

Search for Yield in Housing Markets.* †

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Abstract

We study how investors in housing markets have changed after the 2009 financial crisis and the consequences for the markets and the economy. We document several new facts: (a) Institutional investors have replaced individual investors, but small size investors dominate among these new investors. (b) Most new investors are buy-and-hold investors as they are less likely to sell the properties in the short-term in response to capital gains. (c) Their investment portfolio has a strong local bias and is driven by search for yield. The arrival of buy-and-hold institutional investors has substantially lowered price momentum in housing markets.

Keywords: Investors, Housing Prices, Rental Yield, Homeownership, Residential Investment, Housing, Flipping, Price Momentum.

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1 Introduction

It is by now well-documented that during the housing boom of the 2000s investors in housing markets were typically private households who purchased multiple properties speculating on housing price growth. These pre-crisis investors, also called “speculators”, purchased property investments with a short-term horizon searching for capital gains. That is, these investors bought and then sold as prices increased within one to two years (Bayer, Mangum, and Roberts 2016; Chinco and Mayer 2015; Gao, Sockin, and Xiong 2020; Haughwout, Lee, Tracy and Van Der Klaauw 2011). The investment strategy of these investors generated persistent housing price momentum (DeFusco, Nathanson, and Zwick 2020; Glaeser and Nathanson 2017; Guren 2018; Piazzesi and Schneider 2009).¹

In this paper we show that, post-crisis, the type of dominant investor has dramatically changed. The investors after the crisis are not individuals but incorporated in the form of legal entities. The vast majority of them are relatively small and local. They invest with a longer term horizon in search for yield. The new investors react less to capital gains: they are 12 percent less likely to sell a house within two years, when capital gains increase by one standard deviation from the mean. The new “buy-and-hold” investors have lowered price momentum and the houses’ time on the market. Consistent with these findings that investors post-crisis are searching for yield, Daniel, Garlappi, and Xiao (2018) find that a low-interest-rate monetary policy increases investors’ demand for high-dividend stocks, which is more pronounced among investors who fund consumption using dividend income. As rents are mostly stable, housing becomes an investment asset and a close substitute to safe yield-earning investments (see for example, Eisfeldt and Demers 2018).

Our analysis is based on a large database containing all U.S. deeds.² We show that small investors, that is, those in the bottom 25th percentile in terms of dollar purchases, had the largest growth post-crisis. The very large institutional investors, which have earned critical attention in the media, invest only in specific locations.³

The arrival of buy-and-hold investors to housing markets has a key real effect that we test and confirm in the data. Since these investors react less to past housing price increases, then housing price momentum should slow down. In other words, investors do not chase past capital

¹Housing price momentum refers to the price growth autocorrelation. Persistent, high, positive momentum is often linked to behavioral biases.

²Data provided by Zillow through the Zillow Transaction and Assessment Dataset (ZTRAX). More information on accessing the data can be found at <http://www.zillow.com/ztrax>. The results and opinions are those of the author(s) and do not reflect the position of Zillow Group.

³For example, ninety percent of purchases by the top 20 “Wall Street Landlords” and the public apartment REITs in 2015 are concentrated in 37 MSAs, which is less than 10 percent of all MSAs.

gains and thus avoid momentum purchases. DeFusco, Nathanson, and Zwick (2020) show that the transaction volume leads to price growth, especially during housing bubbles. The arrival of buy-and-hold investors did not increase as much the transaction volume, as it would have if the investors were speculators. This is because buy-and-hold investors hold houses for a longer time period before they resell. Lower transaction volume leads to less acceleration in prices. As a consequence, housing price increases are less serially correlated in the short-term.

This paper expands the established literature that studied investors in the previous housing boom. This literature highlights that investors were individuals searching for capital gains. For example, Garcia (2019) finds that counties with higher share of investor activity experienced higher house flipping rates over 2005-2006, and higher increase in flip rates between 2001 and 2005-2006. Bayer et al. (2016) show that speculation during the boom period was driven by short-horizon investors as a response to past housing price increases. Haughwout et al. (2011) document a large growth in flippers in the early 2000s, and suggest that the relaxation of borrowing constraints from increased housing prices led more optimistic buyers to enter housing markets as short-term speculators. Gao, Sockin, and Xiong (2020) provide evidence linking housing speculation during the previous housing boom to extrapolation by speculators of past housing price changes. Other important papers studying the investors of the 2000s are Chinco and Mayer (2015), DeFusco, Nathanson, and Zwick (2020), Albanesi, DeGiorgi, and Nosal (2017), and Albanesi (2018). Our paper shows that the new investors post-crisis are remarkably different from the speculators of the previous housing boom.

Our second set of results relate to the literature on housing price momentum. This literature shows strong evidence that prices in U.S. areas display significant momentum (Glaeser and Nathanson 2017; Guren 2018). The momentum lasts for up to 2-3 years before prices mean-revert, a time horizon far greater than most other asset markets (Guren 2018). Glaeser and Nathanson (2017) explain momentum based on behavioral biases of speculators in housing markets. Based on this theory, investors underreact to news because of behavioral biases or loss aversion and then “chase returns” because of extrapolative expectations about price appreciation. Investors neglect to account for the fact that previous buyers were learning from prices and instead take past prices as direct measures of demand. Piazzesi and Schneider (2009) show evidence on trading based on the increased belief in rising housing prices, during the housing boom of the 2000s. Our paper shows that the arrival of buy-and-hold investors significantly reduces housing price momentum.

