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Not in my neighborhood: the effects of single-family rentals on home values

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ABSTRACT

Since the Great Recession, single-family rentals have increased as a share of the housing units within America's neighborhoods. Homeowners are concerned that this shift in housing tenure will lower their neighborhood's quality and have an adverse effect on their property values. However, no current evidence exists on whether these concerns have any validity. In this paper, we utilize a six-year balanced panel of neighborhoods from the state of Florida's metropolitan areas to study the impacts that single-family rentals have on the values of single-family homes. Our case for causality is buttressed by estimating house value models that include time and neighborhood fixed effects, treat the rentals as endogenous variables, and control for sample selection and changes in neighborhood demographics and land uses. Our results show that share increases in single-family rentals lower house values, but the effects vary between central cities and suburbs, across neighborhoods of different income levels and density, by the price of the rental unit, and whether the owner has a mailing address outside the state of Florida.

1. Introduction

Within many of America's traditional single-family neighborhoods, housing tenure has been shifting from owner-occupancy to rentals. Figs. 1 and 2 show the upward climb in the total number of rentals and as a percentage of the single-family housing stock from 2005 to 2017 for the nation and the state of Florida, respectively.[1] At the national level, the rental percentage has climbed roughly 4 percentage points, from 13% to 17%. Particularly strong has been Florida's growth in rentals, with an increase of 7 percentage points, from 13% to 20%.[2] The impetus behind these shifts in favor of rentals originated over a decade ago as bank owned properties from the foreclosure crisis were purchased by investors and subsequently rented out. Today, the single-family rental market remains strong as many households opt in favor of renting over purchasing (Joint Center for Housing Studies, 2017). The rise in single-family rentals within their neighborhood has concerned many homeowners, who believe that their property values may be in jeopardy. These concerns have frequently been voiced in media reports (for example, Fottrell 2013, Dewan 2013, Schmit 2012, and Yoder 2012). In response, a growing number of local governments and Homeowners Associations are placing limits on the number of neighborhood single-family rentals (Yoder, 2012) or devising other programs to reduce their number.[3] Constraints on the supply of single-family rentals may reduce social welfare. Households preferring to rent may find it harder to find what they want in a tighter rental market and housing affordability may suffer within higher-quality neighborhoods, exacerbat-

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[1] At the national level, the figure shows that rentals as a percentage of all single-family homes peaked in 2014 and declined somewhat from 2014 to 2017, while in Florida the percentage leveled off after 2015.

[2] Additional data documenting the growing importance of the single-family rental market is provided by Freddie Mac (2019). Based on their analysis of American Community Survey data, they conclude that single-family rentals are now the largest segment of the rental market by valuation and households served and that since the Great Recession they have been the fastest growing segment of rental occupied households.

[3] An example is provided by Coulson and Wommer (2019), who report that homeowners' concerns caused State College, Pennsylvania, to establish a Homestead Investment program to buy homes and resell them only to owner-occupants, with a deed restriction that they could only be resold to other owner-occupants.

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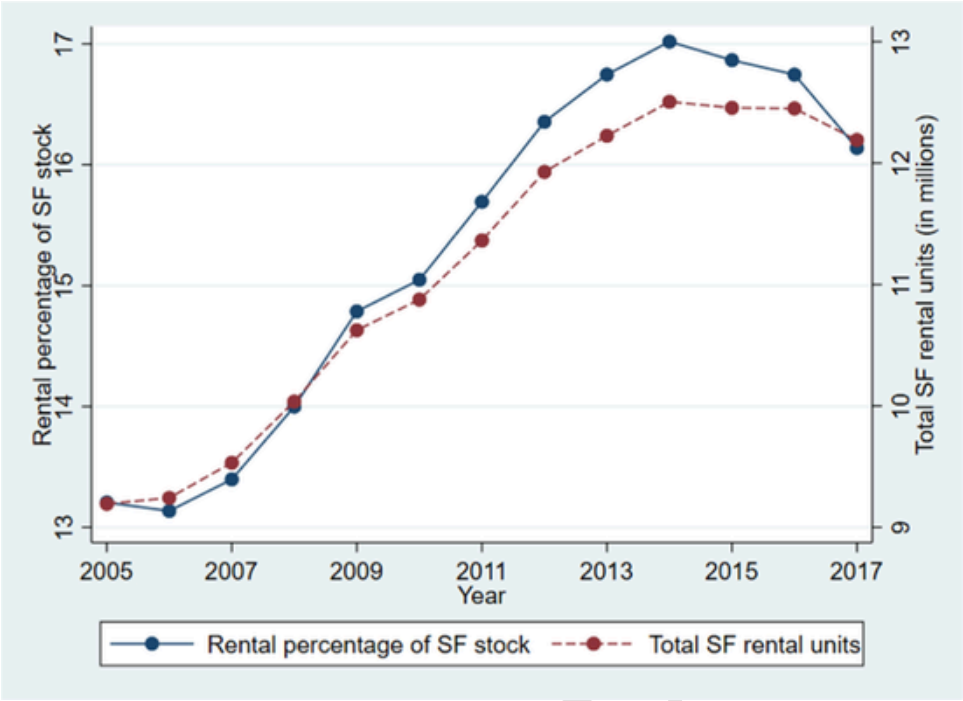

Fig. 1. Rental percentage of single-family stock and total single-family rental units for the U.S. *Note*: Figure is produced from authors' calculations of data from the American Community Survey. SF stands for single-family.

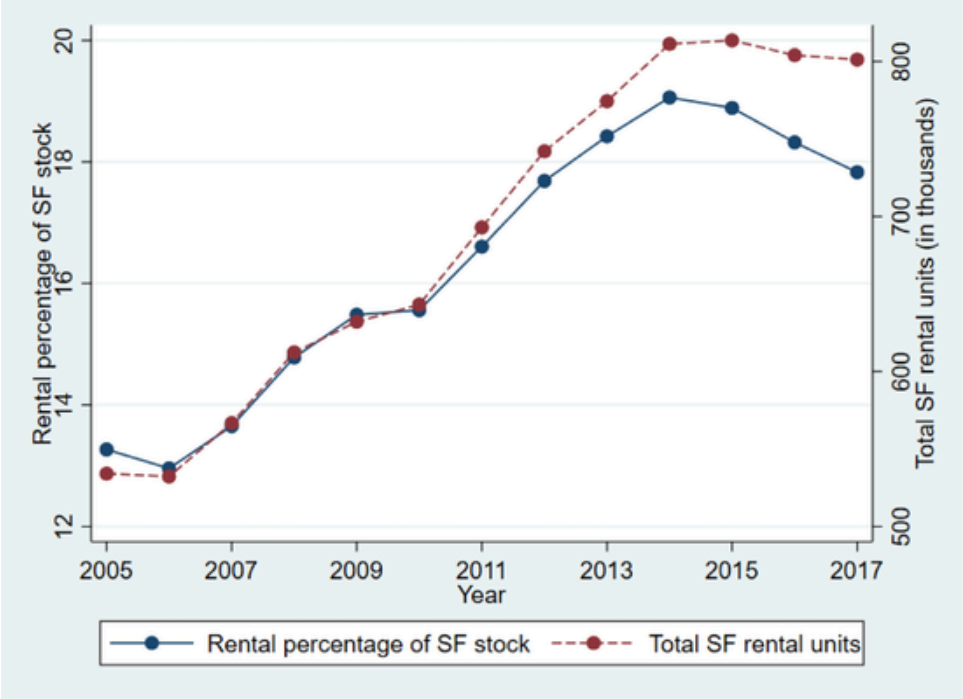

Fig. 2. Rental percentage of single-family stock and total single-family rental units for Florida. *Note*: Figure is produced from authors' calculations of data from the American Community Survey. SF stands for single-family.

ing racial and income segregation.[4] Hence, it is important to determine whether homeowner concerns surrounding the growth in single-family rentals are grounded in reality. To our knowledge, there is no current evidence on this issue.

We utilize a six-year balanced panel of neighborhoods from Florida's metropolitan areas to study the impacts that single-family rentals have on the values of single-family homes.[5] Changes in housing values for 2788 neighborhoods, yielding 16,728 neighborhood/year observations,

[4] Ihlanfeldt and Yang (2021) study the relationship between single-family rentals and neighborhood racial segregation and find a larger share of rentals in neighborhoods where Blacks have historically been underrepresented reduces segregation.

are measured over the years 2013–2018 using the Federal Housing Finance Agency's (FHFA) House Price Index (HPI) for census tracts. The natural log of the HPI is regressed on single-family rentals as a percentage of the neighborhood's housing units, along with the percentage of other housing units. The percentage of single-family owner-occupied homes serves as the excluded reference category. The estimated models control for sample selection, treat single-family rentals as endogenous, and along with year and tract fixed effects include an extensive set of control variables describing the demographics and non-residential properties within the neighborhood. Due to the large size of our sample, we are able to investigate how the impact of single-family rentals on neighborhood house values varies among different types of rentals and neighborhoods, where the latter are broken down by income level, location between central cities and suburbs, and housing unit density.

2. Why might single-family rentals reduce single-family home values?

There are a number of possible pathways that may cause single-family rentals to lower neighborhood single-family home values. First, a number of studies have found that rentals are less well maintained than owner-occupied housing (Galster, 1983; Harding et al., 2000; Shilling et al., 1991). Because renters enjoy only a consumption and not an investment return on their maintenance, they have less incentive to keep up the appearance of their home in comparison to homeowners, who benefit from both types of returns. Landlords do have an incentive to maintain the property, but only from an investment perspective. Coulson and Li (2013) also suggest that maintenance costs are higher if the landlord is an absentee one, which is usually the case. Undermaintained housing units may emit negative visual externalities that take away from the attractiveness of the neighborhood and lower housing values.

A second possible pathway is that rentals may increase neighborhood crime. Criminals may expect that they will be less likely to be apprehended in a neighborhood with rentals. Two arguments can be made. First, “passive policing” within the neighborhood may decline. As coined by Goodstein and Lee (2010), passive policing refers to the efforts that neighborhood residents make to control crime within their own neighborhood. Having no claim to ownership, renters are less invested in the neighborhood than homeowners, who have strong financial incentives to maintain neighborhood quality. Therefore, renters are less likely to engage in passive policing, whether it takes the form of something informal, like providing more “eyes on the street”, or something more formal, such as participating in neighborhood watch programs. Second, the perceived probability of apprehension within the neighborhood may also decline if rental housing lowers the general physical appearance of the neighborhood, as suggested above. According to “broken windows” theory (Kelling and Wilson, 1982), this decline in the appearance of the neighborhood may signal to criminals a lack of concern for the neighborhood on the part of its residents or an area that is not well-policed, resulting in a lower perceived risk of getting caught. Because a large number of studies have found that higher neighborhood crime results in lower housing values (Burnell, 1988; Gibbons, 2004; Ihlanfeldt and Mayock, 2010; Naroff et al., 1980; Rizzo, 1979; Tita et al., 2006), an increase in single-family rentals may reduce house values through the crime pathway.

Finally, in comparison to owner occupants, rental tenants are more transient, which may result in less commitment to improving the schools, parks, and other amenities of the neighborhood. In other words, renters, in comparison to homeowners, are less civically engaged. An absence of involvement may also result because, without ownership, renters have no financial stake in the quality of the neighborhood. Since it is well known that the quality of schools (Black, 1999; Clapp et al., 2008; Crone, 2006) and other local amenities (Espey and Owusu-Edusei, 2001) affect property values, renter disinterest may play a role in reducing house values.

3. Literature review

Wang et al. (1991) provided the first evidence on the impact of single-family rentals on the value of single-family home values. Their sales transactions came from single-family home subdivisions in San Antonio, Texas, covering the years 1984–1986. They measured proximity to single-family rentals as the percentage of rentals among the closest five and eight single-family homes. They found that if a house is surrounded by two rental properties out of the closest five houses or three rentals out of the closest eight houses, the selling price will decrease by 2%, ceteris paribus.

