text{equation (4)}$$

where X'_{it} is defined as before. We follow previous studies and add further variables that play a relevant role in the bargaining process on sale price between sellers and buyers. Those variables are *Cash* payment and *Buyer Occupied*, and they enter the vector Z'_{it}.[27]

The vector γ_2^{SP} includes the associated parameters. The estimation results (shown in Table 5 column 1) return coefficient estimates on housing and neighborhood characteristics that are similar to our earlier results.

Most importantly, the estimation returns a significant positive relation between *Sale Prices* and *Spillovers*. A list price overcharged by $1 above market value increases sale prices of properties in the same neighborhood by 64 cents. On average, properties sold for $37,268 or 5.2 percent above market value due to essayers' overpriced listings.

The significant impact of spillovers on sale price show that overpriced list prices add a surcharge to sale prices causing them to deviate from their market value. This result suggests that the residential real estate market is inefficient.

Differential Spillover Effects and Sale Price Increases

We now evaluate if some homes are more susceptible to overpricing effects on sale prices than others. We evaluate differential sale price increases that result from list price and spillover effects.

[26] Note that, as indicated by superscripts *SP,* we condition on sold properties due to missing sale price observations for unsold properties.

[27] The literature identifies a number of factors that relate to higher closing prices. An important factor in determining the seller's price is occupancy status (non-occupied properties are associated with foregone owner equity, vandalism, and maintenance neglect), and other market conditions (see also Zuehlke (1987)). Also, a cash property transaction can have an impact on the sale price while not having an impact on the listed price, as this choice was unknown at the time of posting the property.

In accordance with the regression specification on list prices, we regress the total sale price deviations—SP_{it}-$E[SP_{it}/X_{it},Spillover_{c(i)t})]$+ $\hat{\delta}^{SP}$*$Spillover_{c(i)t}$—on housing attributes.

The estimation results are shown in Table 5 column 2. We find that spillover effects further increase sale prices for larger and more recently built properties that are paid for in cash and located in higher-income neighborhoods, at waterfronts, with lower buyer occupancy. Figure 17 shows that the effect of overpriced list prices on sale prices via spillovers is highest in coastal and beach areas as well as in central city areas.

5) Modified List Price Estimation using Economic Shifters

Our current results show that unsold properties are listed for higher prices. We also provide evidence that overpriced unsold listings elevate list prices of other properties via spillover effects. Therefore, essayers introduce a wedge between observed prices and equilibrium prices in the market. The question arises whether essayers face differential incentives to overprice property listings and whether the extent of overpricing is dependent on economic conditions. This question is motivated by Figures 4, 6 and 8 which show that the number of unsold listings and chosen list prices fluctuate with unemployment rates and fire sales.

In order to test whether essayers change the amount of overpricing dependent on unemployment rates and fire sales, we estimate a modified regression based on equation (1). We provide multiple specifications that differ in their interaction effects as follows. We include (1) an interaction between the unsold dummy variable and unemployment rates (*Unsold*Unempl*); (2) an interaction between the unsold dummy variable and the number of realized fire sales in the market (*Unsold*REONo*); (3) an interaction between the unsold dummy variable and the percentage of realized fire sales relative to all property listings in the market (*Unsold*REOPerc*). For further robustness checks, we also consider (4) an interaction between the unsold dummy variable and unemployment rates (*Unsold*Unempl*) in addition to an interaction between the unsold dummy variable and the number of realized fire sales in the market (*Unsold*REONo*); and (5) an interaction between the unsold dummy variable and unemployment rates (*Unsold*Unempl*) as well as an interaction between the unsold dummy variable and the percentage of realized fire sales (*Unsold*REOPerc*).

Table 6 shows the estimation results adopting various specifications of the modified list price equation. Most importantly, the coefficients on the interaction effects (*Unsold*Unempl, Unsold*REONo,* and *Unsold*REOPerc*) are all significantly negative. Hence, higher unemployment rates and more fire sales diminish the amount of overpricing. For example, the negative interaction effect (*Unsold*Unempl*) in combination with the *Unsold* dummy variable shown in column (1) of Table 6 indicates that essayers overpriced homes in 2006 by $62,398 prior to the financial crisis when the unemployment rate was at a low of 3.4 percent. In 2010, when the unemployment rate rose to 10 percent, the overpricing amount drastically fell by $39,879 to $22,520. Therefore, overpricing by essayers diminished by two-thirds when the economy was in a downturn. The diminished overpricing amount during the economic crisis is also present in the remaining specifications, that is, more fire sales reduce the amount of overpricing by essayers.

In sum, essayers choose prices above equilibrium market prices and the extent of overpricing depends on the economic environment. During booms (busts), essayers chose higher (lower) degrees of overpricing.

5.1) Differential Spillover Effects and List Price Increases

We now turn to the estimation of spillover effects on list prices while accounting for interaction effects. Table 7 reports the results using the interaction between the unsold dummy variable and unemployment rates (*Unsold*Unempl*). Table 7, column 1 shows that the estimation results are comparable to earlier results as reported in column 2 of Table 4. All estimates carry the same sign and are of the same efficiency and magnitude as the original results with very few exceptions (such as the number of households and the ethnicity variables). Most importantly, the coefficient on the *Spillover* variable is positive, indicating that essayers elevate list prices of other houses in the same geographic area.

The coefficient on the interaction effect (*Spillover*Unempl*) is negative and significant. The estimate, however, is rather small in magnitude and does not have a meaningful economic impact. This finding is reasonable since it is unlikely that higher unemployment rates affect the magnitude of spillover effects per se since the underlying mechanism of how list prices are affected via

spillovers should be unaffected by economic conditions, but rather depend on the use of reference and base cases to establish comparisons to listed homes.

5.2) Differential Spillover Effects and Sale Price Increases

Finally, we estimate the spillover effect on sale prices (as shown in equation (4) and Table 5) while accounting for the interaction effect between spillovers and unemployment rates (Spillover*Unempl). The estimation results are shown in Table 8, column 1. The coefficient on the spillover variable is again significant and positive, and the remaining coefficient estimates are comparable to the earlier results shown in Table 5. Moreover, similar to the earlier estimation results shown in Table 7, column 2, the interaction effect is significantly negative.

Column 2 of Table 8 shows that the spillover effects are more pronounced for larger and more recently built properties paid for in cash and located on waterfronts with low occupancy rates. This finding confirms our earlier results from Table 5.

6) Conclusion

Our study provides relevant insights into the effects of properties that are unsold in the market. We find that unsold properties are overpriced, on average, by $59,576, or 8.1 percent of the average list price. Overpriced properties can cause tremendous property value distortions due to spillover effects that influence other properties' list and sale prices. Our study provides evidence that spillover effects increase list prices, on average, by $40,180 (5.5 percent), and they increase sale prices, on average, by $37,268 (5.2 percent). We find that prices increase especially for properties that are large, recently built, paid for in cash, located in higher-income neighborhoods, and located in close proximity to beaches, coastal areas, and city centers.

Ostensibly, our results may appear puzzling and counterintuitive since we expect that additional properties offered on the market represent additional market supply, which would result in market price reductions. However, the relevant mechanism is that additional supply is offered by speculative property owners, also referred to as *essayers. Essayers* constitute a different market segment—they post their properties for overly high list prices while facing the same demand. The

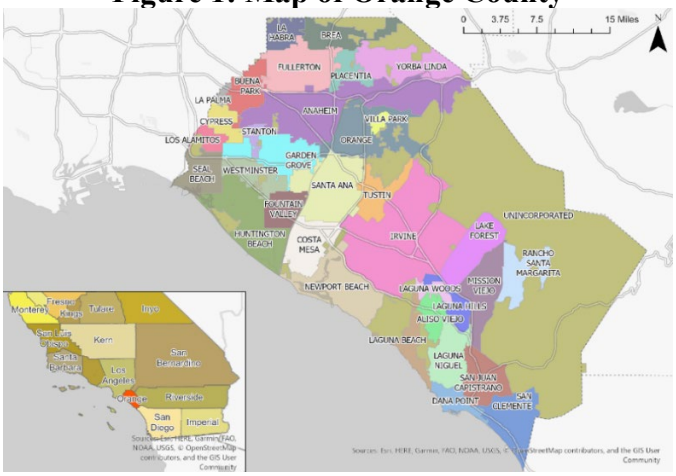
overcharged properties influence other properties' list prices due to spillover effects, as they become references when pricing other properties.