Our paper contributes to the literature studying the implications of the type of ownership of the housing stock. Some early work by Chambers, Garriga, and Schlagenhauf (2009) uses microdata and a structural model to explore the effects of investor purchases in the supply

of rental housing, but in their analysis of the price of houses is determined by the cost of constructing new units. More recently, Landvoigt, Piazzesi, and Schneider (2015) study the different types of buyers during the housing boom of the 2000s in San Diego County, California, but ignores the effects in the rental market. The analysis in this paper integrates both views and evaluates the effects of who owns the housing stock in terms of prices and rents.

Lastly, our paper touches on the recent literature that studies institutional investors in the housing market. So far the literature has focused on documenting the increasing presence of institutional investors in the single-family segment, in specific areas in the U.S. For example, Allen et al. (2017) focusing on the Miami-Dade County in Florida, find that an increase in the share of houses purchased by investors in a census block is related to an increase in house prices. Raymond et al. (2018) find that large institutional owners of single-family rentals file more frequently eviction notices compared to small landlords in Fulton County in Atlanta. Mills, Molloy, and Zarutskie (2019) show that prices increased in neighborhoods where large buy-to-rent investors are concentrated. In a thorough analysis of institutional investors, using deeds data from a different source, and conducting a zip code-level analysis in 20 large U.S. MSAs, Lambie-Hanson, Li and Slonkosky (2019) find that single-family institutional buyers contributed to an increase in price and rent growth, and a decline in homeownership rate change. Their identification is based on the First Look program, a program that gave households and non-profits an opportunity to bid on Fannie Mae and Freddie Mac’s real estate owned properties before they became available to investors.⁴ Gallin and Verbrugge (2019) find that multi-unit landlords, when renegotiating rent contracts, set rent increases that exceed the inflation rate, aided by the law of large numbers and exploiting tenant moving costs.

A more established literature has studied foreign and out-of-town investment in the housing markets. See for example recent papers by Cvijanovic and Spaenjers (2020), Davids and Georg (2020), and Favilukis and Van Nieuwerburgh (2018).

The rest of the paper is organized as follows: Section 2 describes the data. Section 3 shows the distributional results. Section 4 analyses the investment strategies pre- and post-crisis. Section 5 presents the implications of searching-for-yield investments in housing. Section 6 concludes. The online appendix has extra information about the variables and results.

⁴The findings are also included in a nontechnical report (Lambie-Hanson, Li, and Slonkosky 2018).

2 Data

The source of our data on investors in the U.S. housing market is the Zillow (2017) Transaction and Assessment Dataset (ZTRAX). This database contains all property ownership transfers in the U.S., as recorded by the counties' deeds. Our final sample contains all ownership transfers of residential properties, including multi-family and single-family, from January 1st, 2000 to December 31st, 2017. These are 85 million transactions nationally.

We use a rigorous methodology to identify investors. First we distinguish between individual and non individual buyers based on the buyer name. Second, we filter-out buyers that are relocation companies, non profit organizations, construction companies and national and regional authorities, as well as banks, Ginnie Mae, Fannie Mae, Freddie Mac and other mortgage loan companies and credit unions, and the state taking ownership of foreclosed properties.

The housing variables come from Zillow. Housing prices come from the Zillow Home Value Index for all homes, single-family homes, top tier homes and bottom tier homes at the County and MSA levels. Top tier homes are homes in the top third, and bottom tier homes are homes in the bottom third of the home value distribution within an MSA. The Zillow Home Value Index is a dollar-denominated, smoothed, seasonally adjusted measure of the median estimated home value across a given region and housing type. It is constructed using estimated monthly sale prices not just for the homes that sold, but for all homes even if they didn't sell in that time period, which addresses the bias created by the changing group of properties that sell in different periods of time. Housing rents come from the Zillow Rent Index for all homes, which is constructed using a similar methodology to the Zillow Home Value Index.

We finally collect county-year and MSA-year level controls, which are population from the U.S. Census Bureau, unemployment rate from the U.S. Bureau of Labor Statistics, per capita income from the Bureau of Economic Analysis, and median household income from Zillow. More detailed description of the data sources is included in the online Appendix A.

Our first dataset contains transaction-level data, where the buyer is either an institutional or an individual investor. This dataset contains all investors' purchases in 2003, 2004, 2013 and 2014, the duration until the next sale of the property and the capital gains and rental yields at the time of sale, based on monthly median prices and quarterly median rents in the county of the property. In total, this dataset consists of 2,068,562 observations. Table 1, Panel A contains summary statistics of the key variables in our property-level analysis.

Our second dataset contains the market share of investors' purchases at the MSA-level, over the years 2009 to 2017. It also contains the average housing variables, control variables

beginning in 2000, and tax-returns for the year 2007. In total this dataset consists of 332 MSAs. Table 1, Panel B contains summary statistics of the key variables in our MSA-level analysis.

3 Distributional Results

In this section we define investors in the housing market and present remarkable changes in the distribution of investors, from pre- to post-crisis. Using very detailed micro-data at the home purchase level, as described in the previous section, we use economic theory to break down investors in different categories.

First, we distinguish in our data among institutional investors and individual investors. We define *institutional* investors as legal entities who purchase homes, that is, they use the name of an LLC, LP, Trust, REIT, etc. in the purchase deed. We define *individual* investors the buyers who are individuals or households who purchase two or more properties within the same MSA over a two-year period. Individuals who purchase multiple homes are likely to purchase them as an investment, and not for them to live in. Our restriction in the classification of individual investors that they have to purchase within the same MSA, excludes individuals who purchase their main residence and a holiday home in a different MSA. The remaining purchases in our deeds are the homeowners, after excluding purchases by intermediaries.