Numerous hedonic single-family price studies have included the neighborhood homeownership rate as an explanatory variable. Because the homeownership rate and the rental rate are inversely related, these studies are relevant to the present study. The correlation found between the homeownership rate and house price is almost always positive. However, critiques of these studies conclude that their results are suspect because of a failure to control for neighborhood sorting by households, suggesting that the observed correlations are spurious due to unobserved heterogeneity across neighborhoods (Coulson et al., 2002; Coulson and Li, 2013; Haurin et al., 2002).

Coulson and his colleagues completed two studies (Coulson et al., 2002; Coulson and Li, 2013) that are the first to account for the sorting of households across neighborhoods in estimating the impact of the homeownership rate on the value of housing within the neighborhood. The empirical model in the first paper had a probit equation that modeled the choice of tenure and a hedonic housing expenditure equation that combined both rental and owner-occupied single-family homes. Expenditures for the latter homes were obtained by taking 7.5% of the homeowner's estimate of value. To estimate their model, they used the cluster samples from the 1993 American Housing Survey. The clusters comprised the 10 to 11 closest single-family homes surrounding the sampled single-family home. Included in their hedonic model was the percentage of the surrounding units that were owner-occupied, which entered their model quadratically, allowing for a non-linear effect. They found that changing one of the rental units within the cluster to owner-occupancy raises annual neighborhood expenditures by $341, on average. Their second paper also relied upon the American Housing Survey clusters but included two years of data (1989, 1993) on each sampled single-family home. The panel nature of the data allowed for a more convincing identification strategy than that employed in their first paper. The homeowner's estimate of market value was regressed on the cluster's homeownership rate controlling for structural and neighborhood characteristics, as well as house and neighborhood fixed effects. Other models were also estimated that instrumented percent owner-occupied and other variables using lagged values. They found that a 9% increase in the ownership rate of the cluster increases house value by 4.5%.

These studies limited their analysis to a very specific type of neighborhood where the only nearby homes were single-family properties, some of which were rentals. Another limitation is that only rentals in very close proximity to the sample property were measured, while it may be the composition of the housing stock at the neighborhood level that also registers an effect. Also at issue is the age of the data used by these studies, with samples now being decades old. Finally, by addressing the possible endogeneity of single-family rentals, the two papers by Coulson and his colleagues improve upon Wang et al., but an advantage

[5] A balanced panel contains an observation of the same unit (in our case, the neighborhood) in every time period (year). Using a balanced panel has the advantages over an unbalanced panel in that it reduces the noise introduced by unit heterogeneity and yields more reliable estimates, especially when missing values in an unbalanced panel may result from non-random attrition.

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of the latter study is home values were measured with sales prices and not owner-estimates. Results may be unreliable if the value guesses of sampled homeowners incorrectly capture the contribution made to the neighborhood from more ownership and less renting.

4. Expected differences in the estimated effects

An advantage of our large sample size of neighborhoods is that we can cut up the sample in various ways to answer a series of questions regarding how the effects of single-family rentals on neighborhood house values might vary by type and location. Reliably answering these questions will help tailor policies specifically to where they are needed to mitigate the negative spillover effects of single-family rentals. One question is how the house value effects of an increase in the neighborhood share of housing units represented by single-family rentals vary across neighborhoods of different income levels. In comparison to high income neighborhoods, low income neighborhoods have higher crime, less well-maintained housing units, and a lower percentage of residents who are civically engaged (Levin-Waldman, 2013). Recall, these are the three pathways whereby single-family rentals may have a negative impact on neighborhood house values. Hence, on the margin, within a low income neighborhood quality may be less impacted by a share increase in single-family rentals, resulting in less, if any, impact on house values. In other words, within a low income neighborhood, there may be little difference in the negative externalities emitted by a rental and an owner-occupied single-family home. On the other hand, homeowner associations are more frequently found within higher income neighborhoods (Cheung and Meltzer, 2014). Their protective covenants may work to curtail any negative visual externalities emitted by single-family rentals in the neighborhood. Also, the desire to protect property wealth, which is arguably greater in higher income neighborhoods, may cause the homeowners of these neighborhoods to more closely monitor tenant behaviors and report to law enforcement activities that may be detrimental to the neighborhood. Due to these countervailing influences, it is *a priori* unclear whether the house value impacts of single-family rentals will be smaller or larger within high in comparison to low income neighborhoods. The answer requires an examination of the data. We therefore divide our sample of neighborhoods into low, middle, and high income and estimate separate models for each income group.

A second question is whether suburban neighborhoods, compared to central city neighborhoods, are impacted more by an increase in the share of single-family rentals. In comparison to central city neighborhoods, the housing stocks of suburban neighborhoods are more uniform in appearance, with vintages, architecture, and tenure displaying less diversity. Hence, a single-family rental may represent less of an outlier (i.e., a break in uniformity) within a central city neighborhood, mitigating its effect on housing values. Separate models are estimated for central city and suburban neighborhoods.

Negative externalities emitted by any offensive activity are expected to be stronger within denser areas, assuming that longer distances mitigate impacts. In neighborhoods where there are more housing units per land area, a greater loss in neighborhood quality may result from the negative spillover effects produced by a single additional single-family rental. Hence, our third question is whether an increase in single-family rentals as a share of a neighborhood's housing units has a larger effect on house values within denser neighborhoods. We estimate separate models for low, medium, and high density neighborhoods.

A fourth question is whether the effects of single-family rentals on house values differ between local versus non-local investors. Although we offer no evidence, because proximity offers convenience, local landlords may serve as their own property manager and/or general contractor and may personally oversee the decision to rent to any given tenant. In contrast, non-local landlords are less likely to have a personal relationship with their tenants and may find it costly to personally oversee the condition of the property, which suggests a greater use of a property management firm.[6] If a local/non-local owner division corresponds to the use of a professional property management firm, the role that owner location may have on the effect that an increase in the share of single-family rentals has on neighborhood house values will depend on the whether professionally managed single-family rental properties result in smaller spillover effects. Mills et al. (2019) note that technological developments that occurred in the 2000s, such as cloud computing, the widespread use of personal mobile devices, and mobile internet connectivity, have allowed for scattered-site property renovation, maintenance, and management to occur in a much more flexible, efficient manner, suggesting that the scale economies that can be exploited by management companies may enable them to provide better services to single-family rentals than investors who manage their own properties. Nevertheless, the latter owners are expected to have the advantage in choosing reliable tenants. Thus, it is unclear, *a priori,* how the effects of single-family rentals on neighborhood house values might vary with the location of their owners. We estimate models where single-family rentals are categorized based on the location of the owner.

Another question of interest is whether single-family rentals owned by corporations have a different effect on neighborhood housing values in comparison to rentals owned by individuals. While both local and non-local owners may be corporations, according to our data non-local (i.e., out of state) single-family rentals are more frequently corporate owned.[7] We estimate models where rentals are defined by both their type of ownership and whether the owner's address is inside or outside the state of Florida.

The final issue we address is whether the effect of single-family rentals on neighborhood house values varies with the quality of the rental. More expensive single-family rentals are less likely to be owned by landlords seeking to earn higher profit margins by failing to invest in maintenance and improvement (aka, slumlords). We estimate models dividing single-family rentals into less and more expensive to study their different effects on neighborhood house values.

5. Data

The balanced panel that we use to estimate our house value models is constructed at the census tract level covering the years 2013–2018; however, as we describe below, to construct our instrumental variables we employ base year values going back five years before the beginning of the panel to 2008. The census tracts used to form our panel come from Florida's 43 urban counties, as defined by the 2010 Census of Population and Housing. For these counties, the FHFA reports an HPI for 2788 tracts, covering all six years of our panel. The HPI is a weighted, repeat-sales price index measuring the movement of single-family house values from year to year.[8] It is based on transactions involving conforming, conventional mortgages purchased or securitized by Fannie Mae or Freddie Mac. The FHFA HPI index is not reported for tracts

[6] While we could not find any data on the use of property managers by investors in single-family rentals, the articles listed below discuss the difficulties encountered by a non-local owner trying to manage the property without the assistance of a professional management company: https://magazine.realtor/commercial/feature/article/2015/09/demystifying-long-distance-landlording, https://www.rentecdirect.com/blog/long-distance-landlord/, https://www.lawdepot.com/blog/10-tips-for-the-long-distance-landlord/.

[7] For the average neighborhood in our sample, 4.8% of the housing units are single-family rentals with an out-of-state owner's address, and 15.0% of these are corporate owned. Single-family rentals with an in-state owner's address represent 11.5% of the housing units, with 10.8% owned by corporations.

[8] The FHFA HPI for larger geographic areas has been published for the past two decades, but only recently has the census tract version become available. The census tract version of the HPI is described in Bogin, Doerner and Larson (2019). The methodology used to construct the HPI is covered in Calhoun (1996).

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where there are an insufficient number of repeat sales. This resulted in 1010 tracts (26% of the total number of tracts) being excluded from our panel. These tracts are largely agricultural or commercial in character.[9]

Our land use data come from the standardized property tax rolls that each county in the state of Florida must submit annually to the Florida Department of Revenue. These tax roll data, which are updated on an annual basis, contain a wealth of information on real property characteristics, including land use counts at the census tract level broken into 83 categories. From these counts, we selected the following residential units: single-family detached homes and other residential units. Also selected are counts of four different categories of non-residential properties: retail businesses, alcohol-serving establishments, and properties categorized by the Florida Department of Revenue as industrial or institutional. These are property types that may affect the attractiveness of the neighborhood and have their own impact on neighborhood house values that may be correlated with the share of single-family rentals. Hence, they are included in our set of covariates as control variables.

What is most important for our study is a field within the tax rolls which indicates whether or not a property was granted a property tax homestead exemption. According to Florida Statute 196.031, this exemption is available to "[a] person who, on January 1st, has the legal title or beneficial title to real property in [Florida] and who in good faith makes the property his or her permanent residence or the permanent residence of another or others legally or naturally dependent upon him or her".[10] We use the absence of a homestead exemption as one condition required to classify a property as a rental. However, this may result in an overestimate of the number of single-family rentals to the extent that homeowners are living in the home but fail to apply for the homestead exemption. To guard against this, our second condition is that there must be a difference between the address of the home and the address of the property owner.[11]

Meeting these conditions does not ensure that the unit is currently rented. However, the tax roll data are reported for January 1 of the tax roll year (assume, for example, the year is 2015). A unit can satisfy our two conditions anytime in the previous 12 months. If the conditions were met early in 2014, it is unlikely that the unit is vacant during 2015. If the conditions were met toward the end of 2014, the unit might not be rented for all 12 months of 2015, depending on the time it takes for the owner to find a tenant.[12] As is well known, the occupancy status of individual housing units is generally not known; however, we have some assurance that Florida's strong housing market and the aforementioned timing of events results in the vast majority of our single-family rentals being occupied. We are not studying the impact of vacant homes on neighborhood house values.

Our housing typology consists of owner-occupied single-family homes, single-family rentals, and other housing units, which are largely units in multifamily properties (86%). For the average neighborhood in our sample, single-family rentals represent 16.8% of the total number of housing units, single-family owner-occupied homes are 50.0%, and other housing units are 33.1%. In some specifications of the models, single-family rentals are broken down into less expensive and more expensive. Less expensive (more expensive) units are defined for each year and have a just value less than (greater than) the annual median value of the county. Just value is the county property appraiser's best estimate of what the home would sell for on January 1 of the tax roll year.[13] Other breakdowns of the single-family rentals are by the address of the owner: within the same zip code as the property, outside the zip code but within the same county as the property, outside the county containing the property but within Florida, and outside the state of Florida. To identify single-family rentals that are corporate owned we followed the approach of Mills et al. (2019). Single-family rentals whose owner name includes the abbreviations "INC", "LP", or "LLC" are treated as corporate owned.