Our study shows that *essayer* behavior—that is, listing properties at extraordinary high prices—is a serious concern, which can have drastic implications on the housing market. Even though the properties offered by *essayers* (at overly high list prices) may not sell, they distort home values, cause market value distortions, and inflate home prices. Therefore, essayers introduce a wedge between observed prices and equilibrium prices in the market. The wedge is diminished during economic downturns as the number of unsold listings and the extent of overpricing drastically decline. Therefore, an economic crisis can serve as a mechanism to revert essayers' prices closer to market value.

In order to eliminate this *essayer* effect, our study suggests to establish price comparisons and to predict market value based on reference homes that have actually been sold.

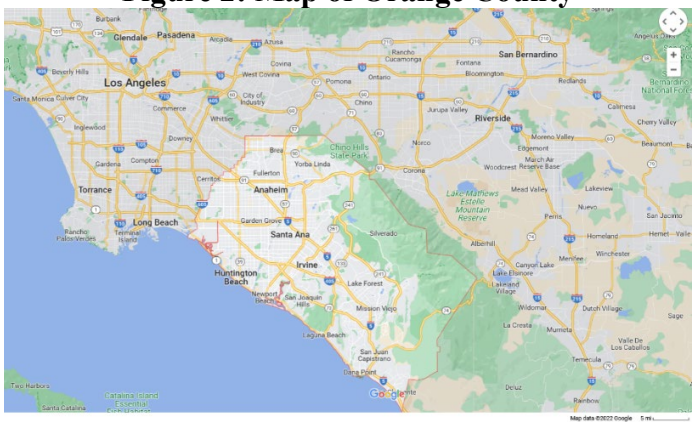
FIGURES

Figure 1: Map of Orange County



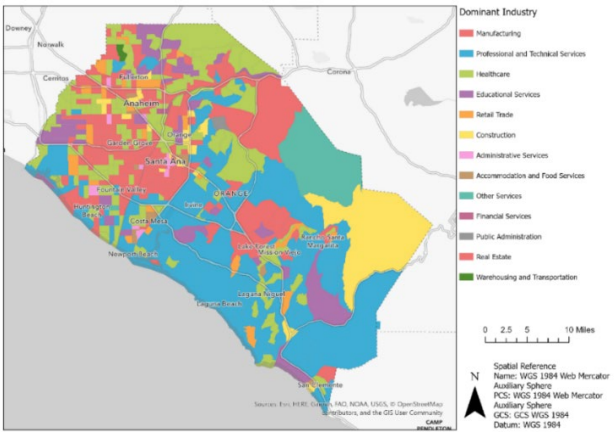
Sources: Esri, HERE, Garmin/FAO, NOAA, USGS.

Figure 2: Map of Orange County



Source: Google Maps.

Figure 3: Dominant Industries in Orange County



Sources: Esri, HERE, Garmin/FAO, NOAA, USGS.

Figure 4: Evolution of List Prices and Sale Prices over Time

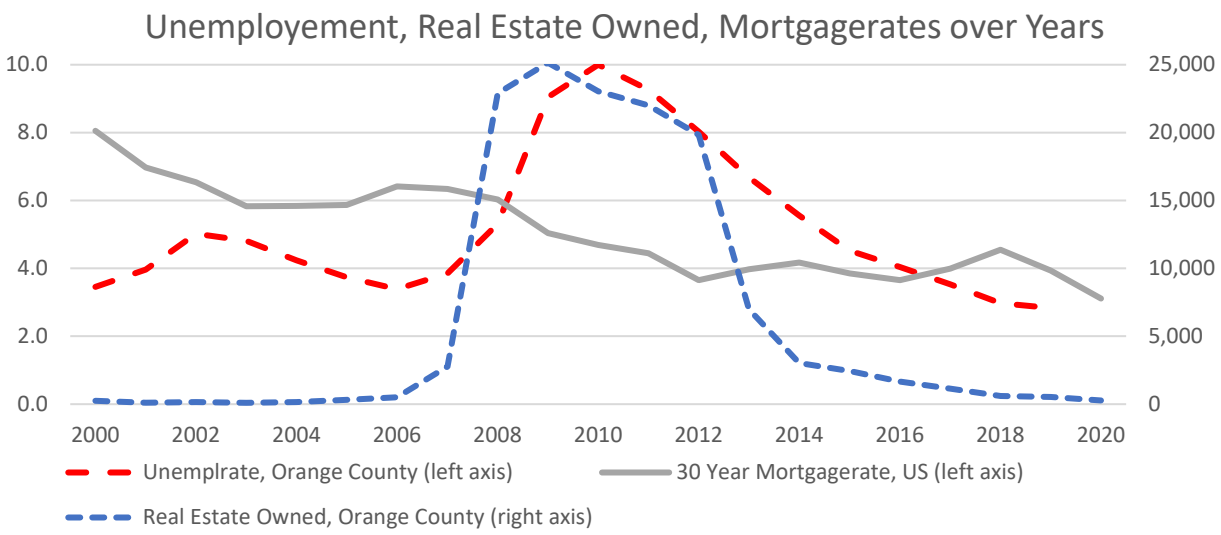
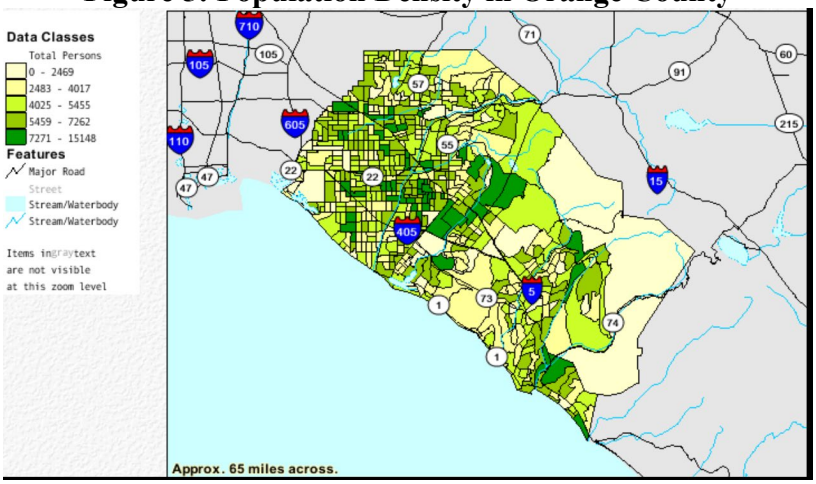


Figure 5: Population Density in Orange County



Source: http://www.prolades.com/glama/la5co07/maps/maps_orco_race-ethic_2000.htm.