To calculate the market share of investors we use the dollar value of purchases by investors instead of the number of purchases since the number of purchases would underestimate presence in the apartments market. For example the number of purchases would equate a purchase of one condominium to the purchase of one apartment building of 100 apartments. The dollar value of purchases reflects more accurately the presence of individuals and institutional investors in the single-family and multi-family markets. Our variable of investors' presence is the share of the dollar value of purchases by investors over the dollar value of all purchases, that is, by investors and households. The total local market value accounts for economic shocks in each location that affect residential purchases.

The top panel of Figure 1 shows that the U.S. housing market experienced a surge in the market share of purchases by total investors in the years following the 2008 financial crisis. It shows the previous boom in investors' share of purchases and housing prices in the early 2000s, and the collapse of both investors and prices after 2005-2006. From 2010 investors' presence in the housing market experiences a steep growth, while the housing prices begin to recover after 2012. The bottom panel of Figure 1 shows a novel fact: institutional investors replace and surpass the individual investors who experienced a boom in the years leading to the crisis.

The largest share of purchases after the financial crisis is attributed to institutions.

Second, within the institutional investors, we examine the investors' size, an important parameter related to their real effects. We calculate the *size* of institutional investors to be the real dollar value of their purchases in each year. The top panel of Figure 2 plots the change in the distribution of the institutional investors' size in 2006 and 2015, to capture the pre- and post-crisis periods.⁵ This figure shows that mainly the small investors below the 35th percentile of the size distribution, and, to a lesser extent, the very large investors, above the 95th percentile, had the largest growth in their purchases, from 2006 to 2015. The bottom panel of Figure 2 shows that the increase in the small investors happened in the extensive margin as well. The number of investors, and not only the aggregate dollar value of their purchases, increased the most in the same period.⁶

The investors in the top one percent put remarkably large amounts of money into the housing market with their purchases. The top one percent consists of the so-called "Wall Street landlords", private-equity backed investors, such as Blackstone's Invitation Homes and American Homes 4 Rent. The top one percent also includes the Apartment REITs such as Equity Residential and AvalonBay Communities that are part of the newly formed Real Estate Sector of the S&P 500 index. Although the top one percent holds significant value of the housing market, their purchases are geographically concentrated. For example, ninety percent of purchases by the top Wall Street Landlords and the public apartment REITs in 2015 is concentrated in 37 MSAs, which is less than 10 percent of all MSAs. In contrast, small investors hold market share in almost all MSAs and they are likely to influence the local housing markets.

Third, we investigate deeper who are the institutional investors, by classifying them into local, out-of-town domestic and foreign. We define *local* investors as the ones who have their mailing address in the same MSA as the property they purchase. *Out-of-town domestic* investors are the ones who have their mailing address in the U.S., but outside the MSA of the property they purchase. *Foreign* investors are the ones who have a mailing address outside the U.S. Figure 4 plots the market share of institutional investors' dollar purchases split into the above categories. About 55% of the institutional investors' purchases after 2009 is attributed to local investors. Local investors are more likely to be small investors, for example mom-and-pop investors that purchase homes in the MSA where they also live - and have their mailing address. In the contrary, out-of-town domestic investors include the large REITs, having their headquarters and mailing address for example in New York, and purchasing single-family properties in Tampa. Out-of-town domestic investors account for about 35% of the institutional

⁵The purchase prices are converted to 2006 real dollars using the monthly CPI index.

⁶Figure A1 uses the buyer's mailing address as a unique identifier, instead of the buyer's name.

investors’ purchases after 2009. The market share of foreign institutional investors seems to be negligible. Our data might not capture the full extent of foreign investment, as foreign legal entities might use a U.S. mailing address, in which case they would be classified as domestic investors. Moreover, foreign individuals would be classified as homeowners if they only make one purchase within two years. To reconcile the share of foreign buyers with the 6.7% share that Favilukis and Van Nieuwerburgh (2018) report over April 2015 to March 2016 in the U.S., and 10% the year after, we would need to add up the above different categories in our classification. Nevertheless, our data point to evidence that foreign investors are very unlikely to drive our results. Moreover, we perform separate analyses using only the market share of local institutional investors.

Figure A2 plots the market share of individual investors’ dollar purchases split by the investors’ origin. About 70% of individual investors are local, and there is minimal variation to this percentage over the years. Figure A3 plots the market share of investors’ purchases split by the investors’ origin, out of the total market.

Lastly, Figure A4 illustrates that institutional investors have increased in most MSAs, with large cross-sectional variations in their market share.

4 Search for Yield

The striking findings of the change in composition of investors, bring up the following questions: How are the investors post-crisis different from the investors pre-crisis? How does their investment strategy differ? Are they driven by search for capital gains or by search for yields? Are the institutional investors contributing to creating a housing bubble in the same way the individual investors contributed to the previous bubble? In this section we aim to answer these questions.

The pre-crisis “speculators” primarily have been reselling houses in a short period, without living in or renting them. Their motivation for the investment is capital gains (Haughwout et al. 2011). In contrast, a buy-and-hold strategy would be less reactive to capital gains, and would hold properties longer in search for rental yields.