Neighborhoods are divided into City and Suburbs, based on the U.S. Census Bureau's identification of the Principal Cities of each metropolitan area. These are in the names given to each Metropolitan Statistical Area.[14] If a neighborhood is within a Principal City it is considered a City neighborhood, otherwise it is a Suburban neighborhood. To categorize neighborhoods into low, middle, and high income categories, we used median household incomes at the census tract level provided by the 2017 American Community Survey (ACS) 5-Year Estimates.[15] The latter estimates were also used to stratify our neighborhoods into low, medium, and high density, where density is defined as the number of housing units per square mile. The ACS 5-Year Estimates for the years 2013 to 2018 were used to obtain our neighborhood demographic controls. Households are categorized based on the race/ethnicity of the household head (non-Hispanic Blacks, non-Hispanic Whites, and Hispanics) and annual income (see Appendix Table A.1).[16] Other demographic controls are the percentage of the tract population under the age of 18, the percentages of the tract's adults aged 45-61 and aged 62 and older (reference group aged 25-44), and the percentage of adults with a college degree.

In isolation, a single-family rental may produce negative spillover effects that lower only nearby property values. Measuring the change in housing values at the tract level may be too large of an area to register the effect. However, our interest is how an increase in the share of a neighborhood's housing units represented by single-family rentals impacts housing values. Our concern, therefore, is not with the impact area of a single-family rental but whether the rentals are concentrated in only a portion of the census tract. To study this issue, we investigated the distribution of single-family rentals across the block groups that make up the tract by computing a Gini Coefficient for each tract. The median (mean) Gini Coefficient for all of our tracts equals 0.13 (0.15), with 75% of the tracts having a Gini Coefficient of less than 0.25. These results suggest that the rentals are distributed fairly evenly over the area covered by the average census tract.

6. Empirical methodology

Our house value equation relates the natural log of the census tract HPI to the neighborhood shares of single-family rentals and housing

[9] In our April 4, 2020 email from William Doerner of the FHFA, he stated "You're correct that the lack of index is a lack of repeat sales. Our exclusion criteria were extremely generous. Instead of counting a pair as one transaction, we decoupled them and then deduped. So if a house sold in 2002, 2008, and 2012 then we'd have only 2 paired transactions but we would count the 'half pairs' as being 3 unique transactions. It's a slight difference from doubling the paired transactions because we don't want to count a transaction twice. To have an index reported, we wanted to have 100 total historical observations (half pairs) to turn an index 'on' and then it must have 10 observations in any given year to not turn back 'off'".

[10] A homestead exemption decreases a property's taxable value by as much as $50,000.

[11] There is also the possibility that the owner takes the homestead exemption illegally and rents out the unit. Besides the penalties associated with apprehension, there would be the inconvenience of the owner's mail being delivered to the rental. Hence, we expect that this deception is uncommon.

[12] Renter's Warehouse is a company that manages a large number of single-family rentals in Florida. They report an average of 17 days to find a tenant.

[13] These just value estimates, which are used in the administration of the property tax, are based on standard assessment methods (*i.e.*, comparable sales, replacement cost, and the income approach) and are validated each year by the Florida Department of Revenue.

[14] For example, the Miami-Ft. Lauderdale-West Palm Beach Metropolitan Statistical Area has three principal cities.

[15] Low, middle and high income are less than $45,000, between $45,000 and $60,000, and greater than $60,000, respectively.

[16] Asians are another ethnic group. We excluded Asians because they account for only 2.8% of the population in Florida according to the 2018 ACS 1-year estimate, resulting in too many empty cells within our income groups.

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units other than single-family homes, along with year and neighborhood fixed effects. Formally,

$$\log\left(\mathrm{HPI}_{it}\right) = \boldsymbol{s}_{it}'\boldsymbol{\beta} + \boldsymbol{x}_{it}'\boldsymbol{\theta} + \alpha_i + \eta_t + \varepsilon_{it}, \tag{1}$$

for $i = 1, 2, \ldots, N$ and $t = 1, 2, \ldots, T$, where HPI_{it} is the House Price Index of tract i in year t, $\boldsymbol{s}_{it}$ is a vector of shares of housing units as percentages of the total number of housing units in tract i in year t, $\boldsymbol{x}_{it}$ is a vector of control variables, α_i is the unobserved tract-specific effect, η_t is the year fixed effect, and ε_{it} is an idiosyncratic error. The share of single-family owner-occupied properties is the excluded house type, which serves as our reference category. In our most basic model, the housing shares, $\boldsymbol{s}_{it}$, are the share of single-family rentals, regardless of type, and the share of housing units other than single-family homes. In other specifications, as noted in Section 4, the single-family rental shares are broken down into various types. Specifically, by the location of the owner: within the same zip code as the property, outside the same zip code but within the same county, outside the county but within the state, and outside the state; by more and less expensive; and by type of ownership: corporate and individually owned. The control variables include the neighborhood demographic variables and the non-residential property types. Also included as a control is the log of the number of single-family homes. An increase in the number of single-family homes within the tract may reduce excess demand and dampen the growth in housing values. On the other hand, an increase may register omitted amenity effects that positively affect housing demand, resulting in a higher HPI.[17] In order to obtain a consistent estimate of $\boldsymbol{\beta}$ in Eq. (1), we have to carefully address two potential econometric problems—endogeneity and sample selection. First, although Eq. (1) includes tract fixed effects to control for unobservable time-invariant heterogeneity affecting the HPI, there may be time-varying unobservables that are correlated with single-family rentals that have their own impact on neighborhood house values. Hence, to control for this possibility, there is a need for instrumental variables (IV) for the single-family housing types that satisfy strict exogeneity (i.e., variables that would be correlated with the housing shares that would not have their own influence on the HPI). Conceptually, it is reasonable to argue that a change in the neighborhood share of single-family rentals is driven by factors both within the neighborhood and county-wide. While factors within the neighborhood may be endogenous to the HPI, county-wide factors should not be affected by conditions within the home neighborhood, especially if the county-wide factors are defined over the portion of the county that excludes the home census tract. Based on this logic, the following IV is suggested: first define a base year preceding the beginning of the panel. Using the entire county, then calculate the percentage change in the share of single-family rentals at the county level between the base and current years, excluding the home neighborhood value. These percentage changes are then multiplied by a base year value of the single-family rentals share to obtain a prediction ($\hat{s}_{it}$), assuming the growth in the share at the neighborhood level followed the change that occurred at the county level. Formally,

$$\hat{s}_{it,j} = s_{ib,j} \times \left(1 + \frac{s_{ct,j} - s_{cb,j}}{s_{cb,j}}\right), \tag{2}$$

where i indexes the census tract, t indexes the current year, j indexes housing type, b is the base year, and c represents the county (excluding tract i). Note that the IV varies over time, across counties and across neighborhoods within the same county by construction. While HPI may affect $s_{it,j}$, it should not have an effect on $\hat{s}_{it,j}$. However, the validity of $\hat{s}_{it,j}$ as an instrument also depends on whether the neighborhood base year housing share can be treated as exogenous. For example, there may be an omitted variable that is correlated with the base year value that has a delayed impact on neighborhood quality, which in turn dampens the HPI. In that case, the instrument would, in part, be capturing the omitted variable effect and would not be orthogonal to the error term of our estimated equations. The way to guard against this is to move the base year backward in time, lessening the probability that a delayed response could impact the current year's HPI. We used 2008 as our base year. While it is still possible that events five years prior to the beginning of the panel (2013) could affect the current HPI, this seems unlikely.[18]

The second problem that may result in inconsistent estimation of Eq. (1) is non-random sampling. As noted in Section 5, the FHFA HPI index is not reported for tracts that have an insufficient number of repeat sales. Therefore, the standard fixed effects two-stage least squares estimates may be subject to sample selection bias. To formally address this issue, we consider the following sample selection process:

$$d_{it} = 1\left[d_{it}^{*} > 0\right], \quad \text{where} \quad d_{it}^{*} = \boldsymbol{z}_{it}'\boldsymbol{\delta}_t + \mu_i + \gamma_t + v_{it}, \tag{3}$$

where $1[\cdot]$ is the indicator function, d_{it} is a selection indicator that equals one if HPI_{it} is observed ($d_{it}^{*} > 0$), and zero otherwise. d_{it}^{*} is a latent (unobserved) variable representing the propensity for a tract to have available HPI data; d_{it}^{*} is assumed to follow a linear process where $\boldsymbol{z}_{it}$ is a vector of exogenous variables that affects selection, μ_i represents unobserved heterogeneity, γ_t is the year fixed effect, and v_{it} is an idiosyncratic error. Note that the parameters in $\boldsymbol{\delta}_t$ are allowed to be time-varying. This specification follows the model considered in Semykina and Wooldridge (2010), who showed that, under fairly general assumptions, consistent estimates of $\boldsymbol{\beta}$ in Eq. (1) in the presence of both endogeneity and sample selection could be achieved by a two-step procedure: In the first step, for each $t = 1, 2, \ldots, T$, estimate the selection Eq. (3) by probit, where the unobserved heterogeneity is approximated by the Mundlak's (1978) device, and use the resulting estimates to obtain the inverse Mills ratio, denoted by $\hat{\lambda}_{it}$. In the second step, apply a pooled two-stage least squares (2SLS) estimation of the equation:

$$\log\left(\mathrm{HPI}_{it}\right) = \boldsymbol{s}_{it}'\boldsymbol{\beta} + \boldsymbol{x}_{it}'\boldsymbol{\theta} + \bar{\boldsymbol{z}}_i'\boldsymbol{\xi} + \rho_t\hat{\lambda}_{it} + \eta_t + e_{it}, \tag{4}$$

where $\bar{\boldsymbol{z}}_i$ is the within-tract time mean of the exogeneous regressors $\boldsymbol{z}_{it}$. The standard errors that are adjusted for the first-step estimation and robust to heteroskedasticity and serial correlation in $\{\varepsilon_{it}\}$ can be computed by the analytical formulae provided by Semykina and

[17] Changes in the number of single-family homes may be endogenous to changes in HPI. All of our HPI models are estimated with and without this variable. There is little change in the estimated single-family effects, suggesting our conclusions are not altered by possible endogeneity bias.

[18] The validity of our instrumental variable depends on satisfying two conditions—the instrument is strictly exogenous and not "weakly" correlated with the tested regressor. Supporting evidence on the exogeneity of our instrument is provided as one of our robustness checks. To detect weak instruments, we conduct the F test of the joint significance of the instruments in the first-stage reduced form regression in the models where single-family rentals is the only variable requiring instrumentation (*i.e.*, single-family rentals are not broken into different types). We follow Staiger and Stock's (1997) rule of thumb and reject the null hypothesis that our instrument is weak if the F value is 10 or larger. For models with multiple endogenous variables, Baum, Schaffer and Stillman (2003) have illustrated that the standard F statistic may not be sufficiently informative. A more informative test may be the Sanderson-Windmeijer (SW) (2016) conditional F statistic that tests the weak identification of individual endogenous regressors. Again, we use an SW F value of 10 or greater to reject that our instrument is weak. The standard F statistics are larger than 10 in 46 of the 49 reported cases, with the three exceptions still indicating a non-trivial correlation between the instrument and the endogenous variable. Hence, these results suggest that our results are not being biased by weak instruments. While the vast majority of the conditional F statistics are also larger than 10, in some cases they conflict with the information provided by the standard F statistic. Detailed test results are given in Appendix Tables A.5 and A.6.

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Wooldridge (2010).[19] The test for selection bias can be easily obtained by a Wald test of $H_0: \rho_1 = \rho_2 = \cdots = \rho_T = 0$. A rejection of the null hypothesis would indicate evidence of sample selection bias.