Figure 6: Number of Postings of Sold and Unsold Properties over Time

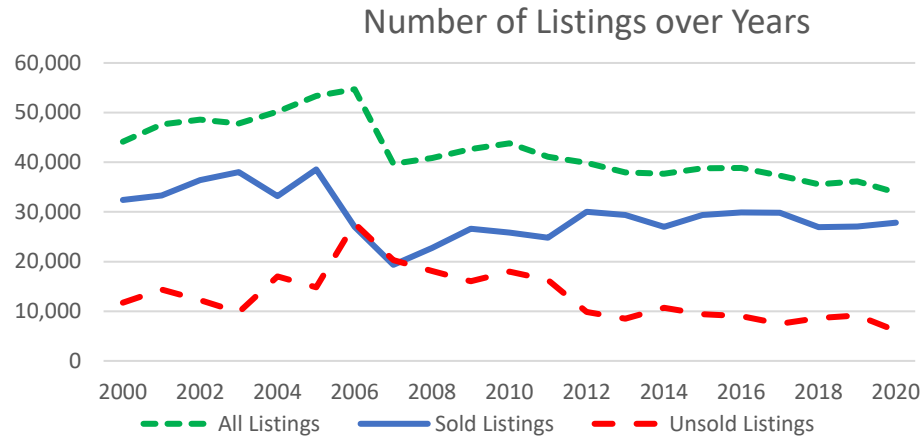


Figure 7: Shares of Unsold to Sold Property Listings over Time

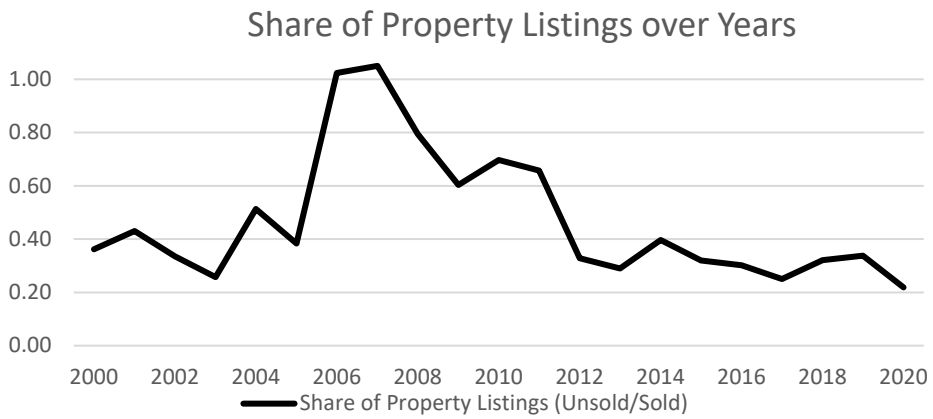


Figure 8: Evolution of List Prices and Sale Prices over Time

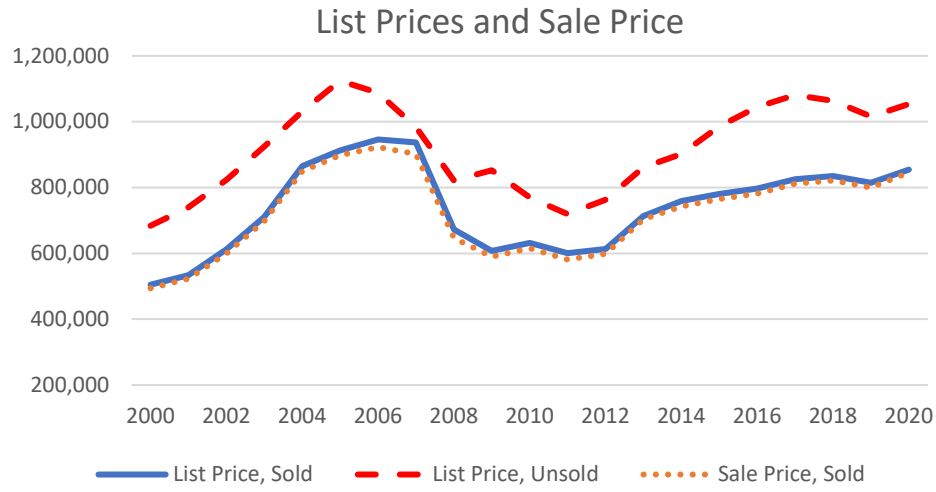


Figure 9: Evolution of Prices Per Square Foot over Time

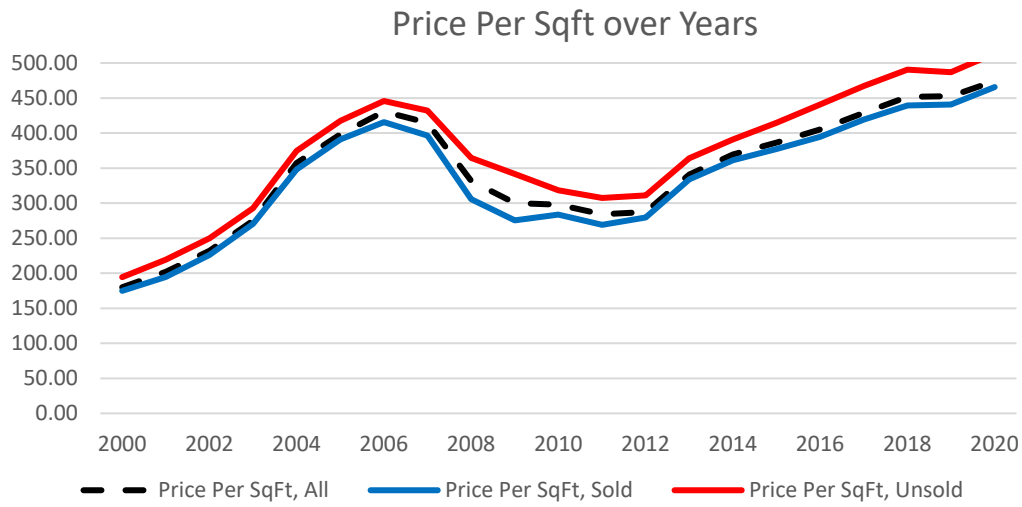


Figure 10: Evolution of Original and Last List Prices

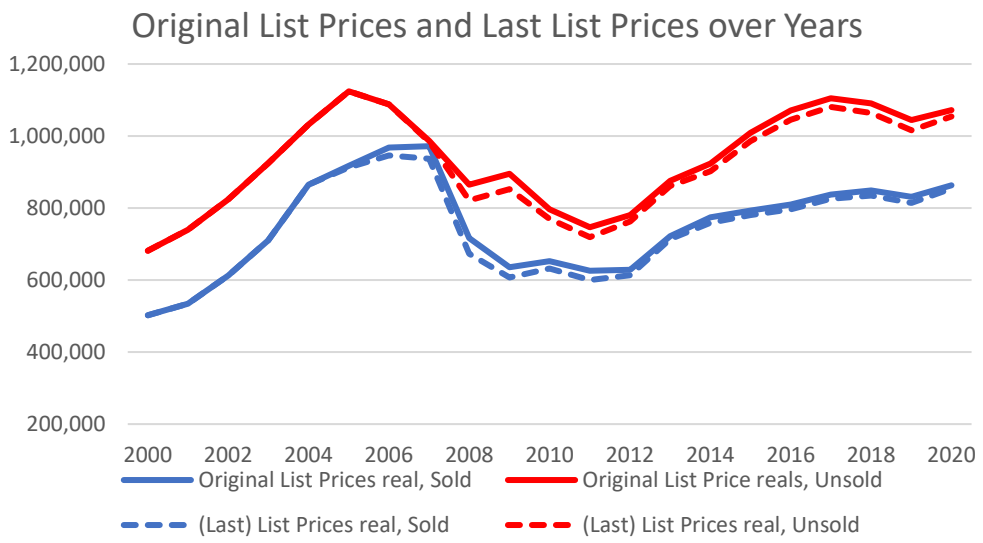


Figure 11: List Prices during Specific Months

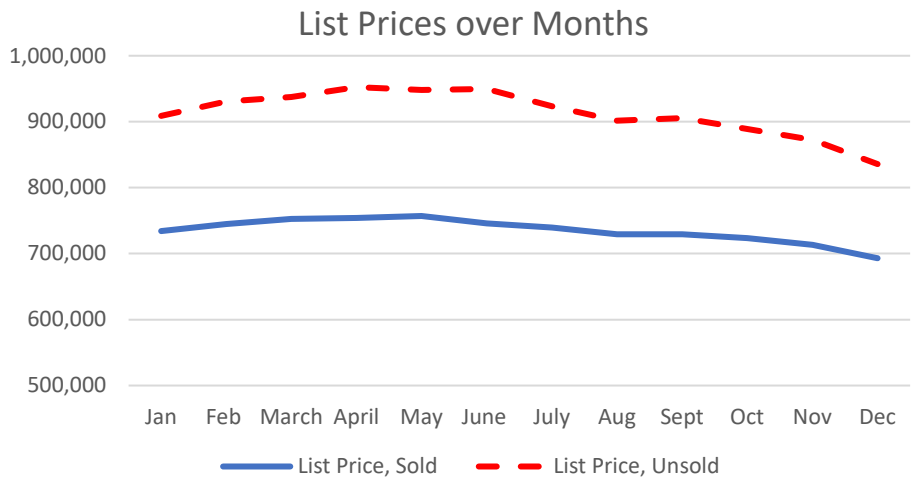


Figure 12: Number of Listings of Sold and Unsold Properties across Census Tracts

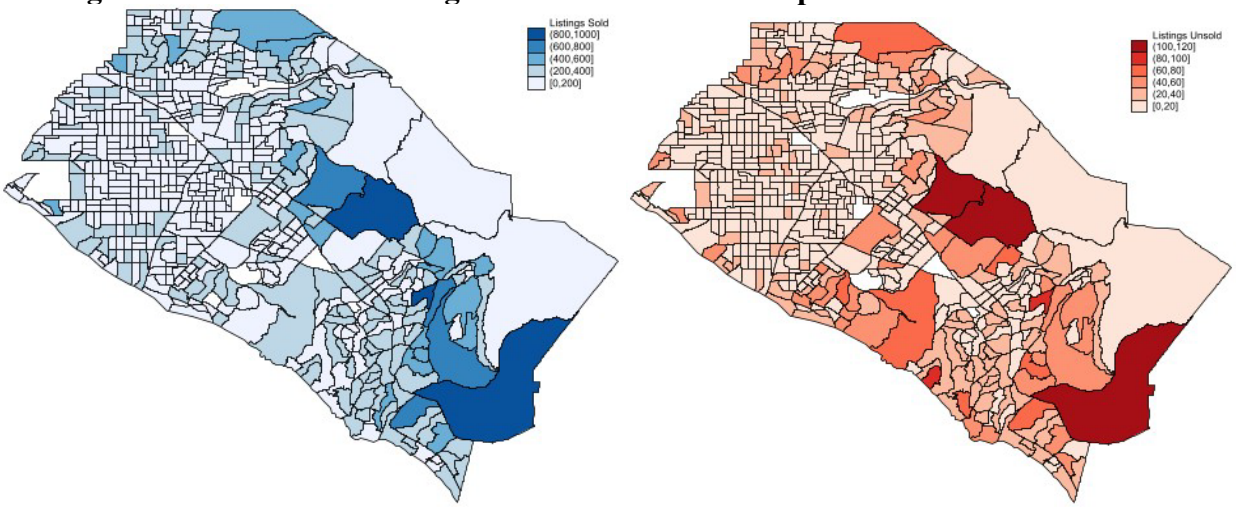


Figure 13: List Prices of Sold and Unsold Properties across Census Tracts