To study the investment strategy of the pre-crisis investors, we focus on all the housing purchases by investors in the U.S. from the beginning of 2003 until the end of 2004, which we track until their next sale. Importantly, we track which of the houses purchased were sold within two years of their purchase, that is before the end of 2006. This way we cover most of

the housing boom period of the early 2000s. To study the investment strategy of the post-crisis investors, we focus on all the housing purchases by investors in the U.S. from the beginning of 2013 until the end of 2014, which we track until the end of our dataset on December 2017. Equivalently to the pre-crisis period, we are interested whether these houses were sold within two years of purchase, that is, up to the end of 2016, covering most of the post-crisis housing boom. As we showed earlier, the periods 2003-2004 and 2013-2014 experienced high growth in purchases by investors, although different types of investors.⁷

Our analysis consists of two steps. First, we estimate the sale price of all properties using hedonic regression, and the implied capital gains from a short-term sale. Second, we estimate how the capital gains are related to the probability of a short-term sale.

4.1 Hedonic estimation

In the first step, we use the following specification to estimate the housing prices at the time of purchase and at the time of sale:

$$\log P_j = \beta_0 + \beta_1 Size_j + \beta_2 Age_j + \beta_3 Renov_j + \sum_z \beta_z Zip_z + u_j, \quad (1)$$

where j indexes the property. P_j is the price of property j . $Size_j$ is the size of the property, measured in log square feet. Age_j is the number of years from the time the property was built, and $Renov_j$ is the number of years since the last renovation. Zip_z are dummy variables that take the value of one if the property is located in zipcode z .

We estimate (1) for the properties in our sample that were sold within two years of their purchase, for which we have the purchase and the sale price. We estimate (1) separately for each year of purchase 2003, 2004, 2013 and 2014. Table 2 contains the results of the hedonic regressions.

We obtain sale price for all properties - not only the once sold within two years - as the linear projection of the estimated coefficients. Similarly we obtain the purchase price for all properties purchased by investors from the hedonic estimations. We then calculate the short-term capital gains as the percentage increase from the estimated purchase price to the estimated sales price. That is, $G_j = (P_j^{sell} - P_j^{purchase}) / P_j^{purchase}$, where P_j^{sell} is the sales price and $P_j^{purchase}$ is the

⁷We do lots of sensitivity tests and find that the results are robust to the selection of pre- and post-crisis boom years. Pre-crisis we are restricted to study housing purchases after the recession of 2001, and up to 2004, so we can track the sales up to the end of the housing boom in 2006. Post-crisis we are restricted to study housing purchases from the beginning of the housing boom in 2012, and up to 2015, so we can track the sales up to the end of our dataset in 2017.

purchase price of the property.

4.2 Buy-and-hold

In the second step, our analysis asks whether the investors post-crisis are more likely or less likely compared to the pre-crisis investors to hold the property longer, based on their potential capital gains. To study the probability of selling short-term, we estimate the following logit model:

$$l(Sell)_{i,j} = \beta_0 + \beta_1 I_i + \beta_2 G_j + \beta_3 I_i G_j + C_c + u_{i,j}, \quad (2)$$

where i indexes the investor (buyer name) and j the property. $l(Sell)_{i,j} = \log(\frac{\pi_{i,j}}{1-\pi_{i,j}})$, where $\pi_{i,j}$ is the probability of the property j that was bought by investor i to be sold within 2 years. I_i is a binary variable that takes the value of one for investors post-crisis (who bought in 2013 or 2014) and the value of zero for investors pre-crisis (who bought in 2003 or 2004). G_j is the capital gains that would be realized if the property was sold within 2 years, estimated in the previous step. While the capital gains were calculated separately for each year, to allow for different economic conditions, we also include additional controls for housing demand. The controls C_c include the growth in population, growth in per capita income, and change in unemployment rate for each county, for the year of the property purchase and the following year.

We estimate the logit model (2) for the sample of all purchases by investors in the pre-crisis years 2003-2004, and the post-crisis years 2013-2014. The estimation allows for robust standard errors.

Next, we study the investment strategy of different types of investors post-crisis. To achieve this we add in (2) interactions of the capital gains with dummies for different types of investors, as follows:

$$l(Sell)_{i,j} = \beta_0 + \beta_1 G_j + \beta_2 D_i + \beta_3 G_j D_i + C_c + u_{i,j}, \quad (3)$$

where D_i is a dummy for the largest institutional investors, or a dummy for out-of-town and another dummy for foreign investors. We estimate the logit model (3) for the sample of purchases by investors in the post-crisis years 2013-2014.

Table 3 shows the results of the estimation of (2). The coefficient β_3 is -0.23 percent, and significant at the 1% level. This means that in the presence capital gains the post-crisis investors are less likely to sell the property in the short-term compared to pre-crisis investors. Keeping all other things constant, investors post-crisis flip their properties with 12.2% less probability

based on one standard deviation increase in capital gains from the mean, compared to investors pre-crisis.⁸

Figure 5 interprets the results of the interaction of pre- and post-crisis investors with the capital gains. Figure 6 illustrates the previous results specifically for institutional and individual investors. Table A1 shows that the results are robust if we use the time to sell as 1 year or 18 months.

Table 4 shows that the top investors, which are the 20 largest institutions in the market of single-family rentals, were significantly less likely to sell the properties in the short-term, while they were more sensitive to capital gains, compared to the rest of the investors. Figure 7 interprets the estimated coefficients.

Compared to the local investors, out-of-town buyers did not differ significantly in their short-term selling behavior. Foreign investors were significantly less likely than the locals to sell the properties within two years, but their sensitivity to capital gains was not significantly different.

5 Implications for Momentum

Housing price momentum means the positive time series autocorrelation of log price changes. The literature shows considerable evidence that prices in U.S. areas display significant momentum (Glaeser and Nathanson 2017; Guren 2018; Ben-David 2011). The momentum lasts for up to 2-3 years before prices mean-revert, a time horizon far greater than most other asset markets (Guren 2018).