The only remaining issue is the specification of z_{it}. As emphasized in Semykina and Wooldridge (2010), "the procedure is convincing only if we have at least one IV for each endogenous element of $[s_{it}]$ and then another exogenous variable that affects selection." Selection depends on the number of repeat sales within the census tract. More repeat sales are expected where the number of single-family homes is larger and turnover is more frequent. A variable possibly affecting turnover is the mean ratio of taxable to just value for single-family homes in the neighborhood. Taxable value multiplied by the millage rate determines the amount of property taxes owed. Just value is the property tax assessor's estimate of the market value of the home. Differences in just and taxable value result from exemptions and Florida's annual cap on the growth in assessed value.[20] The smaller the taxable to just value, the larger are property tax savings, which creates a disincentive to sell and therefore may lower turnover (and repeat sales) within the neighborhood. Accordingly, we choose z_{it} to be the vector of all exogenous variables, including the mean ratio of taxable to just value allowing for its interaction with the log of the number of single-family homes, which improved model fit. The latter two variables, which are excluded from the reduced form regressions of the 2SLS, provides another source of exogenous variation for the house value equation in addition to the instruments $\hat{s}_{it}$. The variables are jointly significant at the 1% level in our selection models, and the average marginal effect of the ratio is positive and significant, as expected.[21]

7. Descriptive statistics

Table 1 shows the census tract mean percentage changes in the HPI and their standard deviations for each year of our panel. Housing prices increased monotonically over the six-year period, which mirrors the trend at the national level in the post-recession recovery period. However, the annual average appreciation rate for our sample of census tracts (9.3%) exceeded what occurred at the national level (5.7%), based upon the national FHFA HPI.

Single-family rentals as a share of a neighborhood's housing units are reported in Table 2. Mean values are broken down by both our single-family rental and neighborhood typologies. Lumping all single-family rentals together shows little variation in the share across the neighborhood types, ranging from 15% to 18%. Not unexpected is that the high income neighborhoods have the lowest percentage of single-family rentals and the highest percentage of more expensive single-family rentals, with the share in the highest income group roughly twice as large as within the lowest income group. Shares are similar between the central city and the suburbs. Regardless of the type of neighborhood, the breakdown by the location of the owner of the single-family rentals reveals a fairly even distribution across the four defined locations.

Overall, our panel shows a good number of tracts within each neighborhood group (shown at the bottom of the table) ranging between 900 and 1888 and share totals for each of our single-family rental types. Hence, our balanced panel is ideal for answering our questions of interest.

Table 1
FHFA House Price Index (HPI): Means and standard deviations (SD) of annual percentages changes in house values within census tracts.

	Percentage Change in HPI	
	Mean	SD
2013—2014	11.1	9.5
2014—2015	9.5	9.1
2015—2016	10.3	9.3
2016—2017	10.1	9.5
2017—2018	9.3	9.0

Table 2
Single-family rentals as a share of neighborhood housing units: Means and standard deviations.

	All neigh	City	Suburbs	Income		
				Low	Middle	High
Total	16.83	17.85	16.34	18.10	17.69	14.88
	(8.84)	(8.74)	(8.86)	(10.09)	(8.97)	(6.96)
Less expensive	9.23	10.0	8.83	13.94	10.11	4.11
	(8.90)	(8.96)	(8.84)	(10.10)	(7.93)	(5.09)
More expensive	7.60	7.81	7.50 (6.04)	4.15	7.58	10.77
	(5.99)	(5.88)		(4.01)	(5.92)	(5.77)
Owner location						
Zip code	4.06	4.35	3.92	4.39	4.11	3.70
	(3.21)	(3.04)	(3.28)	(3.51)	(3.24)	(2.85)
County	4.91	6.04	4.35	6.18	4.93	3.72
	(3.61)	(4.02)	(3.26)	(4.46)	(3.31)	(2.42)
State	3.02	2.69	3.18	3.42	3.12	2.56
	(2.34)	(2.03)	(2.54)	(2.67)	(2.59)	(1.81)
Out of state	4.85	4.77	4.89	4.12	5.53	4.91
	(4.39)	(4.34)	(4.41)	(3.45)	(5.11)	(4.34)
# of neighborhoods	2788	900	1888	915	885	985

Note: Neighborhoods are defined as census tracts. Less and more expensive are the shares of less and more expensive single-family rentals, respectively. Owner location gives a breakdown of the shares of single-family rentals by the location of the property owner: within the zip code of the rental, outside the zip code but within the county of the rental, outside the county but within the state of the rental, and outside of the state. Standard deviations are in parentheses.

8. Results

The first issue we addressed is whether the housing shares could be treated as exogenous. The neighborhood shares entering our models are single-family rentals (with and without the divisions into different types) and other housing units. The share of other housing units is comprised almost entirely of units within multifamily properties. An annual increase in these units comes mostly from new construction. The length of time between the decision to build and occupancy is generally very long for these properties. Finding and purchasing the land (sometimes involving assembling multiple parcels), completing the building and site plans, obtaining project approval from local government (multiple levels of government are many times involved), and demolition/construction all together commonly take years in the making. Hence, we do not expect the current HPI or time-varying within tract unobservables would impact the current share of other housing units. Furthermore, the decision to build is expected to be based on projections of future apartment rents and condominium prices and not on the projection of

[19] The Stata code that implements the two-step estimation procedure is available at the website of Anastasia Semykina: http://myweb.fsu.edu/asemykina/.

[20] Tax exemptions reduce the value of the property subject to taxation. In Florida, there are state, county, and municipality exemptions. Exemptions exist for property owners who permanently reside in their home and homeowners who are disabled, blind, widows, widowers, low income seniors, and who provide living quarters for parents and grandparents. Florida's cap on annual increases in assessed value went into effect in 1995. The cap limits increases in assessed value to 3 percent or the percent change in the Consumer Price Index, whichever is less.

[21] For each model, we tested for selection bias by a Wald test for joint significance of the inverse Mills ratios while allowing for heteroskedasticity and serial correlation in the errors. The test statistic and associated *p*-value are given in the appendix. The test outcomes suggest that the null hypothesis of no selection bias is strongly rejected in all estimated models except the low income subsample, and hence correcting for selection bias is warranted. We do not report the coefficient estimates of the first-step probit in the interest of saving space. They are available upon request.

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the future prices of single-family homes. Hence, we treat the share of other housing units as exogenous in estimating our models.

Regarding the exogeneity of single-family rentals, whether suppliers are builders or converters of existing owner-occupied homes, neighborhood house values may play a role in their decisions. Moreover, the time involved in creating a rental from a previously owner-occupied home can be short in duration. The construction of a new home takes more time, but in most cases it also is of short duration, given that builders typically build on developed lots with permitting already in place. Hence, in all of our regression, we treated the share of single-family rentals as endogenous.

The results from estimating our neighborhood HPI models are divided between Tables 3 and 4.[22] Table 3 reports the results from estimating Eq. (4) treating all single-family rentals as the same (Panel A), dividing single-family rentals into less and more expensive (Panel B), and breaking single-family rentals down into the four locations describing the address of the property owner (Panel C). In each panel, results are reported for all census tracts, census tracts within central cities, census tracts within the suburbs, and for low, middle, and high income census tracts. Table 4 reports results using a different neighborhood typology than used in Table 3, with neighborhoods divided into low, medium, and high density (Panel A). Panel B of Table 3 shows the results from dividing single-family rentals based upon the owner's state location and type of ownership.

In the tables, two numbers are reported for each explanatory variable. The first number is the estimated coefficient. Based upon our log-linear functional form, the estimated coefficient (multiplied by 100) is interpreted as the percentage change in the HPI caused by a one percentage point increase in the neighborhood share of the housing type. The second number is the standard error clustered at the census tract level and corrected for the first-step estimation of the selection equation. It should be noted that the standard errors are robust to unknown heteroskedasticity and serial correlation of arbitrary forms.

Panel A of Table 3 shows that an increase in the neighborhood share of single-family rentals is associated with a reduction in neighborhood house values. For the sample of all census tracts, a one percentage point increase in the single-family rental share reduces house values by 1.4%. The effect is statistically significant at the 1% level. The effect is the same for suburban neighborhoods. In contrast, the percentage reduction within cities is less than 1% and is not statistically significant. The results are consistent with the hypothesis that the more varied mix of the residential units within central city compared to suburban neighborhoods mitigates the negative effect of single-family rentals on house values. The estimations for the three neighborhood income groups are all significant at the 5% level and yield percentage reductions in HPI equaling 2.6, 0.9, and 1.5 for low, middle, and high income neighborhoods, respectively. These results suggest that single-family rentals have a stronger negative impact on house values within low in comparison to middle and high income neighborhoods. To assess the reasonableness of the estimates in Panel A, consider that the average census tract contains 2148 housing units (the sum of single-family rentals, single-family owner-occupied units, and other housing units); hence, a one percent share increase equals 21 additional single-family rentals. In light of this number, the percentage reductions presented in the panel seem plausible in magnitude.

In Panel B, single-family rentals are divided into less and more expensive units. The results contrast sharply between these two types of rentals. Across all neighborhoods and sample divisions, less expensive units have negative and significant effects on HPI, with the greatest reduction in housing values occurring within high income neighborhoods (5.0%). In comparison, the effects of more expensive units are all positive, and for all neighborhoods and suburban neighborhoods the effect is significant. These results strongly support the hypothesis that an increase in a neighborhood's share of housing units represented by less expensive single-family rentals results in a greater reduction in neighborhood housing values than an equivalent increase in the share of more expensive single-family rentals.

Panel C shows the results obtained from breaking single-family rentals into the four alternative locations of the owner of the property: within the zip code of the rental, outside the zip code but within the county of the rental, outside the county but within Florida, and outside the state of Florida. There is a common pattern in the results for all neighborhoods and the neighborhood types. Across the three in-state locations, there is little difference in the results. For example, for all neighborhoods, the estimated percentage reductions in HPI equal 3.4, 3.4, and 3.5 from a percentage point increase in the share of single-family rentals owned within the same zip code as the rental, outside the zip code but within the same county, and outside the county but within the state, respectively. All estimates are significant at the 1% level. The in-state locations also yield similar estimates across the sample divisions, although the effects for high income neighborhoods are not significant. In contrast, the estimates for single-family rentals with an owner address out of the state are small and are either insignificant or significant at only the 10% level. One glaring exception is within high income neighborhoods, where a one percentage point increase in out-of-state rentals increases housing values by 5%. Because we have no data on rentals that are professionally managed, we cannot conclude that the contrasting in-state versus out-of-state results reflect possible efficiencies provided by these companies; however, we view this as a strong possibility that merits additional research.

Panel A of Table 4 uses a different neighborhood typology than used in Table 3. Neighborhoods are first ordered by the number of housing units per square mile, and the distribution is divided into terciles, with the first, second, and third groups defined as low, medium, and high density neighborhoods, respectively. The higher the density, the greater the negative impact of a share increase in single-family rentals on neighborhood house values. A one percentage point share increase in single-family rentals reduces neighborhood house values by 1.1%, 1.4%, and 2.6% for low, medium, and high density neighborhoods, respectively. Because the results obtained with the location of the owner reported in Table 3 showed that the location difference that matters is whether the owner's address is within or outside the state of Florida, in Panel B of Table 4, we separate single-family rentals into four categories based on the latter two locations and whether the rental is owned individually or by a corporation. The results show that it makes no difference whether individuals or corporations own the single-family rentals whose owners' addresses are located out of state. In both cases, the results parallel those reported in Table 3, showing that these rentals have little effect on neighborhood house values. For rentals whose owners are located within the state and are not a corporate entity, a one percentage point increase in their share is found to produce a highly significant 3.3% reduction in neighborhood house values. For these rentals that are owned by corporations, the effect is not significant (the estimated coefficient is smaller than the estimated standard error). Again, a possible difference in the use of property management companies between rentals owned by individuals and corporations may play a role in accounting for these results.