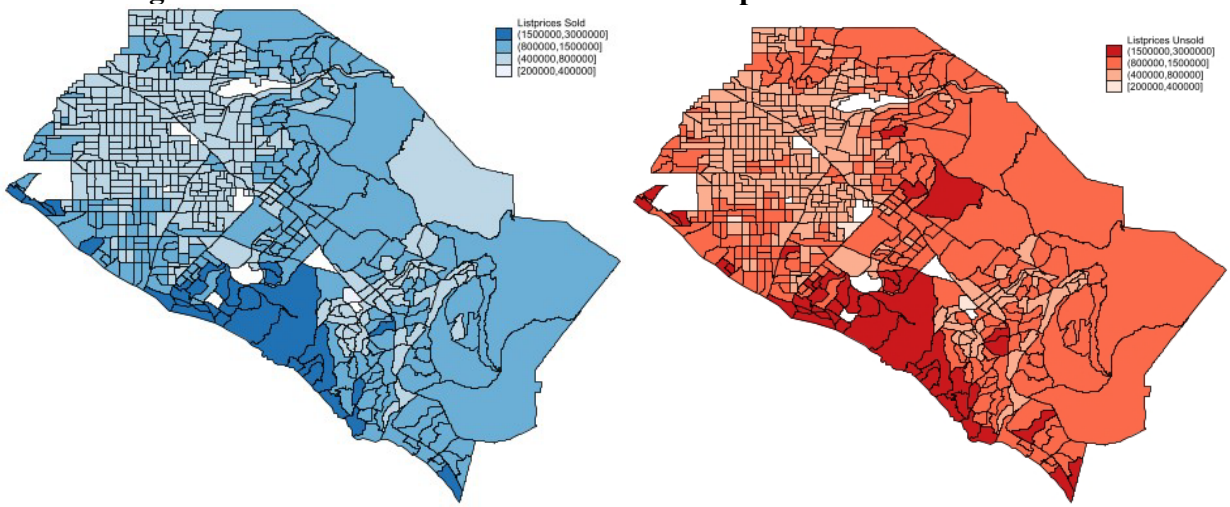


Figure 14: *Spillover* Variable across Census Tracts

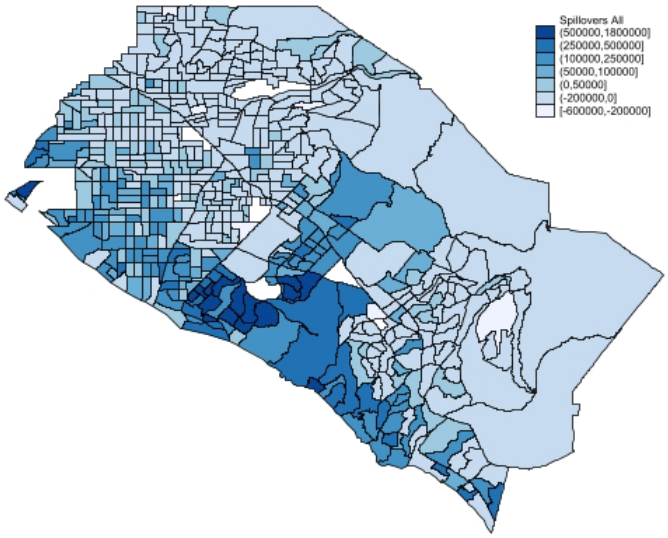


Figure 15: Overpriced Sold and Unsold Properties across Census Tracts

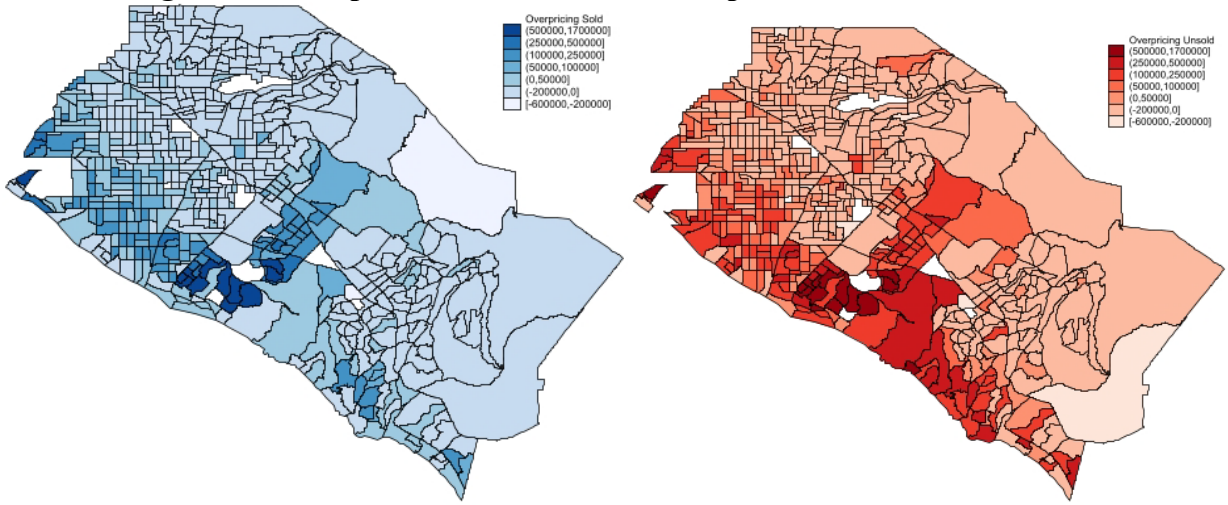


Figure 16: List Price Increases with Spillover Effects

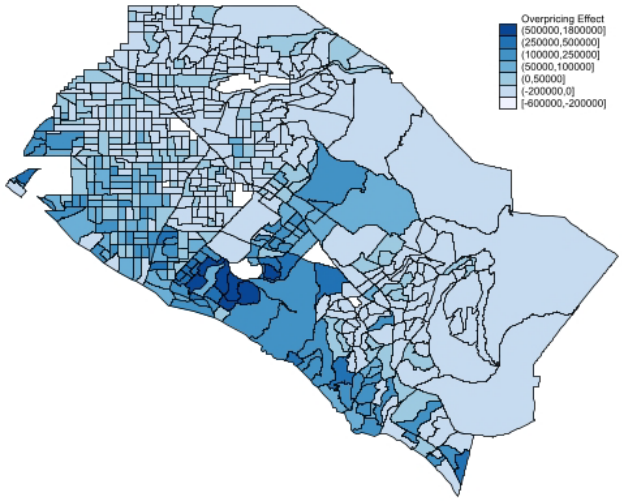
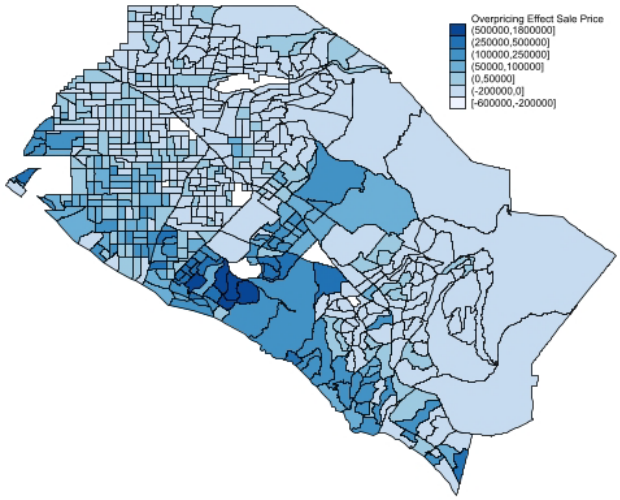


Figure 17: Sale Price Increases with Spillover Effects



TABLES

Table 1: City Demographics for Orange County, 2020

Variable	Mean
Population	3,186,989
Housing Units	1,118,110
Households	1,037,492
Person per Household	3.01
Owner Occupied (in %)	57.4
In Labor Force (in %)	65.5
Median Household Income ($)	90,234
Asian (in %)	21.7
Black (in %)	2.1
White (in %)	71.1

Source: Census. gov.