Glaeser and Nathanson (2017) provide a theory to explain momentum based on behavioral biases of investors in the housing market. Based on this theory, investors underreact to news because of behavioral biases or loss aversion and then “chase returns” because of extrapolative expectations about price appreciation. Investors neglect to account for the fact that previous buyers were learning from prices and instead take past prices as direct measures of demand. Piazzesi and Schneider (2009) show evidence on trading based on the increased belief in rising housing prices, during the housing boom of the 2000s.

We estimate the relationship between the market share of purchases by institutional investors

⁸To interpret the coefficients of the logistic regression, we calculate the probability $\pi = \frac{\exp(\sum \beta_i x_i)}{1 + \exp(\sum \beta_i x_i)}$. An increase in capital gains from the mean 32.86% to the mean plus one standard deviation (95.59%, from Table 1, Panel A) decreases the sale probability from 48.0% to 42.1%, which is a percentage decrease of 12.2%.

and the price momentum during the recovery period 2009-2017. For comparison, we also estimate the relationship between the market share of purchases by individual investors and the price momentum during the previous housing boom of 2000-2005. Our specification is as follows:

$$M_{m,09-17} = \beta_0 + \beta_1 Inst_{m,09-17} + \gamma C_{m,07} + \alpha_s + u_m \quad (4)$$

Similarly, the specification for the study of the previous housing boom is:

$$M_{m,00-05} = \beta'_0 + \beta'_1 Ind_{m,00-05} + \gamma' C_{m,98} + \alpha_s + u_m \quad (5)$$

We define the annual change in log housing price as $\Delta P_{m,t} = P_{m,t} - P_{m,t-4}$, where $P_{m,t}$ is the log real housing price in MSA m in quarter t . The autocorrelations $Cor(\Delta P_{m,t}, \Delta P_{m,t+k})$ summarize the serial correlation of log price changes over time and have been the focus in the literature on the predictability of house prices, starting with Case and Shiller (1989) and appearing in the most recent literature of momentum (e.g. Glaeser and Nathanson 2017; Glaeser et al. 2014; Guren 2018; Head et al. 2014). We measure one-year price momentum in MSA m for the years 2009-2017 as the 4-quarter lag serial autocorrelation of price changes $M_{m,09-17} = Cor(\Delta P_{m,t}, \Delta P_{m,t+4})$, where t ranges from first quarter of 2009 to fourth quarter of 2016 in (4), and first quarter 2000 to fourth quarter 2004 in (5). Having a smaller time period pre-crisis to measure the momentum, gives a smaller average momentum than post-crisis.⁹ Our focus however is in the direction of the correlation between share of investors and momentum.

$Inst_{m,09-17}$ is the average share of institutional investors' purchases over the total market value of housing purchases in MSA m in the years 2009-2017. We also show the results for the share of local institutional investors' purchases over the total market. $Ind_{m,00-05}$ is the average share of individual investors' purchases over the total market value of housing purchases in MSA m in the years 2000-2005. C_m summarizes the MSA-specific controls, which are the log population, log income and log price in 2007 in (4), and 1999 in (5). The specifications control for state dummies α_s .

The results of the estimation of (4) and (5) are in Table 5. Individual investors increase price momentum in line with the theory of behavioral biases and search for capital gains. Interestingly institutional investors have the opposite effect on momentum in the post-crisis period. One percentage point increase in the average market share of institutional investors'

⁹Our calculation of momentum for the years 1980-2011 gives an average of 0.61, for the largest 115 MSAs that have price data in Zillow since 1980. This is very close to the average momentum Glaeser and Nathanson (2017) report, using the same time frame and number of MSAs, and data from the Federal Housing Finance Agency house price indices.

purchases is related to 0.006 lower one-year price autocorrelation. For the local institutional investors, the results are stronger. One percentage point increase in the average share of local institutional investors' purchases is related to 0.011 lower one-year price autocorrelation. This negative relationship between institutional investors and price momentum points to the direction of our previous findings that the new institutional investors are less reactive to capital gains than the traditional individual investors.

6 Conclusions

There has been a great amount of research on the characteristics of housing investors during the previous housing boom. A consensus in the literature is that the housing investors in the previous boom were speculators, they naively extrapolated expected price growth based on previous-period price growth, and increased housing price momentum.

This paper undertakes a thorough data exercise to classify all house buyers in the U.S. MSAs, for the period 2000 to 2017, into three mutually exclusive categories: institutional investors, individual investors or homeowners. It further classifies the properties purchased by institutional investors into three mutually exclusive categories: houses purchased by local investors, by out-of-town investors or by foreign investors. Focusing on institutional investors, it divides them into percentile segments based on their size (dollar value of total purchases), and singles out the large private equity firms that entered the buy-to-rent market and publicly traded apartment REITs. This is one of the first studies to provide detailed stylized facts about the housing market investors in the U.S. and compare the investors before and after the financial crisis.

By implementing hedonic regressions and estimating logit models, this paper shows evidence that the new investors post-financial crisis are less reactive to capital gains, and hold the houses longer to extract rental yields. Their longer investment horizon is related to lower housing price momentum. These investment patterns are in line with a buy-and-hold strategy. The results are also consistent with the recent literature in housing economics that shows differential patterns in the housing markets between the previous housing boom and the period post-crisis in many advanced economies. Moreover, this study finds that small local investors increased their presence the most and drove most of these effects. However, the investors who held the houses the longest post-crisis were the large institutions that specifically entered the single-family rental market to extract rental yields.