All of the estimated models include the demographic variables, the non-residential property types, and the number of single-family homes (in logs) as controls. The results with these variables are reported in the appendix. Increasing the percentage of the neighborhood's households falling into one of the race/ethnicity/income groups (with a corresponding reduction in the percentage of the highest income White group) results in a reduction in the HPI in 79% of the cases, with more than half significant at the 10% level or better. Negative effects are fewer for Hispanics than for the two racial groups. A larger percentage of middle age households (household head aged 45 to 61) raise the HPI,

[22] Reported in the tables are the results obtained for the housing shares. Full results, including those for the control variables, are reported in the appendix.

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Table 3
Expand
Results from estimating HPI models for the first set of sample divisions.

	All neigh	City	Suburbs	Income		
				Low	Middle	High
			Panel A			
Single-family rentals	−0.01419***	−0.00970	−0.01354***	−0.02640***	−0.00881**	−0.01500**
	(0.00371)	(0.00591)	(0.00415)	(0.00851)	(0.00403)	(0.00690)
Other housing units	−0.00202*	−0.00325*	−0.00080	−0.00619**	−0.00213	0.00120
	(0.00109)	(0.00171)	(0.00143)	(0.00240)	(0.00163)	(0.00174)
			Panel B			
Single-family rentals						
Less expensive	−0.02179***	−0.01552**	−0.02023***	−0.02672***	−0.01256**	−0.04978*
	(0.00571)	(0.00726)	(0.00684)	(0.00976)	(0.00629)	(0.02631)
More expensive	0.01407*	0.00974	0.01291**	0.01570	0.00881	0.01623
	(0.00788)	(0.01300)	(0.00604)	(0.01700)	(0.00951)	(0.01562)
Other housing units	−0.00080	−0.00269	0.00048	−0.00456**	−0.00140	0.00270
	(0.00110)	(0.00182)	(0.00127)	(0.00224)	(0.00126)	(0.00228)
			Panel C			
Single-family rentals						
Zip code	−0.03431***	−0.01612*	−0.04185***	−0.06463**	−0.03945***	0.02868
	(0.00928)	(0.00975)	(0.01484)	(0.02693)	(0.01346)	(0.02541)
County	−0.03364***	−0.02732*	−0.03932***	−0.06880***	−0.02846**	0.03257
	(0.00851)	(0.01608)	(0.01367)	(0.02450)	(0.01121)	(0.02678)
State	−0.03468***	−0.02103**	−0.04197***	−0.05669	−0.03194***	0.01636
	(0.00852)	(0.00913)	(0.01416)	(0.03563)	(0.01163)	(0.02350)
Out of state	0.00093	−0.00612	0.00597	−0.02860*	−0.01311*	0.05563**
	(0.00742)	(0.01648)	(0.00880)	(0.01699)	(0.00743)	(0.02528)
Other housing units	−0.00317**	−0.00137	−0.00399*	−0.01184**	−0.00440**	0.00734**
	(0.00153)	(0.00180)	(0.00234)	(0.00599)	(0.00217)	(0.00352)

Note: Reported are the results from estimating Eq. (4): log of the FHFA housing price index (HPI) for the census tract is regressed on the neighborhood shares of single-family rentals and other housing units, along with controls for year, neighborhood demographics, non-residential properties and the log of the number of single-family homes. All regressions also include time averages of exogenous variables and inverse Mills ratio from the probit model for each year. In Panel B, single-family rentals are broken down into less and more expensive. In Panel C, single-family rentals are broken down into four categories defining the home location of the owner. Standard errors clustered at the tract level and corrected for the first-step estimation of the selection equation are in parentheses. *, **, *** indicate significance at the 10, 5, and 1 percent levels, respectively.

with significance registered in a majority of the cases. A shift in the population away from younger to middle-aged adults may be correlated with unobserved neighborhood amenity effects, resulting from the latter group's greater civic engagement (Smith, 2013). An increase in the percentage of the population younger than 18 years old is found to reduce housing values, and all effects are significant at the 1% level. Because many homebuyers in Florida are retirees, neighborhoods with children may experience less demand. Retirees, especially those on a fixed income, may avoid these neighborhoods because they do not want to pay higher property taxes for schools. Another factor that may explain lower housing values in neighborhoods with children is that larger homes are correlated with larger families, and homebuyer preferences tend to be shifting in favor of smaller homes (Keys and Myers, 2019). The percentage of adults in the neighborhoods who are college graduates also produces positive, significant effects. Neighborhoods with more educated residents tend to have less crime and better schools, which may account for our results.

The property types are the number of retail businesses, alcohol serving places other than restaurants (for example, bars, nightclubs, and cocktail lounges), and properties categorized on the tax rolls as industrial and institutional. While more retail tends to raise the HPI, increases in the other property types are found to lower the HPI.

Finally, an increase in the number of single-family homes generally raises the HPI, except within high income neighborhoods. As noted in Section 6, an increase in the number of single-family homes within the tract may register countervailing supply and amenity effects, whose net effect may vary across different types of neighborhoods.

9. Robustness checks

We altered variable definitions and the specifications of our estimated models in the interest of testing the robustness of our results. First, we investigated whether the results reported in Tables 3 and 4 are being driven by one or more of Florida's large counties, which because of their size have a disproportionately large number of neighborhoods as part of the state sample. The five largest counties are Miami-Dade, Broward, Palm Beach, Hillsborough, and Orange. Dropping these counties one at a time or all together has no discernable impact on the results.[23]

We also tested whether the results are sensitive to alternative constructions of the variables. Specifically, instead of basing our definition of a rental on our two conditions—that the property has no homestead exemption and the property owner's address is different from that of the rental—we just used the absence of a homestead exemption. The estimated effects of the single-family rental shares are smaller, but generally remain statistically significant, albeit at lower levels of signifi-

[23] A referee suggested that the results might be different for South Florida than for the rest of the state. To check this, we estimated the Panel A models of Table 3 for Florida's six most southern coastal counties: Lee and Collier in southwest Florida and Monroe, Palm Beach, Miami-Dade, and Broward in southeast Florida. While this reduced the number of neighborhoods from 2788 to 871, the results are consistent with those obtained for the full sample of neighborhoods. For all southern neighborhoods, a 1% point increase in single-family rentals reduces housing values by 1.8% (p-value = .000), which is close to the 1.4% decline reported for all neighborhoods in Panel A of Table 3. The breakdown in neighborhood types again shows that the estimated effect is small (and insignificant) within city in comparison to suburban neighborhoods. For the neighborhood income groups, small sample sizes resulted in imprecise estimates.

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Table 4
Expand
Results from estimating HPI models for the second set of sample divisions.

	Panel A		
	Neighborhood density		
	Low	Medium	High
Single-family rentals	−0.01059***	−0.01407***	−0.02617***
	(0.00349)	(0.00495)	(0.01006)
Other housing units	−0.01059***	−0.01407***	−0.02617***
	(0.00349)	(0.00495)	(0.01006)
	Panel B		
	Type of rental by owner location and corporate status		
Single-family rentals			
Out of state			
Corporate owned		−0.00134	
		(0.09484)	
Non-corporate owned		0.00386	
		(0.02889)	
In state			
Corporate owned		−0.05393	
		(0.05287)	
Non-corporate owned		−0.03287***	
		(0.00894)	
Other housing units		−0.00323**	
		(0.00151)	

Note: Reported are the results from estimating Eq. (4): log of the FHFA housing price index (HPI) for the census tract is regressed on the neighborhood shares of single-family rentals and other housing units, along with controls for year, neighborhood demographics, non-residential properties and the log of the number of single-family homes. Both regressions also include time averages of exogenous variables and inverse Mills ratio from the probit model for each year. Standard errors clustered at the tract level and corrected for the first-step estimation of the selection equation are in parentheses. **, *** indicate significance at the 5 and 1 percent levels, respectively.

cance. We also reconstructed our instrumental variable, retaining the home neighborhood value in computing the changes at the county level. This had almost no effect on the results reported in the Tables.

Next, we were interested in further assessing the exogeneity of our instrumental variable by choosing a base year farther back than five years. Going back before 2008 reduced our accuracy in placing properties in the proper census tract. However, the time gap between the base year and the first year of our sample can be expanded by delaying the first year of our panel. If we start the panel with the year 2014 instead of 2013, the panel becomes a five-year panel instead of a six-year panel. The time gap between the base year of 2008 and 2014 is extended from 5 to 6 years. Similarly, if we start the panel with the year 2015 (2016), the panel is four (three) years in length and the base year is then 7 (8) years before the start of the panel. Using these various panels, we estimated the same model for Panel A of Table 3. The six, five, four, and three year panels yielded estimated coefficients for the share of single-family rentals ranging between −0.013 and −0.017, and all estimates are statistically significant at the 1% level. These results lend support to our assumption that the base year share values are exogenous to the current year HPI values used to estimate our models.

Finally, we estimated all of our models without the neighborhood demographic variables and the non-residential property types. Our main conclusions on the effects of single-family rentals on neighborhood house values continue to hold after dropping these variables.

10. Loss of property tax revenue

Besides single-family homeowners, another group for which our results have important consequences are local governments. By lowering the values of neighborhood homes, the negative spillover effects from single-family rentals reduce the property tax revenues received by local governments. To obtain a rough estimate of the magnitude of the average tax loss per neighborhood, consider what would result from a one standard deviation increase in the share of single-family rentals within the median neighborhood in our sample. With panel data, a standard deviation (SD) change can be measured as either "between" or "within" the observational units. The between SD comparison can be thought of as selecting two neighborhoods from the same year, with one experiencing and the other not experiencing a standard deviation increase in the share of single-family rentals. The within SD compares two years for the same neighborhood, where, in one of the years but not the other, there is a standard deviation increase in the share of single-family rentals. Because the within SD change is a better gage of the tax loss experienced by the median neighborhood, we employ this number. A within SD increase is 1.78%; hence, when multiplied by the estimated coefficient on the share of single-family rentals (−0.014), the house value percentage loss is 2.5%. According to Zillow, the median value of single-family homes in Florida in 2015 equaled $160,000, so the loss in dollars would be $4000. Since the median neighborhood in 2015 contains 1438 single-family homes, the total loss in value for the entire neighborhood is 5.7 million dollars. Florida's effective property tax is in the range of roughly 1.5%, which implies that a within one SD increase in the share of single-family rentals would reduce tax revenue by $85,500. One important policy implication from the size of this tax loss is that strategies to mitigate the negative spillover effects from single-family rentals could possibly be financed, at least in part, by local government tax increment financing, which dedicates tax increments within a certain defined district to finance the debt that is issued to pay for the project.

11. Conclusions

Single-family rentals have grown in importance as a component of the housing stocks of urban neighborhoods. This trend is likely to continue as there exists a strong demand for this type of housing (Freddie Mac, 2019). Homeowners have shown concerns that the increase in single-family rentals could have an adverse effect on their property values and, in some cases, have made efforts to restrict the presence of these rentals within their neighborhoods. This paper has provided some new evidence suggesting that these concerns have some validity. Our estimated models show that a one percentage point increase in the single-family rental share of a neighborhood's housing units can reduce house values by as much as 7%, depending on the type of rental and neighborhood. Most of our estimates, however, fall within a range of 1.5% to 5%. Our results are based on estimated models using a balanced panel that control for unobserved heterogeneity across and within tracts, sample selection resulting from the HPI not being reported for all census tracts, and the endogeneity of the rentals.

The large size of our panel allowed us to investigate differences in the house value effects of single-family rentals among different types of neighborhoods and different types of rentals. We found that the negative impact of single-family rentals on neighborhood house values is larger within suburbs than central cities, greater in low income than high income neighborhoods, larger in neighborhoods with a higher density of housing units, worse for less expensive than more expensive homes, and unimportant for properties that are owned by corporations or whose owners have addresses outside the state of Florida.