Table 2: Number of Sold and Unsold Listings

Postings	Obs	Percent
Total Listings	890,702	100
Sold Listing	615,421	69.1
Unsold Listings	275,281	30.9

Source: Our Data sample from CoreLogic.

Table 3: Comparison of Sold and Unsold Listings

Variable	Sold Mean	Unsold Mean	Difference Mean	Difference % Mean
OLP	748,847	932,275	183,428	24.49
LP	736,367	916,978	180,611	24.52
SP	720,914	/	/	/
Property Size	1,769	1,975	207	11.69
Price per SqFt	332	368	36	10.85
Baths	2.34	2.44	0.10	4.28
Bedrooms	3.13	3.27	0.14	4.54
Garages	2.04	2.11	0.07	3.38
Year Built	1,977	1,978	1	0.03
Lot Size	6,635	7,173	538	8.10
Owner Occupancy	0.77	0.73	-0.04	5.43
Pool	0.57	0.53	-0.04	-7.02
Waterview	0.03	0.03	0	0
Employed	62.51	61.80	-0.71	-1.13
Asian	18.95	18.70	-0.25	-1.30
Black	1.61	1.49	-0.13	-7.82
Spring	0.29	0.29	0.00	0.00
Summer	0.26	0.29	0.03	10.14
Fall	0.18	0.19	0.00	0.00
Winter	0.27	0.24	-0.03	-11.19
Observations	615,421	275,174	/	/

Table 3 shows a comparison between sold and unsold properties. *OLP*: Original List Price; *LP*: Last List Price; *SP*: Sale Price; *SqFt*: Square Feet; *MLP*: Mortgage to Sale Price Ratio. The last two columns refer to differences (unsold minus sold properties).

Table 4: Estimation Results of List Price Functions

Variables	List Price (1)	List Price with Spillovers (2)	Spillover Effect and Overpricing (3)
Unsold Dummy	56,726.00***		
	(2,538.27)		
Spillover		0.69***	
		(0.003)	
Property Size	315.64***	300.34***	9.62***
	(1.95)	(1.65)	(1.96)
Baths	21,453.00***	21,049.00***	4,720.99***
	(1,445.08)	(1,225.10)	(1,447.88)
Bedrooms	-15,558.00***	-9,295.35***	-3,362.83***
	(1,163.45)	(991.88)	(1,165.81)
Garages	11,826.00***	24,148.00***	-1,877.59
	(1,842.33)	(1,562.35)	(1,845.70)
Year Built	6549.95***	483.69***	35.26***
	(11.39)	(9.72)	(11.42)
Lot Size	10.69***	12.18***	-0.09
	(0.18)	(0.15)	(0.18)
Foreclosure	-111,214.00***	-99,753.00***	-27,130.00**
	(11,543.00)	(10,033.00)	(11,552.00)
Pool	-27,559.00***	-16,137.00***	-3,216.34**
	(1,594.33)	(1,359.03)	(1,597.15)
Waterfront	116,960.00***	86,620.00***	14,523.00***
	(3,937.56)	(3,305.27)	(3,945.61)
Owner	-12,571.00***	-9,532.34***	-4,205.54***
	(226.70)	(193.03)	(142.53)
Income	0.60***	0.53***	-0.06***
	(0.02)	(0.02)	(0.02)
Households	19.95***	16.19***	-0.06
	(0.71)	(0.59)	(0.71)
Asian	-1,023.21***	-883.47***	-85.74
	(53.59)	(45.77)	(53.69)
Black	-13,114.00***	-10,074.00***	-709.06
	(452.22)	(389.52)	(453.08)
Spring	6,878.84***	6,342.76***	-1,324.77
	(1,617.05)	(1,362.71)	(1,614.33)
Summer	11,767.00***	11,408.00***	-1,105.91
	(1,726.13)	(1,460.37)	(1,728.89)
Fall	15,568.00***	16,190.00***	-1,095.35
	(1,958.16)	(1,675.25)	(1,957.41)
Local Dummies	Yes***	Yes***	Yes***
Time Dummies	Yes***	Yes***	Yes***

***,**, and * refer to 1%, 5%, and 10% significance levels. Obs.: 113,899. R-squared: >0.90.

Table 5: Estimation Results of Sale Price Functions and Overcharges

Variables	Sale Price with Spillovers (1)	Spillover Effect and Overpricing (2)
Spillover	0.64***	
	(0.003)	
Property Size	281.47***	22.34***
	(1.81)	(2.21)
Baths	22,912.00***	1,881.63
	(1,330.65)	(1,632.62)
Bedrooms	-7,846.89***	-8,162.01***
	(1,071.14)	(1,313.28)
Garages	22,626.00***	-15,434.00***
	(1,691.41)	(2,073.11)
Year Built	19.69***	24.25***
	(2.49)	(3.05)
Lot Size	11.58***	-1.06***
	(0.17)	(0.21)
Foreclosure	-124,024.00***	-17,123.00
	(12,387.00)	(15,198.00)
Pool	-11,313.00***	-9,962.88***
	(1,463.01)	(1,794.00)
Waterfront	74,408.00***	19,789.00***
	(3,548.45)	(4,352.11)
Cash	18,279.00***	14,607.00***
	(1,888.45)	(2,315.31)
Buyer Occupied	16,946.00***	-16,150.00***
	(1,633.30)	(2,001.53)
Income	0.59***	0.01***
	(0.02)	(0.003)
Households	21.23***	5.64***
	(0.63)	(0.77)
Asian	-974.39***	-287.30***
	(49.75)	(61.02)
Black	-9,028.86***	2,667.39***
	(419.98)	(515.03)
Spring	9,371.19***	827.14
	(1,459.61)	(1,790.88)
Summer	15,907.00***	-124.95
	(1,556.94)	(1,910.31)
Fall	22,225.00***	-448.19
	(1,802.76)	(2,211.92)
Local Dummies	Yes***	Yes***
Time Dummies	Yes***	Yes***