Important avenues for future research are to understand the drivers and motivations of

the small local institutional investors. Monetary policy may have played a key role through a portfolio rebalance channel. That is, the findings are consistent with the hypothesis that lower returns on risk-free assets due to the implementation of large asset purchases during the crisis, may have pushed investors to rebalance their portfolio by increasing exposure to alternative assets such as real estate. More research is required to show this channel.

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Figures

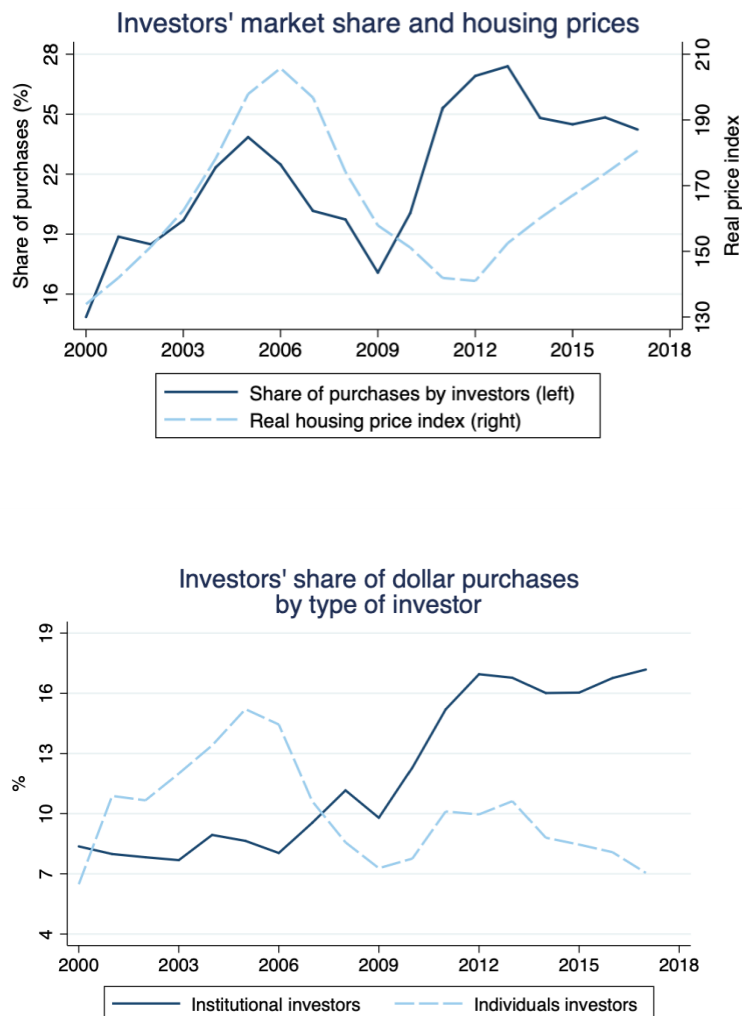


Figure 1. Presence of investors in the U.S. housing market. The top figure plots the average market share of investors' dollar purchases (left y-axis) and the national index of real housing prices (right y-axis). The investors' data are annual MSA averages, for 411 U.S. MSAs and MSA divisions, between 2000 and 2017. Investors refer to both institutional investors and individuals. Institutional investors are classified by their legal entity name. Individual investors are those individuals who purchase more than one house within two years in the same MSA. The bottom figure plots the average market share of the investors' purchases, by type of investor. The investors' share is weighted by the MSA market size. Appendix A describes the data.

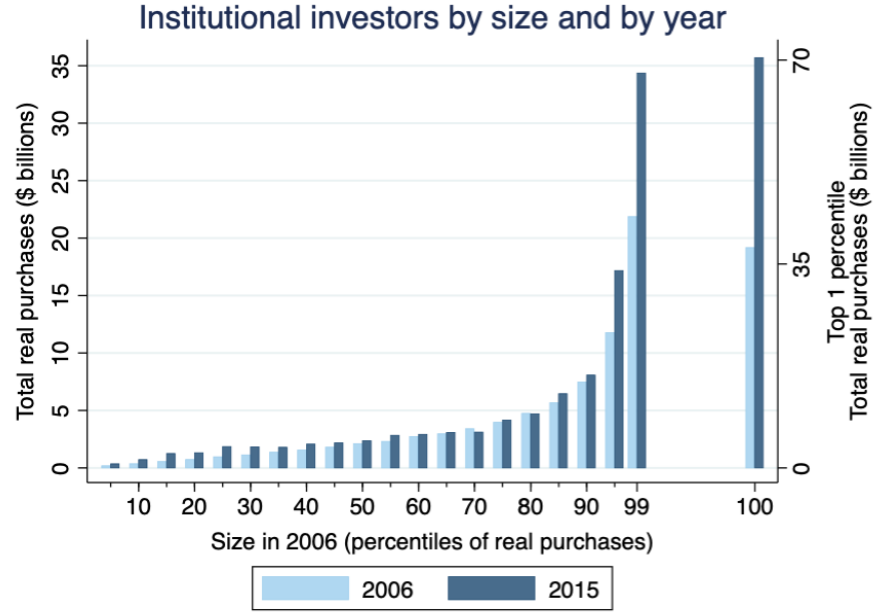


Figure 2. Size distribution of institutional investors. The figure plots the dollar purchases by institutional investors from 2006 to 2015 in each percentile segment of purchase value. The percentile cutoffs are the dollar values of the cutoffs in 2006. All dollar values are in 2006 dollars.