From a policy perspective, a number of recommendations can be drawn from our results. Government intervention is suggested where market failure is evident, and our detection of negative spillover effects from single-family rentals suggests that this is the case. Moreover, our results suggest that the single-family rental spillover phenomenon is worsening the housing wealth gap between low and high income homeowners. The rentals reduce home values more in low in comparison to high income neighborhoods. Hence, government intervention is justified, but a blanket approach is ill-advised. Because spillover effects vary

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by type of rental and the location of the rental, policies should be contextual in nature. We do not recommend limitations on the number or share of single-family rentals. They offer a relatively new rental option in many neighborhoods that better meet the needs of many households. Moreover, their presence in high income neighborhoods increases housing affordability that has been found to increase racial integration (Ihlanfeldt and Yang, 2021). Future research should be directed toward an understanding of the possible pathways whereby these particular rentals negatively impact neighborhood house values. With this knowledge, the negative spillovers from the rentals hopefully can be mitigated.[24]

The standard caveats regarding a study of our nature apply. Ours is the first study that uses recent data on the growth of single-family rentals to analyze their spillover effects. Research is needed to determine if our results generalize to other states. However, the fact that we find rather consistent effects using neighborhoods throughout the metropolitan areas of Florida and find that these results are robust to dropping its largest counties suggest that our conclusions will be reproducible for other states.

[24] For example, if single-family rentals reduce neighborhood housing values because they are not kept up, housing codes could be more stringently enforced. Community policing may be an option if rentals are associated with higher crime. If the tenants of rentals show indifference to the quality of their neighborhood, their interest and support could possibly be garnered by inviting them to attend homeowner association meetings and by encouraging them to participate in other collective activities such as community gardens.

Appendix

See Tables A.1—A.6.

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Table A.1

Expand

Complete set of estimates of Panel A of Table 3 model.

	All neigh	City	Suburbs	Income		
				Low	Middle	High
Single-family rentals	−0.01419***	−0.00970	−0.01354***	−0.02640***	−0.00881**	−0.01500**
	(0.00371)	(0.00591)	(0.00415)	(0.00851)	(0.00403)	(0.00690)
Other housing units	−0.00202*	−0.00325*	−0.00080	−0.00619**	−0.00213	0.00120
	(0.00109)	(0.00171)	(0.00143)	(0.00240)	(0.00163)	(0.00174)
Middle age	0.00432***	0.00938***	0.00181	0.00605***	0.00930***	0.00200
	(0.00117)	(0.00171)	(0.00157)	(0.00185)	(0.00197)	(0.00197)
Old age	−0.00027	−0.00115	−0.00154	−0.00160	−0.00252*	−0.00062
	(0.00081)	(0.00113)	(0.00107)	(0.00127)	(0.00144)	(0.00128)
Children	−0.01142***	−0.01099***	−0.01277***	−0.00872***	−0.01639***	−0.00706***
	(0.00138)	(0.00194)	(0.00178)	(0.00204)	(0.00246)	(0.00247)
College	0.00903***	0.00602***	0.01110***	0.00830***	0.00975***	0.00811***
	(0.00072)	(0.00103)	(0.00096)	(0.00137)	(0.00129)	(0.00113)
Black25	−0.00437**	−0.00886***	−0.00251	−0.00854*	−0.00913**	−0.01043**
	(0.00174)	(0.00257)	(0.00227)	(0.00446)	(0.00367)	(0.00457)
Black50	−0.00417**	−0.01017***	−0.00053	−0.00820*	−0.01155***	−0.00267
	(0.00190)	(0.00303)	(0.00236)	(0.00465)	(0.00332)	(0.00466)
Black75	−0.00268	−0.01320***	−0.00068	−0.00686	−0.00136	−0.00568
	(0.00222)	(0.00378)	(0.00266)	(0.00467)	(0.00360)	(0.00457)
Black125	−0.00100	−0.01549***	0.00386	−0.01257**	0.00310	−0.00177
	(0.00235)	(0.00416)	(0.00273)	(0.00522)	(0.00416)	(0.00401)
Black125+	−0.01248***	−0.02441***	−0.00879**	−0.00574	−0.01055	−0.01464**
	(0.00397)	(0.00879)	(0.00441)	(0.00974)	(0.00695)	(0.00591)
Hispanic25	−0.00190	−0.00724***	0.00138	−0.00471	−0.00361	0.00273
	(0.00151)	(0.00259)	(0.00180)	(0.00407)	(0.00317)	(0.00363)
Hispanic50	0.00130	−0.00648**	0.00381*	−0.00311	−0.00232	−0.00045
	(0.00166)	(0.00287)	(0.00195)	(0.00419)	(0.00309)	(0.00322)
Hispanic75	0.00148	0.00056	0.00156	−0.00374	0.00050	−0.00093
	(0.00196)	(0.00373)	(0.00223)	(0.00412)	(0.00356)	(0.00329)
Hispanic125	−0.00032	0.00113	0.00005	−0.00139	0.00390	−0.00619**
	(0.00201)	(0.00411)	(0.00224)	(0.00461)	(0.00365)	(0.00301)
Hispanic125+	0.00306	−0.00132	0.00503**	0.01542**	−0.00774*	0.00472**
	(0.00186)	(0.00410)	(0.00206)	(0.00656)	(0.00417)	(0.00227)
White25	−0.00531***	−0.00993***	−0.00259	−0.00795*	−0.00379	−0.00197
	(0.00151)	(0.00236)	(0.00183)	(0.00426)	(0.00275)	(0.00249)
White50	−0.00499***	−0.00976***	−0.00277	−0.00605	−0.00944***	−0.00464**
	(0.00144)	(0.00224)	(0.00176)	(0.00432)	(0.00264)	(0.00224)
White75	−0.00434***	−0.00846***	−0.00219	−0.01133***	−0.00691***	−0.00625***
	(0.00147)	(0.00240)	(0.00175)	(0.00432)	(0.00260)	(0.00218)
White125	−0.00587***	−0.00811***	−0.00422**	−0.00557	−0.00862***	−0.00946***
	(0.00137)	(0.00242)	(0.00164)	(0.00416)	(0.00257)	(0.00188)
Retail	0.00079**	0.00075	0.00084**	0.00102**	0.00209***	0.00096*
	(0.00031)	(0.00050)	(0.00039)	(0.00041)	(0.00071)	(0.00050)
Alcohol serving	−0.00635	−0.00871	−0.00600	−0.01620**	−0.00539	−0.00037
	(0.00512)	(0.00713)	(0.00761)	(0.00809)	(0.00941)	(0.01107)
Industrial	−0.00035***	−0.00001	−0.00039***	−0.00070**	−0.00043	−0.00034***
	(0.00010)	(0.00073)	(0.00011)	(0.00029)	(0.00040)	(0.00010)
Institutional	−0.00668***	−0.00490***	−0.00719***	−0.00715***	−0.00674***	−0.01166***
	(0.00105)	(0.00139)	(0.00137)	(0.00142)	(0.00231)	(0.00192)
Log # of SF homes	0.02762	0.04242*	0.03021	0.22168***	0.09017***	−0.04428*
	(0.01771)	(0.02527)	(0.02142)	(0.03499)	(0.02741)	(0.02480)
Wald test	87.05	34.64	58.46	8.70	21.74	85.00
p-value	[0.000]	[0.000]	[0.000]	[0.191]	[0.001]	[0.000]

Note: Reported are the results from estimating Eq. (4). Single-family rentals are the share of single-family homes offered for rent as a percentage of all housing units located in the neighborhood (census tract). Middle age and old age are the percentages of the tract's adults aged 45 to 61 and aged 62 and older, respectively, with the reference group aged 25 to 44. College is the percent of the adult population with a college degree. Children is the percent of the tract population under the age of 18. Black25 = % of neighborhood households with Black head and annual income of $25,000 or less, Black50 = % of neighborhood households with Black head with annual income more than $25,000 and less than or equal to $50,000, Black75 = % of neighborhood households with Black head and annual income of more than $50,000 and less than or equal to $75,000. Black125 = % of neighborhood households with a Black head and annual income of more than $75,000 and less than or equal to $125,000. Black125+ is the percent of neighborhood households with Black head and an annual income of more than $125,000. The variables for White and Hispanic household heads are similarly defined. White households with annual incomes exceeding $125,000 is the reference group. Log # of SF home is the log of the number of single-family homes. All regressions also include year dummies, time averages of exogenous variables, and inverse Mills ratio from the probit model for each year. These estimates are not shown to save space. The bottom of the table reports the Wald test statistic for joint significance of the inverse Mills

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ratios. The *p*-value of the associated Wald test is in square bracket. Standard errors clustered at the tract level and corrected for the first-step estimation of the selection equation are in parentheses. *, **, *** indicate significance at the 10, 5, and 1 percent levels, respectively.

Table A.2

Expand

Complete set of estimates of Panel B of Table 3 model.

	All neigh	City	Suburbs	Income		
				Low	Middle	High
Single-family rentals						
Less expensive	−0.02179***	−0.01552**	−0.02023***	−0.02672***	−0.01256**	−0.04978*
	(0.00571)	(0.00726)	(0.00684)	(0.00976)	(0.00629)	(0.02631)
More expensive	0.01407*	0.00974	0.01291**	0.01570	0.00881	0.01623
	(0.00788)	(0.01300)	(0.00604)	(0.01700)	(0.00951)	(0.01562)
Other housing units	−0.00080	−0.00269	0.00048	−0.00456**	−0.00140	0.00270
	(0.00110)	(0.00182)	(0.00127)	(0.00224)	(0.00126)	(0.00228)
Middle age	0.00335**	0.00948***	0.00033	0.00637***	0.00811***	0.00377
	(0.00133)	(0.00202)	(0.00181)	(0.00203)	(0.00224)	(0.00291)
Old age	−0.00027	−0.00149	−0.00205	−0.00212	−0.00263	−0.00130
	(0.00095)	(0.00125)	(0.00130)	(0.00151)	(0.00161)	(0.00154)
Children	−0.00872***	−0.00915***	−0.01098***	−0.00828***	−0.01531***	−0.00572*
	(0.00187)	(0.00296)	(0.00208)	(0.00227)	(0.00273)	(0.00329)
College	0.00703***	0.00440***	0.00955***	0.00551***	0.00819***	0.00531***
	(0.00099)	(0.00144)	(0.00111)	(0.00208)	(0.00168)	(0.00194)
Black25	−0.00374*	−0.00840***	−0.00145	−0.00606	−0.00721*	−0.01103*
	(0.00198)	(0.00269)	(0.00257)	(0.00533)	(0.00428)	(0.00579)
Black50	−0.00370*	−0.00868**	−0.00024	−0.00481	−0.00943**	−0.00260
	(0.00214)	(0.00348)	(0.00268)	(0.00603)	(0.00382)	(0.00557)
Black75	−0.00265	−0.01218***	−0.00058	−0.00198	0.00110	0.00215
	(0.00256)	(0.00405)	(0.00315)	(0.00617)	(0.00416)	(0.00849)
Black125	−0.00121	−0.01849***	0.00537*	−0.01117**	0.00714	−0.00136
	(0.00267)	(0.00456)	(0.00315)	(0.00566)	(0.00483)	(0.00521)
Black125 +	−0.00987**	−0.02239**	−0.00696	0.00267	−0.00958	−0.01577**
	(0.00456)	(0.00962)	(0.00496)	(0.01211)	(0.00733)	(0.00703)
Hispanic25	−0.00287*	−0.00713***	0.00077	−0.00313	−0.00271	0.00553
	(0.00170)	(0.00271)	(0.00203)	(0.00462)	(0.00346)	(0.00457)
Hispanic50	0.00074	−0.00692**	0.00390*	0.00116	−0.00109	0.00021
	(0.00184)	(0.00300)	(0.00222)	(0.00572)	(0.00344)	(0.00382)
Hispanic75	0.00039	0.00026	0.00077	0.00053	0.00263	−0.00171
	(0.00217)	(0.00399)	(0.00246)	(0.00549)	(0.00406)	(0.00379)
Hispanic125	−0.00178	−0.00241	−0.00060	0.00225	0.00694*	−0.00839**
	(0.00227)	(0.00507)	(0.00252)	(0.00561)	(0.00415)	(0.00356)
Hispanic125 +	0.00420**	−0.00072	0.00643***	0.01241	−0.00748*	0.00609**
	(0.00214)	(0.00436)	(0.00230)	(0.00766)	(0.00443)	(0.00298)
White25	−0.00592***	−0.01018***	−0.00244	−0.00552	−0.00230	−0.00347
	(0.00172)	(0.00249)	(0.00216)	(0.00527)	(0.00315)	(0.00316)
White50	−0.00673***	−0.01080***	−0.00400**	−0.00461	−0.00905***	−0.00503*
	(0.00159)	(0.00233)	(0.00196)	(0.00484)	(0.00279)	(0.00276)
White75	−0.00629***	−0.00980***	−0.00339*	−0.00936*	−0.00559*	−0.00511*
	(0.00166)	(0.00251)	(0.00194)	(0.00497)	(0.00292)	(0.00299)
White125	−0.00762***	−0.01077***	−0.00507***	−0.00429	−0.00657**	−0.00968***
	(0.00157)	(0.00271)	(0.00181)	(0.00465)	(0.00296)	(0.00223)
Retail	0.00028	0.00072	0.00020	0.00060	0.00139*	0.00098
	(0.00037)	(0.00051)	(0.00042)	(0.00046)	(0.00084)	(0.00061)
Alcohol serving	−0.00826	−0.00825	−0.01224	−0.01812*	−0.00738	−0.00352
	(0.00572)	(0.00721)	(0.00884)	(0.00959)	(0.01017)	(0.01644)
Industrial	−0.00030**	0.00112	−0.00034***	−0.00056*	−0.00018	−0.00037***
	(0.00013)	(0.00121)	(0.00013)	(0.00033)	(0.00044)	(0.00013)
Institutional	−0.00561***	−0.00373***	−0.00630***	−0.00708***	−0.00530**	−0.00880***
	(0.00111)	(0.00138)	(0.00141)	(0.00144)	(0.00235)	(0.00293)
Log # of SF homes	−0.06884*	−0.01925	−0.05620*	0.16746***	0.01485	−0.12008**
	(0.03728)	(0.05464)	(0.03230)	(0.05258)	(0.05065)	(0.05914)
Wald test	77.05	29.94	68.10	6.64	22.17	63.14
p-value	[0.000]	[0.000]	[0.000]	[0.355]	[0.001]	[0.000]