***,**, and * refer to 1%, 5%, and 10% significance levels. Obs.: 113,899. R-squared: >0.90.

Table 6: Estimation Results of List Price Functions with Interactions

Variables	List Price Interaction (1)	List Price Interaction (2)	List Price Interaction (3)	List Price Interaction (4)	List Price Interaction (5)
Unsold	82,866.00***	78,718.00***	79,249.00***	206,568.00***	207,121.00***
	(2,073.18)	(967.23)	(965.58)	(2,288.24)	(2,260.94)
Unsold*Unempl	-6,034.62***			-23,529.00***	-23,529.00***
	(358.37)			(487.89)	(487.89)
Unsold*REONo		-4.19***		-3.11***	
		(0.08)		(0.12)	
Unsold*REOPerc			-2,367.62***		-1,740.30***
			(44.21)		(63.69)
Property Size	437.69***	436.93***	436.89***	443.08***	443.05***
	(0.82)	(0.82)	(0.82)	(0.84)	(0.84)
Baths	49,262.00***	49,894.00***	49,933.00***	46,093.00***	46,114.00***
	(651.59)	(650.78)	(650.74)	(667.66)	(667.64)
Bedrooms	-84,420.00***	-84,601.00***	-84,608.00***	-84,472.00***	-84,475.00***
	(529.43)	(528.69)	(528.65)	(542.59)	(542.58)
Garages	-15,719.00***	-15,507.00***	-15,503.00***	-14,206.00***	-14,204.00***
	(837.19)	(836.03)	(835.97)	(858.00)	(857.98)
Year Built	-775.18***	-781.85***	-781.90***	-1,238.57***	-1,238.86***
	(23.41)	(23.37)	(23.37)	(23.89)	(23.89)
Lot Size	5.68***	5.69***	5.69***	5.01***	5.01***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Foreclosure	-	-243,488.00***	-243,263.00***	-280,149.00***	-280,035.00***
	(1,231.22)	(1,231.43)	(1,231.48)	(1,252.28)	(1,252.36)
Pool	-40,478.00***	-40,516.00***	1,231.48***	-36,009.00***	-36,007.00***
	(714.19)	(713.19)	(713.14)	(731.64)	(731.62)
Waterfront	281,912.00***	281,864.00***	281,856.00***	280,554.00***	280,548.00***
	(2,025.36)	(2,022.52)	(2,022.37)	(2,075.71)	(2,075.66)
Unemplrate	-52,772.00***	-52,217.00***	-52,260.00***		
	(249.75)	(236.33)	(236.03)		
Owner Occupied	-40,375.00***	-41,853.00***	-41,925.00***	2,806.08***	2,794.72***
	(613.69)	(613.34)	(613.32)	(592.55)	(592.53)
Households	5,875.99***	6,137.91***	6,145.63***	2,975.14***	2,976.64***
	(25.82)	(26.29)	(26.29)	(22.56)	(22.54)
Asian	-4,307.72***	-4,535.69***	-4,540.28***	-2,682.01***	-2,682.34***
	(18.93)	(19.44)	(19.43)	(18.07)	(18.04)
Black	20,210.00***	20,803.00***	20,814.00***	11,784.00***	11,782.00***
	(149.73)	(149.92)	(149.90)	(147.94)	(147.91)
Spring	4,144.14***	4,325.06***	4,351.10***	4,337.31***	4,354.75***
	(721.95)	(720.87)	(720.81)	(739.99)	(739.97)
Summer	11,123.00***	10,923.00***	10,924.00***	7,976.96***	7,976.99***
	(802.22)	(801.02)	(800.95)	(822.03)	(822.01)
Fall	13,275.00***	15,544.00***	15,808.00***	12,407.00***	12,581.00***
	(882.48)	(881.78)	(881.89)	(907.31)	(907.62)
Local Dummies	Yes***	Yes***	Yes***	Yes***	Yes***
Time Dummies	Yes***	Yes***	Yes***	Yes***	Yes***

***,**, and * refer to 1%, 5%, and 10% significance levels. Obs.: 113,899. R-squared: >0.90.

Table 7: Estimation Results of List Price Spillover Effects

Variables	List Price with Spillovers (1)	Spillover Effect and Overpricing (2)
Spillover	0.86***	
	(0.006)	
Spillover*Unempl	-0.008***	
	(0.001)	
Property Size	321.23***	22.49***
	(1.43)	(0.82)
Baths	19,548.00***	6,636.52***
	(1,106.55)	(652.76)
Bedrooms	-18,288.00***	-10,808.00***
	(873.20)	(530.59)
Garages	26,330.00***	-9,686.77***
	(1,355.18)	(838.79)
Year Built	392.78***	-105.79***
	(38.19)	(23.46)
Lot Size	11.66***	-0.29***
	(0.14)	(0.07)
Foreclosure	-169,310.00***	-16,561.00***
	(4,488.32)	(1,230.16)
Pool	-6,743.94***	-6,637.53***
	(1,182.93)	(715.68)
Waterfront	79,434.00***	27,212.00***
	(2,928.43)	(2,029.64)
Unemplrate	20,029.00	-2,860.25***
	(40,128.50)	(203.38)
Owner Occupied Housing	159,605.00***	1,091.61*
	(33,880.71)	(594.33)
Households	-10,792.00	331.76***
	(28,037.60)	(24.87)
Asian	-2,112.91	-360.75***
	(47,253.00)	(18.52)
Black	41,787.00	1,176.48***
	(50,635.90)	(137.76)
Spring	9,442.90***	1,313.25*
	(1,189.35)	(722.71)
Summer	11,569.00***	1,346.88*
	(1,283.86)	(803.29)
Fall	21,139.00***	4,849.43***
	(1,449.03)	(879.42)
Local Dummies	Yes***	Yes***
Time Dummies	Yes***	Yes***

***,**, and * refer to 1%, 5%, and 10% significance levels. Obs.: 113,899. R-squared: >0.90.

Table 8: Estimation Results of Sale Price Functions and Overcharges

Variables	Sale Price with Spillovers (1)	Spillover Effect and Overpricing (2)
Spillover	0.79***	
	(0.01)	
Spillover*Unempl	-0.004***	
	(0.001)	
Property Size	292.39***	28.22***
	(1.68)	(2.15)
Baths	16,976.00***	12,294.00***
	(1,286.51)	(1,648.63)
Bedrooms	-10,547.00***	-12,146.00***
	(1,012.39)	(1,296.77)
Garages	28,542.00***	-19,660.00***
	(1,566.58)	(2,006.33)
Year Built	520.81***	-558.31***
	(44.60)	(57.12)
Lot Size	11.73***	-1.92***
	(0.17)	(0.21)
Foreclosure	-143,521.00***	-34,766.00***
	(5,525.78)	(7,084.76)
Pool	-4,713.43***	-1,342.57
	(1,352.62)	(1,734.92)
Waterfront	66,776.00***	20,027.00***
	(3,340.89)	(4,282.95)
Unempl	-391.58	5,298.21***
	(290.53)	(360.42)
Cash	14,403.00***	21,174.00***
	(1,742.72)	(2,232.10)
Buyer Occupied	17,379.00***	-15,291.00***
	(1,511.84)	(1,937.25)
Households	301.12**	825.33***
	(131.22)	(168.25)
Asian	-1,318.04***	-897.39**
	(322.44)	(413.55)
Black	5,677.89***	7,639.21***
	(2,417.34)	(3,100.32)
Spring	8,609.11***	899.52
	(1,353.64)	(1,736.25)
Summer	14,554.00***	-842.21
	(1,442.43)	(1,850.08)
Fall	23,486.00***	-702.18
	(1,683.26)	(2,159.05)
Local Dummies	Yes***	Yes***
Time Dummies	Yes***	Yes***

***,**, and * refer to 1%, 5%, and 10% significance levels. Obs.: 113,899. R-squared: >0.90.

APPENDIX 1: Variable Description

In the following, we provide a description of the variables.

(1) OLP: Original list price;

(2) LP: Last list price;

(3) SP: Final sale price;

(4) Property size: Size of the property in square footage;

(5) Baths: Number of full bathrooms;

(6) Bedrooms: Number of bedrooms;

(7) Garages: Number of garage spaces available in the parking facility;

(8) Year built: Year that the property has been built;

(9) Lot size: Lot size in square footage;

(10) Owner Occupancy: Dummy that indicates if the property owner resides at the property;

(11) Cash: Dummy that indicates if the property has been paid in cash;

(12) Mortgage Rate: Mortgage interest rate;

(13) Pool: Dummy variable if the property has a pool;

(14) Waterfront: Dummy variable is the property is located at the water;

(15) Housing Units: Number of housing units in the (census tract) neighborhood where a property is located;

(16) Employed: Employment in percentage in the (census tract) neighborhood where a property is located;

(17) Black: Percentage of Black residents in the (census tract) neighborhood where a property is located;

(18) Asian: Percentage of Asian residents in the (census tract) neighborhood where a property is located;

(19) Spring: Seasonal dummy that takes a value of one if a property is sold during the Spring period;

(20) Summer: Seasonal dummy that takes a value of one if a property is sold during the Summer period;

(21) Fall: Seasonal dummy that takes a value of one if a property is sold during the Fall period;

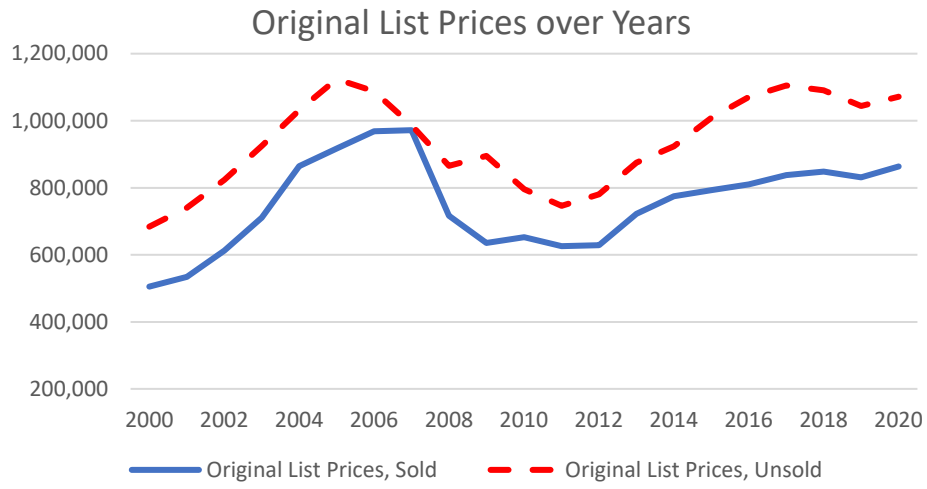
(22) Local Dummies: Dummy variables for Census tracts;

(23) Time Dummies: Dummy variable for years.