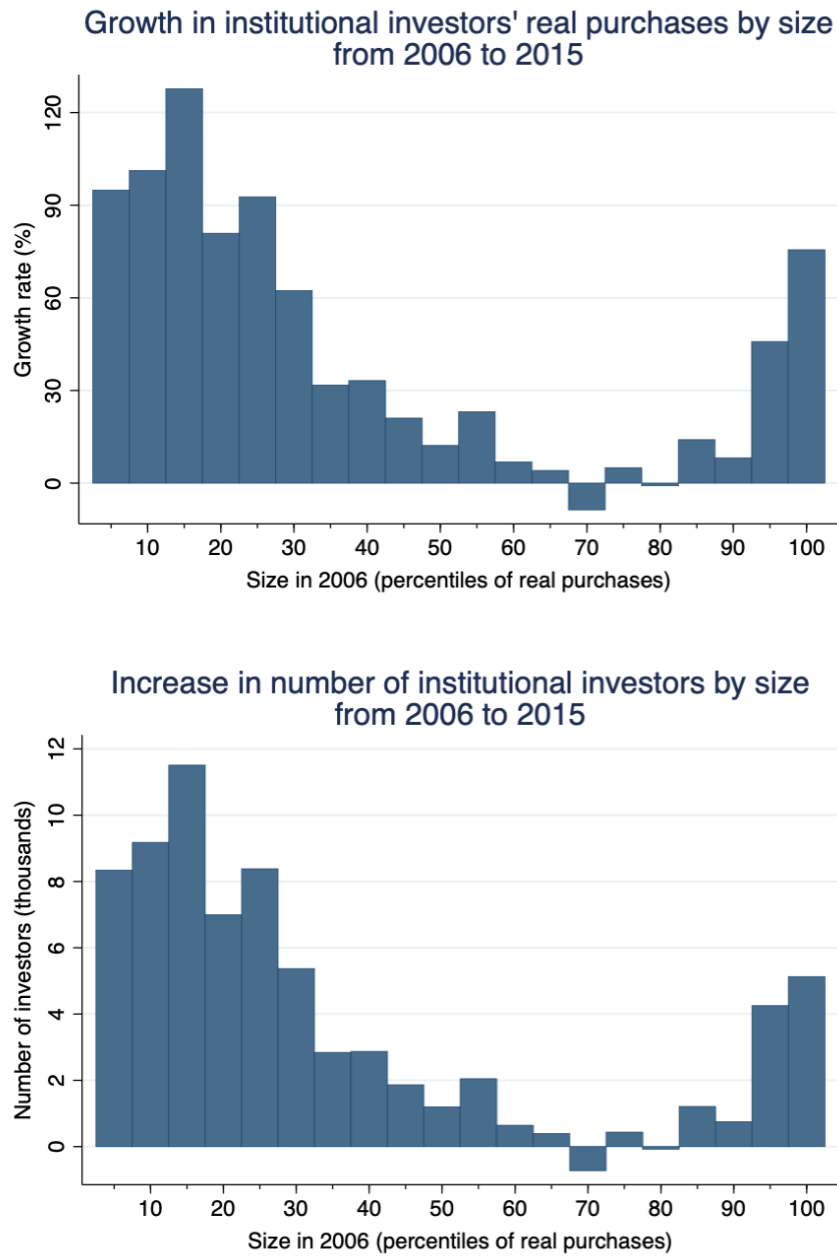


Figure 3. Growth of institutional investors by size. The top figure plots the growth in dollar purchases by institutional investors from 2006 to 2015 in each percentile segment of purchase value. The percentile cutoffs are the dollar values of the cutoffs in 2006. All dollar values are in 2006 dollars. The bottom figure shows the change in the number of investors (extensive margin) over the same period.

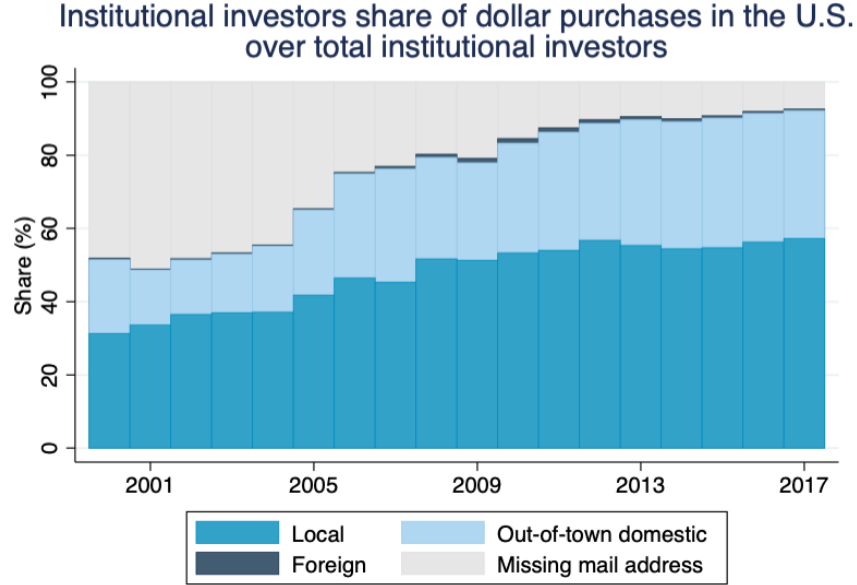


Figure 4. Local and out-of-town investors. The figure plots the market share of institutional investors’ dollar purchases split into local, out-of-town domestic and foreign investors. We define local investors as the ones who have their mailing address in the same MSA as the property they purchase. Out-of-town domestic investors are the ones who have their mailing address in the U.S., but outside the MSA of the property they purchase. Foreign investors are the ones who have a mailing address outside the U.S. The investors’ data are annual MSA averages, for 411 U.S. MSAs and MSA divisions, between 2000 and 2017.