Note: Single-family rentals are broken down into less and more expensive. See also the note to Table A.1.

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Table A.3

Expand

Complete set of estimates of Panel C of Table 3 model.

	All neigh	City	Suburbs	Income		
				Low	Middle	High
Single-family rentals						
Zip code	−0.03431***	−0.01612*	−0.04185***	−0.06463**	−0.03945***	0.02868
	(0.00928)	(0.00975)	(0.01484)	(0.02693)	(0.01346)	(0.02541)
County	−0.03364***	−0.02732*	−0.03932***	−0.06880***	−0.02846**	0.03257
	(0.00851)	(0.01608)	(0.01367)	(0.02450)	(0.01121)	(0.02678)
State	−0.03468***	−0.02103**	−0.04197***	−0.05669	−0.03194***	0.01636
	(0.00852)	(0.00913)	(0.01416)	(0.03563)	(0.01163)	(0.02350)
Out of state	0.00093	−0.00612	0.00597	−0.02860*	−0.01311*	0.05563**
	(0.00742)	(0.01648)	(0.00880)	(0.01699)	(0.00743)	(0.02528)
Other housing units	−0.00317**	−0.00137	−0.00399*	−0.01184**	−0.00440**	0.00734**
	(0.00153)	(0.00180)	(0.00234)	(0.00599)	(0.00217)	(0.00352)
Middle age	0.00360***	0.00797***	0.00160	0.00213	0.00887***	0.00763**
	(0.00135)	(0.00181)	(0.00198)	(0.00297)	(0.00229)	(0.00309)
Old age	−0.00183*	−0.00243*	−0.00320**	−0.00425*	−0.00351*	0.00350
	(0.00103)	(0.00127)	(0.00158)	(0.00246)	(0.00188)	(0.00262)
Children	−0.01177***	−0.01145***	−0.01312***	−0.00794***	−0.01685***	−0.00715**
	(0.00145)	(0.00203)	(0.00196)	(0.00241)	(0.00256)	(0.00278)
College	0.00954***	0.00640***	0.01148***	0.00827***	0.01010***	0.00680***
	(0.00078)	(0.00111)	(0.00108)	(0.00158)	(0.00142)	(0.00149)
Black25	−0.00016	−0.00542*	0.00320	0.00358	−0.00494	−0.01264**
	(0.00244)	(0.00315)	(0.00362)	(0.00800)	(0.00423)	(0.00577)
Black50	−0.00104	−0.00741**	0.00309	0.00063	−0.00913**	−0.00280
	(0.00234)	(0.00348)	(0.00317)	(0.00638)	(0.00364)	(0.00561)
Black75	−0.00043	−0.01083***	0.00204	−0.00250	0.00008	−0.01331*
	(0.00241)	(0.00395)	(0.00306)	(0.00620)	(0.00382)	(0.00687)
Black125	−0.00190	−0.01367***	0.00156	−0.01345**	0.00096	−0.00696
	(0.00237)	(0.00417)	(0.00286)	(0.00583)	(0.00419)	(0.00530)
Black125+	−0.01583***	−0.02700***	−0.01227**	−0.00902	−0.00810	−0.01190
	(0.00436)	(0.00895)	(0.00504)	(0.01112)	(0.00715)	(0.00773)
Hispanic25	0.00234	−0.00419	0.00603**	0.00363	−0.00014	0.00044
	(0.00189)	(0.00292)	(0.00256)	(0.00634)	(0.00359)	(0.00525)
Hispanic50	0.00463**	−0.00480	0.00812**	0.00411	0.00086	−0.00754
	(0.00215)	(0.00304)	(0.00315)	(0.00611)	(0.00353)	(0.00592)
Hispanic75	0.00369*	0.00191	0.00479*	0.00084	0.00338	−0.00623
	(0.00221)	(0.00389)	(0.00286)	(0.00549)	(0.00381)	(0.00489)
Hispanic125	0.00008	0.00260	0.00029	0.00149	0.00355	−0.00729**
	(0.00209)	(0.00416)	(0.00238)	(0.00563)	(0.00397)	(0.00362)
Hispanic125+	0.00396*	0.00094	0.00569**	0.01418*	−0.00637	0.00913***
	(0.00207)	(0.00433)	(0.00244)	(0.00797)	(0.00472)	(0.00297)
White25	−0.00109	−0.00717**	0.00250	0.00184	−0.00138	−0.01088*
	(0.00233)	(0.00279)	(0.00367)	(0.00761)	(0.00317)	(0.00568)
White50	−0.00114	−0.00741***	0.00243	0.00215	−0.00529	−0.01278**
	(0.00212)	(0.00251)	(0.00332)	(0.00674)	(0.00325)	(0.00521)
White75	−0.00255	−0.00692***	−0.00042	−0.00577	−0.00408	−0.01454***
	(0.00172)	(0.00257)	(0.00220)	(0.00577)	(0.00301)	(0.00468)
White125	−0.00610***	−0.00822***	−0.00475**	−0.00393	−0.00841***	−0.01144***
	(0.00146)	(0.00239)	(0.00185)	(0.00500)	(0.00282)	(0.00243)
Retail	0.00137***	0.00130**	0.00133**	0.00183***	0.00306***	0.00014
	(0.00039)	(0.00056)	(0.00053)	(0.00069)	(0.00080)	(0.00071)
Alcohol serving	−0.00233	−0.00702	0.00155	−0.01080	−0.00231	−0.02098
	(0.00556)	(0.00731)	(0.00878)	(0.00815)	(0.00931)	(0.01669)
Industrial	−0.00040***	−0.00021	−0.00041***	−0.00122***	−0.00073	−0.00040***
	(0.00013)	(0.00076)	(0.00013)	(0.00043)	(0.00045)	(0.00013)
Institutional	−0.00617***	−0.00543***	−0.00589***	−0.00567***	−0.00622**	−0.00555**
	(0.00113)	(0.00152)	(0.00158)	(0.00154)	(0.00268)	(0.00234)
Log # of SF homes	0.03418*	0.02778	0.05581**	0.13099***	0.10334***	−0.06634*
	(0.01943)	(0.02868)	(0.02483)	(0.04464)	(0.03244)	(0.03380)
Wald test	105.24	41.52	54.13	16.18	25.36	58.30
p-value	[0.000]	[0.000]	[0.000]	[0.013]	[0.000]	[0.000]

Note: Single-family rentals are broken down into four categories defining the home location of the owner. See also the note to Table A.1.

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Table A.4

Expand

Complete set of estimates of Table 4 model.

	Neighborhood density			
	Low	Medium	High	
	(1)	(2)	(3)	(4)
Single-family rentals	−0.01059***	−0.01407***	−0.02617***	
	(0.00349)	(0.00495)	(0.01006)	
Out of state				
Corp owned				−0.00134
				(0.09484)
Non-corp owned				0.00386
				(0.02889)
In state				
Corp owned				−0.05393
				(0.05287)
Non-corp owned				−0.03287***
				(0.00894)
Other housing units	−0.00294**	−0.00334**	−0.00303*	−0.00323**
	(0.00137)	(0.00136)	(0.00176)	(0.00151)
Middle age	0.00511***	0.01097***	0.00714***	0.00357***
	(0.00166)	(0.00179)	(0.00164)	(0.00137)
Old age	0.00005	0.00151	−0.00075	−0.00183
	(0.00115)	(0.00120)	(0.00118)	(0.00130)
Children	−0.01006***	−0.01059***	−0.00779***	−0.01144***
	(0.00182)	(0.00195)	(0.00225)	(0.00263)
College	0.00578***	0.00401***	0.00580***	0.00944***
	(0.00104)	(0.00104)	(0.00127)	(0.00116)
Black25	−0.00590**	−0.01263***	−0.01290***	−0.00018
	(0.00267)	(0.00257)	(0.00343)	(0.00263)
Black50	−0.00373	−0.01134***	−0.00992***	−0.00075
	(0.00267)	(0.00304)	(0.00356)	(0.00244)
Black75	−0.01295***	−0.00387	−0.00404	0.00011
	(0.00326)	(0.00385)	(0.00336)	(0.00376)
Black125	−0.00311	−0.01382***	−0.00190	−0.00196
	(0.00335)	(0.00435)	(0.00330)	(0.00274)
Black125+	−0.01285**	−0.00876	−0.01376**	−0.01551***
	(0.00613)	(0.00733)	(0.00559)	(0.00452)
Hispanic25	−0.00078	−0.00485*	−0.00444*	0.00211
	(0.00307)	(0.00249)	(0.00264)	(0.00229)
Hispanic50	0.00209	−0.00333	−0.00322	0.00464**
	(0.00295)	(0.00257)	(0.00281)	(0.00215)
Hispanic75	0.00318	−0.00278	−0.00484	0.00367
	(0.00304)	(0.00319)	(0.00340)	(0.00224)
Hispanic125	−0.00640*	−0.00411	−0.00134	0.00012
	(0.00354)	(0.00355)	(0.00286)	(0.00246)
Hispanic125+	0.00844***	0.00309	−0.00378	0.00419*
	(0.00280)	(0.00319)	(0.00278)	(0.00228)
White25	−0.00448**	−0.00976***	−0.00963***	−0.00129
	(0.00191)	(0.00219)	(0.00319)	(0.00264)
White50	−0.00411**	−0.00782***	−0.00687**	−0.00155
	(0.00189)	(0.00214)	(0.00299)	(0.00296)
White75	−0.00336*	−0.00530**	−0.00399	−0.00305
	(0.00189)	(0.00221)	(0.00312)	(0.00281)
White125	−0.00276	−0.00558***	−0.00474*	−0.00660***
	(0.00173)	(0.00207)	(0.00264)	(0.00198)
Retail	0.00128***	0.00111**	0.00107**	0.00133***
	(0.00038)	(0.00055)	(0.00050)	(0.00042)
Alcohol serving	−0.00420	−0.00431	−0.00672	−0.00305
	(0.00720)	(0.01026)	(0.00681)	(0.00674)
Industrial	−0.00035	−0.00007	−0.00042	−0.00040***
	(0.00030)	(0.00013)	(0.00081)	(0.00014)
Institutional	−0.00370***	0.00039	−0.00526**	−0.00568***
	(0.00090)	(0.00188)	(0.00211)	(0.00117)
Log # of SF homes	0.08386***	0.11421***	0.22390***	0.02783
	(0.01973)	(0.02702)	(0.03453)	(0.02970)
Wald test	15.51	11.54	9.05	67.93
p-value	[0.017]	[0.073]	[0.171]	[0.000]

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Note: In Column (4), single-family rentals are broken down into four categories depending on owner location and corporate status. See also the note to Table A.1.