APPENDIX 2: Evolution of Original List Prices over Years

Figure 18 compares the original list prices for sold and unsold properties over time. We find that original list prices of unsold properties remain higher throughout all periods. The prices show a general positive trend with the exception of the financial crisis when the prices declined.

Figure 18: Evolution of Original List Prices



APPENDIX 3: Theoretical Motivation

We consider a product market (the housing market) in which vertically differentiated varieties (houses) are offered. Following Rosen (1974), we assume houses are differentiated by quality, and can be classified into quality levels z where the number of houses at every quality level is described by Q_z.

Consumers buy, at most, one house and consider quality and price when making a purchase decision. Consumers agree on house quality rankings (if offered at the same price), but they are willing to pay more for higher-quality houses. Consumers differ in their willingness to pay (or reservation value) for quality. This may be because consumers have different incomes or different desires for quality.

Turning to sellers, we consider two types in the market. The first seller type (referred to as *regular sellers*) is characterized by an (original) willingness to supply function $S_{R1}(Q,z)$ depending on quantity and quality. The second seller type (*essayers*) exhibits a willingness to supply function $S_E(Q,z)$ that lies above the supply of the regular sellers for every given quality level z. Therefore, for any given quality level z, an essayer offers a comparable property for a higher list price than a regular seller, that is, $P_E(Q,z) > P_{R1}(Q,z)$.

To simplify our illustration, we consider one variety (house type) characterized by a fixed quality level $\bar{z}$. Figure 19 shows demand and supply for this quality level $\bar{z}$. The demand $D(Q, \bar{z})$ describes

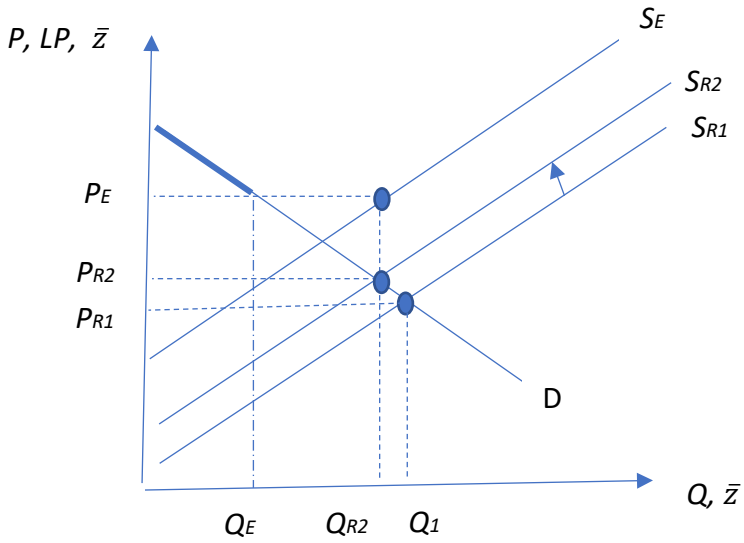
consumers that rank according to their reservation prices. Hence, consumers along the demand are characterized by different willingness to pay for quality level $\bar{z}$. The clearing price P_{R1} depends on the quantity offered ($Q/\bar{z}$) at quality level $\bar{z}$. The consumer at P_{R1} is the marginal consumer who is indifferent between buying or not, and consumers to the left are inframarginal consumers.

We now introduce how the existence of essayers will affect prices in the market. Remember that essayers charge higher list prices for any given quality level compared to regular sellers. As mentioned earlier, essayers' higher chosen list prices exert spillover effects on regular sellers, resulting in an increase in their list prices. This is explained by houses posted by essayers entering the reference set when sellers, agents, and buyers form expectations on market prices (Zestimate on Zillow was one example).[28] As a result of this spillover effect, the supply of regular sellers shifts from S_{R1} to S_{R2}, and the price increases from P_{R1} to P_{R2}.[29] Therefore, the difference between P_{R2} and P_{R1} refers to a price increase due to the spillover effect originated by the essayers' overpriced listings.

It should be noted that a fraction of property buyers has a willingness to pay for Q_{R2} that is even above the asking price of the essayers (P_E) (see the thick portion on the upper left of demand D). This portion of buyers provides incentives for speculative owners or essayers to post their properties above market value.

Note also that consumers located on the thick part of the inverse demand have the option to purchase from either a regular seller or an essayer. Therefore, consumers on the thick line can be served by both types of sellers, but only one type of seller will be able to complete the transaction. Consequently, Q_E housing units will be sold to either seller, while the remaining Q_E housing units represent unsold overpriced listings in the market.

Figure 19: A Theoretical Illustration on the Effects of Essayers on List Prices



[28] See Thanos et al. (2016).

[29] To simplify the illustration, we assume a parallel shift in the supply. The supply function does not necessarily have to shift in a parallel fashion. The shift depends on heterogeneous spillover effects on sellers.

According to our arguments outlined above, unsold properties are priced above fair market value. Remember our descriptive part has shown that a large number of unsold houses are overpriced. The remainder of the study explores the extent to which overpriced properties exert spillover effects on other properties' list and sale prices.

APPENDIX 4: Robustness Check on Spillovers

We provide a robustness check on the *Spillover* variable that includes overpricing of all (sold and unsold) properties in a census tract (see equation (3b)). Remember, this definition incorporates overpricing of all properties, including sold properties. The estimation results are displayed in Tables 9 and 10.

Table 9: Estimation Results of List Price Functions

Variables	List Price with Spillovers (1)	Spillover Effect (2)
Spillover	1.01***	
	(0.003)	
Property Size	293.77***	15.23***
	(1.45)	(1.98)
Baths	20,889.00***	-4,502.30***
	(1,073.15)	(1,457.21)
Bedrooms	-8,910.20***	-3,389.50***
	(864.35)	(1,166.24)
Garages	29,892.00***	-18,201.00***
	(1,369.43)	(1,844.26)
Year Built	585.15***	84.27***
	(8.46)	(11.59)
Lot Size	12.86***	-1.82***
	(0.14)	(0.19)
Foreclosure	-86,341.00***	16,504.00
	(8,562.58)	(13,370.00)
Pool	-15,160.00***	-10,747.00***
	(1,184.56)	(1,582.93)
Waterfront	91,197.00***	8,770.97**
	(2,925.56)	(3,911.28)
Income	0.59***	0.07***
	(0.02)	(0.02)
Owner Occupied Housing	-11,713.00***	-1,178.85***
	(168.08)	(230.35)
Households	21.58***	-1.06
	(0.53)	(0.71)
Asian	-978.13***	-41.87
	(39.80)	(53.51)
Black	-11,958.00***	-921.40***
	(335.83)	(447.71)
Spring	6,338.91***	1,626.57
	(1,196.51)	(1,614.73)
Summer	11,498.00***	281.28
	(1,281.42)	(1,717.64)
Fall	17,383.00***	-1,690.14
	(1,450.82)	(1,948.49)
Local Dummies	Yes***	Yes***
Time Dummies	Yes***	Yes***

***,**, and * refer to 1%, 5%, and 10% significance levels. Obs.: 113,899. R-squared: >0.90.

Table 9 shows similar coefficient estimates (in sign, magnitude, and efficiency levels) compared with the previous estimation results shown in Table 4. Most importantly, the coefficient estimate on the Spillover variable is positive and significant, supporting the earlier result that overcharged list prices exert an externality on other properties via spillovers. As expected, the coefficient is slightly higher due to the fact that the mean of the Spillover variable declined.

Table 10 shows robust coefficient estimate compared with Table 5.

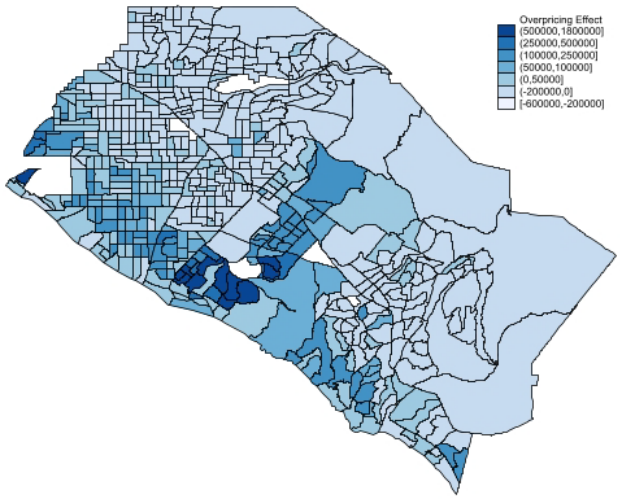
Table 10: Estimation Results of Sale Price Functions and Overcharges

Variables	Sale Price with Spillovers (1)	Spillover Effect (2)
Spillover	0.94***	
	(0.004)	
Property Size	278.49***	23.57***
	(1.59)	(2.11)
Baths	22,683.00***	-190.22
	(1,166.34)	(1,554.27)
Bedrooms	-9,441.75***	-6,421.40***
	(932.91)	(1,242.75)
Garages	28.375.00***	-19,156.00***
	(1,484.71)	(1,976.02)
Year Built	10.72***	27.89***
	(2.15)	(2.86)
Lot Size	12.24***	-1.81***
	(0.15)	(0.19)
Foreclosure	-100,424.00***	-28,057.00*
	(10,266.00)	(13,679.00)
Pool	-9,115.22***	-12,028.00***
	(1,274.92)	(1,697.81)
Waterfront	78,305.00***	17,137.00***
	(3,146.21)	(4,191.70)
Cash	12,884.00***	18,956.00***
	(1,649.36)	(2,195.73)
Buyer Occupied	20,527.00***	-18,826.00***
	(1,422.26)	(1,892.78)
Income	0.66***	-0.01***
	(0.02)	(0.003)
Households	27.69***	-0.24
	(0.56)	(0.75)
Asian	-1,105.56***	-124.94**
	(43.37)	(57.79)
Black	-10,432.00***	-1,042.90**
	(361.71)	(481.97)
Spring	8,431.06***	1,191.12
	(1,283.56)	(1,710.47)
Summer	16,119.00***	227.65
	(1,368.22)	(1,823.30)
Fall	23,105.00***	-2,083.80
	(1,563.02)	(2,082.85)
Local Dummies	Yes***	Yes***
Time Dummies	Yes***	Yes***

***,**, and * refer to 1%, 5%, and 10% significance levels. Obs.: 113,899. R-squared: >0.90.

Figure 20 shows the spillover effects on sold and unsold property prices using the alternative spillover definition as shown in equation (3b). The spillover patterns closely resemble the spillover effects using the definition from equation (3a). Spillover effects are large in Irvine (city) and the coastal areas.

Figure 20: Spillover Effects on List Prices using Alternative Spillover Variable Definition are Shown in Equation (3b).



REFERENCES

Anenberg, E. and E. Kung, 2014, "Estimates of the Size and Source of Price Declines Due to Nearby Foreclosures," American Economic Review, Vol. 104, pp. 2527-2551.

Anglin, P.M., R. Rutherford, and T.M. Springer, 2003, "The Trade-Off Between the Selling Price of Residential Properties and Time-On-Market: The Impact of Price Setting," Journal of Real Estate Finance and Economics, Vol. 26, pp. 95-111.

Autor, D.H., C.J. Palmer, and P.A. Pathak, 2014, "Housing Market Spillovers: Evidence from the End of Rent Control in Cambridge, Massachusetts," Journal of Political Economy, Vol. 122, pp. 661-717.

Benkard, C.L., 2000, "Learning and Forgetting: The Dynamics of Aircraft Production," American Economic Review, Vol. 90, pp. 1034-1054.

Beracha, E. and M.J. Seiler, 2014, "The Effect of Listing Price Strategy on Transaction Selling Prices," Journal of Real Estate Finance and Economics, Vol. 49, pp. 237-255.

Burdett, K. and K. Judd, 1983, "Equilibrium Price Dispersion," Econometrica, Vol. 51, pp. 955-969.

Campbell, J., S. Giglio, and P. Pathak, 2011, "Forced Sales and House Prices," American Economic Review, Vol. 101, No. 5, pp. 2108-2131.

Case, K.E. and R.J. Shiller, 1989, "The Efficiency of the Market for Single-Family Homes," American Economic Review, Vol. 79, pp. 125-137.

Cutler, D., E. Glaeser, and J. Vigdor, 1999, "The Rise and Decline of the American Ghetto," Journal of Political Economy, Vol. 107, pp. 455-506.

Duso, T., K. Gugler, and B.B.Yurtoglu, 2011, "How Effective is European Merger Control?," European Economic Review, Vol. 55, pp. 980-1006.

Feldstein, M.S., 2007, "Housing, Credit Markets and the Business Cycle," NBER Working Paper No. 13471.

Gordon, B.L. and D.T. Winkler, 2017, "The Effect of Listing Price Changes on the Selling Price of Single-Family Residential Properties," Journal Real Estate Finance and Economics, Vol. 55, pp. 185–215.

Guerrieri, V., D. Hartley, and E. Hurst, 2012, "Within-City Variation in Urban Decline: The Case of Detroit," The American Economic Review, Vol. 102, pp. 120-126.

Haurin, D.R., J.L. Haurin, T. Nadauld, and A. Sanders, 2010, "List Prices, Sale Prices and Marketing Time: An Application to U.S. Housing Markets," Real Estate Economics, Vol. 38, pp. 659–685.

Irwin D.A. and P.J. Klenow, 1994, "Learning-by-Doing Spillovers in the Semiconductor Industry," Journal of Political Economy, Vol. 102, pp. 1200-1227.

Knight, J.R., 2002, "Listing Price, Time on Market, and Ultimate Selling Price: Causes and Effects of Listing Price Changes," Real Estate Economics, Vol. 30, pp. 213-237.

Levitt, S. and C. Syverson, 2008, "Market Distortions When Agents Are Better Informed: The Value of Information in Real Estate Transactions," Review of Economics and Statistics, Vol. 90, pp. 599-611.

List, J.A., 2003, "Does Market Experience Eliminate Market Anomalies?," The Quarterly Journal of Economics, Vol.118, pp. 41-71.

Liu, A.-H. and R.B. Siebert, 2022, "The Competitive Effects of Declining Entry Costs over Time: Evidence from the Static Random Access Memory Market," International Journal of Industrial Organization, Vol. 80, Article 102797.

Mian, A., A. Sufi, and F. Trebbi, 2015, "Foreclosures, House Prices, and the Real Economy," The Journal of Finance, Vol.70, pp.2587-2634.

Newey, W.K. and D. McFadden, 1994, "Large Sample Estimation and Hypothesis Testing," in Robert F. Engle and Daniel L. McFadden, eds., *The Handbook of Econometrics* (Amsterdam: North-Holland).

Rosen, S., 1974, "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition," Journal of Political Economy, Vol. 82, pp. 34-55.

Rossi-Hansberg, E., P.-D. Sarte, and R. Owens, III, 2010, "Housing Externalities," Journal of Political Economy, Vol. 118, p. 485-535.

Siebert, R.B., 2022, "Heterogeneous Foreclosure Discounts of Homes," Journal of Real Estate Research, Vol. 44, pp. 1-28.

Siebert, R.B. and M.J. Seiler, 2022, "Why Do Buyers Pay Different Prices for Comparable Products? A Structural Approach on the Housing Market," Journal of Real Estate Finance and Economics, Vol. 65, pp. 1-32.

Solow, R, 1957, "Technical Change and the Aggregate Production Function," Review of Economics and Statistics, Vol. 39, pp. 312-320.

Thanos, S., J. Dubé, and D. Legros, 2016, "Putting Time into Space: The Temporal Coherence of Spatial Applications in the Housing Market," Regional Science and Urban Economics ,Vol. 58, pp. 78-88.

Thornton R.A. and P. Thompson, 2001, "Learning from Experience and Learning from Others: An Exploration of Learning and Spillovers in Wartime Shipbuilding," American Economic Review, Vol. 91, pp. 1350-1368.

Topel, R. and S. Rosen, 1988, "Housing Investment in the United States," Journal of Political Economy, Vol. 96, pp. 718–740.

Tversky, A. and D. Kahneman, 1974, "Judgment under Uncertainty: Heuristics and Biases," Science, Vol. 185, pp. 1124-1131.

Yavas, A. and S. Yang, 1995, "The Strategic Role of Listing Price in Marketing Real Estate: Theory and Evidence," Real Estate Economics, Vol. 23, pp. 347-368.

Zuehlke, T.W., 1987, "Duration Dependence in the Housing Market," Review of Economics and Statistics, Vol. 69, pp. 701-704.