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Table A.5

Expand

Results for first-stage diagnostics of 2SLS estimation of Table 3 models.

	Standard *F*-statistic	SW *F*-statistic
	Panel A	
All neighborhoods	202.09	
City	102.93	
Suburbs	120.26	
Low income	75.10	
Middle income	111.17	
High income	42.80	
	Panel B	
All Neighborhoods		
Less expensive	69.24	33.59
More expensive	17.58	22.90
City		
Less expensive	26.96	6.82
More expensive	5.76	4.73
Suburbs		
Less expensive	57.62	25.18
More expensive	12.34	18.38
Low income		
Less expensive	23.51	48.77
More expensive	1.30	2.60
Middle income		
Less expensive	66.02	10.18
More expensive	13.84	10.10
High income		
Less expensive	26.07	6.37
More expensive	12.52	6.19
	Panel C	
All Neighborhoods		
Zip code	166.57	50.08
County	58.67	55.36
State	146.27	68.52
Out of state	44.21	87.56
City		
Zip code	78.09	57.55
County	17.55	27.20
State	74.93	39.14
Out of state	18.01	28.21
Suburbs		
Zip code	136.10	12.91
County	63.03	13.37
State	86.07	14.52
Out of state	30.58	49.55
Low income		
Zip code	105.02	7.74
County	64.69	8.20
State	36.21	7.87
Out of state	30.58	48.56
Middle income		
Zip code	47.49	21.71
County	35.10	27.14
State	69.31	29.14
Out of state	42.68	77.89
High income		
Zip code	51.78	14.69
County	18.69	14.40
State	53.63	16.53
Out of state	11.51	13.26

Note: Reported are the first-stage 2SLS results from estimating Eq. (1): log of the FHFA housing price index (HPI) for the census tract is regressed on the neighborhood shares of single-family rentals and other housing units, along with year and neighborhood fixed effects, neighborhood demographics, non-residential properties and the log of the number of single-family homes. In Panel B, single-family rentals are broken down into less and more expensive. In Panel C, single-family rentals are broken down into four categories defining the home location of the owner. The Standard *F*-statistic is the Kleibergen-Paap (2007) Wald *rk F* statistic that is robust to clustering. The SW *F*-statistic refers to the Sanderson-Windmeijer (2016) conditional *F* statistic, which is used for testing weak identification of each endogenous regressor separately in the case of multiple endogenous variables (Panels B and C). In the case of a single endogenous regressor (Panel A), the SW *F*-statistic is identical to the Standard *F*-statistic and hence omitted from the table.

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Table A.6

Expand

Results for first-stage diagnostics of 2SLS estimation of Table 4 models.

	Standard *F*-statistic	SW *F*-statistic
	Panel A	
Low density	184.08	
Medium density	65.73	
High density	17.94	
	Panel B	
Corporate owned, out of state	14.59	18.44
Non-corporate owned, out of state	56.27	17.74
Corporate owned, in state	3.78	13.37
Non-corporate owned, in state	21.09	71.62

Note: Reported are the first-stage 2SLS results from estimating Eq. (1): log of the FHFA housing price index (HPI) for the census tract is regressed on the neighborhood shares of single-family rentals and other housing units, along with year and neighborhood fixed effects, neighborhood demographics, and non-residential properties. The Standard *F*-statistic is the Kleibergen-Paap (2007) Wald *rk F* statistic that is robust to clustering. The SW *F*-statistic refers to the Sanderson-Windmeijer (2016) conditional *F* statistic, which is used for testing weak identification of each endogenous regressor separately in the case of multiple endogenous variables (Panel B). In the case of a single endogenous regressor (Panel A), the SW *F*-statistic is identical to the Standard *F*-statistic and hence omitted from the table.

References

Baum, C.F., Schaffer, M.E., Stillman, S., 2003. Instrumental variables and GMM: estimation and testing. Stata J. 3 (1), 1–31.

Black, S.E., 1999. Do better schools matter? parental valuation of elementary education. Q. J. Econ. 114 (2), 577–599.

Bogin, A.N., Doerner, W.M., Larson, W.D., 2019. Missing the mark: mortgage valuation accuracy and credit modeling. Financial Anal. J. 75 (1), 32–47.

Burnell, J.D., 1988. Crime and racial composition in contiguous communities as negative externalities. Am. J. Econ. Sociol. 47 (2), 177–193.

Calhoun, C.A. 1996. OFHEO House Price Indexes: HPI Technical Description. Office of Federal Housing Enterprise Oversight, U.S. Department of Housing and Urban Development, Washington, DC.

Cheung, R., Meltzer, R., 2014. Why and where do homeowners form?. Cityscape: J. Policy Dev. Res. 16 (3), 69–92.

Clapp, J.M., Nanda, A., Ross, S.L., 2008. Which school attributes matter? the influence of school district performance and demographic composition on property values. J. Urban Econ. 63 (2), 451–466.

Coulson, N.E., Hwang, S.-. J., Imai, S., 2002. The value of owner occupation in neighborhoods. J. Hous. Res. 13 (2), 153–174.

Coulson, N.E., Li, H., 2013. Measuring the external benefits of homeownership. J. Urban Econ. 77 (September), 57–67.

Coulson, N.E., Wommer, G., 2019. Tenure tipping. Reg. Sci. Urban Econ. 77 (July), 172–181.

Crone, T.M. 2006. Capitalization of the quality of local public schools: what do home buyers value? Working Paper No. 06-15, Federal Reserve Bank of Philadelphia.

Dewan, S. 2013. As renters move in, some homeowners fret. New York Times, August 28. https://www.nytimes.com/2013/08/29/business/economy/as-renters-move-in-and-neighborhoods-change-homeowners-grumble.html.

Espey, M., Owusu-Edusei, K., 2001. Neighborhood parks and residential property values in Greenville, South Carolina. J. Agric. Appl. Econ 33 (3), 487–492.

Fottrell, Q. 2013. America's Least Favorite Neighbors: Renters. MarketWatch, October 30.

Freddie Mac. 2019. Spotlight On Underserved Markets: Single-family Rental | An Evolving Market. https://mf.freddiemac.com/docs/single-family-rental-markets.pdf.

Galster, G.C., 1983. Empirical evidence on cross-tenure differences in home maintenance and conditions. Land Econ. 59 (1), 107–113.

Gibbons, S., 2004. The costs of urban property crime. Econ. J. 114 (November), F441–F463.

Goodstein, R.M., Lee, Y.Y., 2010. Do foreclosures increase crime?. Working Paper No. 2010-05. FDIC Center for Financial Research.

Harding, J., Miceli, T.J., Sirmans, C.F., 2000. Do owners take better care of their housing than renters?. Real Estate Econ. 28 (4), 663–681.

Haurin, D.R., Dietz, R.D., Weinberg, B.A., 2002. The impact of neighborhood homeownership rates: a review of the theoretical and empirical literature. J. Hous. Res. 13 (2), 119–151.

Ihlanfeldt, K., Mayock, T., 2010. Panel data estimates of the effects of different types of crime on housing prices. Reg. Sci. Urban Econ. 40 (2–3), 161–172.

Ihlanfeldt, K., Yang, C.F., 2021. Single-family rentals and neighborhood racial integration. J. Hous. Econ. 53 September.

Joint Center for Housing Studies, 2017. America's Rental Housing 2017. Harvard University, Cambridge, MA.

Kelling, G.L., Wilson, J.Q., 1982. Broken windows: the police and neighborhood safety. Atlantic 249 (3), 29–38.

Kleibergen, F., Paap, R., 2007. Generalized reduced rank tests using the singular value decomposition. J. Econom. 133 (1), 97–126.

Levin-Waldman, O.R., 2013. Income, civic participation and achieving greater democracy. J. Socio. Econ. 43, 83–92 April.

Mills, J., Molloy, R., Zarutskie, R., 2019. Large-scale buy-to-rent investors in the single-family housing market: the emergence of a new asset class. Real Estate Econ. 47 (2), 399–430.

Mundlak, Y., 1978. On the pooling of time series and cross section data. Econometrica 46, 69–85.

Naroff, J.L., Hellman, D., Skinner, D., 1980. Estimates of the impact of crime on property values. Growth Change 11 (4), 24–30.

Rizzo, M.J., 1979. The cost of crime to victims: an empirical analysis. J. Leg. Stud. 8 (1), 177–205.

Sanderson, E., Windmeijer, F., 2016. A weak instrument F-test in linear IV models with multiple endogenous variables. J. Econom. 190 (2), 212–221.

Semykina, A., Wooldridge, J.M., 2010. Estimating panel data models in the presence of endogeneity and selection. J. Econom. 157 (2), 375–380.

Keys, B. and D. Myers. 2019. Whither the McMansion? Why Millennials Aren't Buying. Knowledge@Wharton,April18.https://knowledge.wharton.upenn.edu/article/mcmansions-millennials/.

Schmit, J. 2012. Home Rentals — The New American Dream? USA Today, June 6. https://usatoday30.usatoday.com/money/economy/housing/story/2012-06-05/are-home-rentals-the-new-american-dream/55402648/1.

Shilling, J.D., Sirmans, C.F., Dombrow, J.F., 1991. Measuring depreciation in single-family rental and owner-occupied housing. J. Hous. Econ. 1 (4), 368–383.

Smith, A. 2013. Civic engagement in the digital age. Pew Res. Cent. http://pewinternet.org/Reports/2013/Civic-Engagement.aspx.

Staiger, D., Stock, J.H., 1997. Instrumental variables regression with weak instruments. Econometrica 65 (3), 557–586.

Tita, G.E., Petras, T.L., Greenbaum, R.T., 2006. Crime and residential choice: a neighborhood level analysis of the impact of crime on housing prices. J. Quant. Criminol. 22 (4), 299–317.

Wang, K., Grissom, T.V., Webb, J.R., Spellman, L., 1991. The impact of rental properties on the value of single-family residences. J. Urban Econ. 30 (2), 152–166.

Yoder, S. 2012. Can Too Many Renters Bring Down the Neighborhood? The Fiscal Times, January 24. http://www.thefiscaltimes.com/Articles/2012/01/24/Can-Too-Many-Renters-Bring-Down-the-Neighborhood.

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