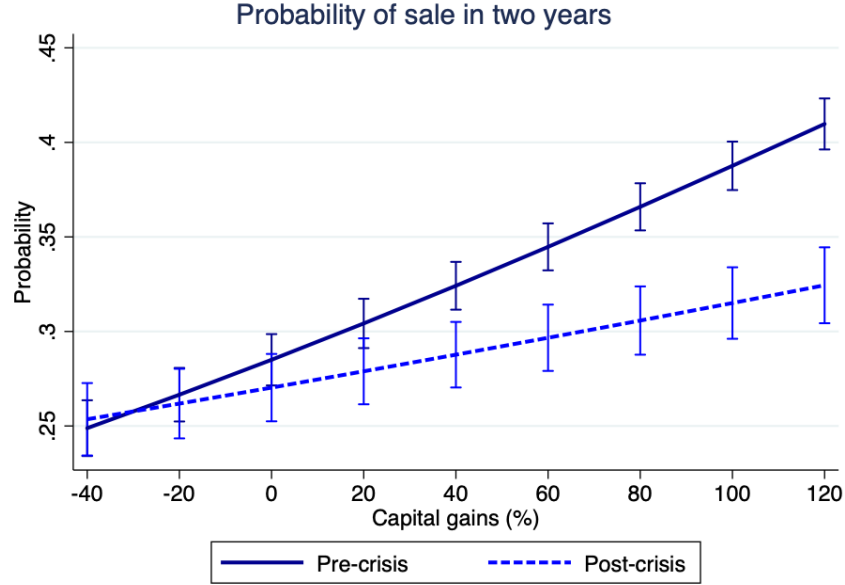


Figure 5. Probability of sale in two years pre- and post-crisis. The figure plots the estimated probability of short-term sale (sale within two years from the month of purchase) for the properties purchased by investors pre-crisis during 2003 and 2004, and post-crisis during 2013 and 2014. The vertical lines show the 90% confidence intervals. The probabilities are derived from the estimation of the logit model (2) described in section 4.2, and shown in Table 3.

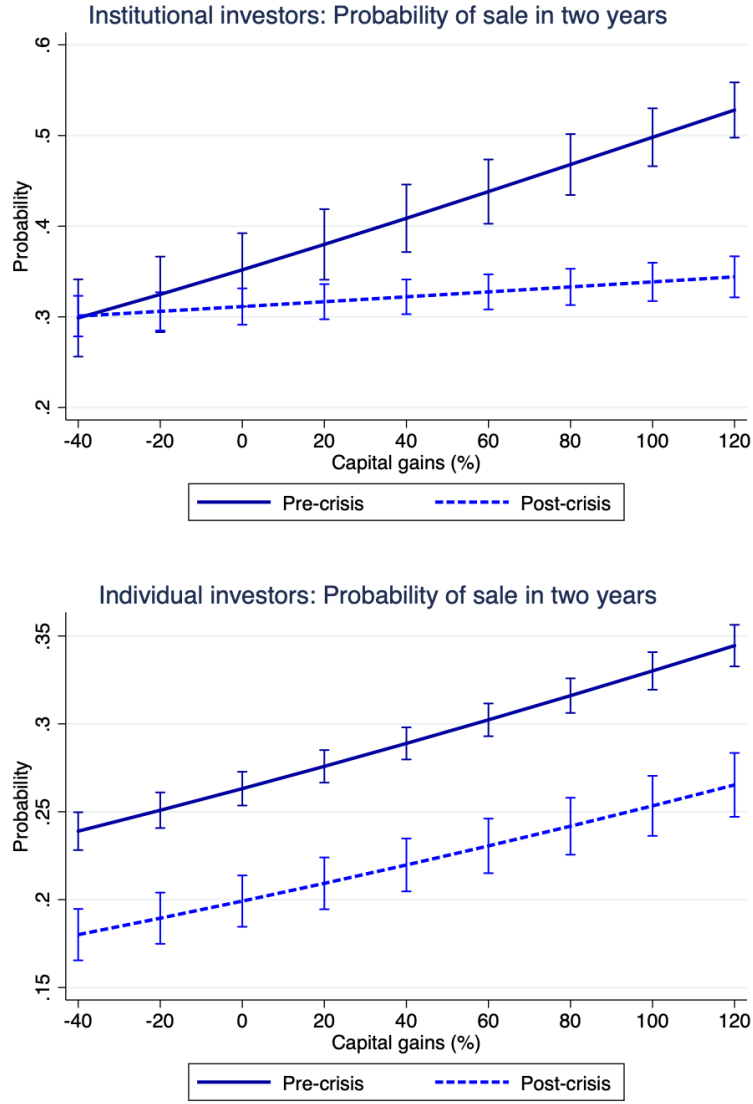


Figure 6. Probability of sale in two years pre- and post-crisis by type of investor. The top figure plots the estimated probability of short-term sale (sale within two years from the month of purchase) by institutional investors for the properties purchased by investors pre- and post-crisis. The bottom figure plots the same estimated probabilities for individual investors. The vertical lines show the 90% confidence intervals. The probabilities are derived from the estimation of the logit model (2) described in section 4.2.

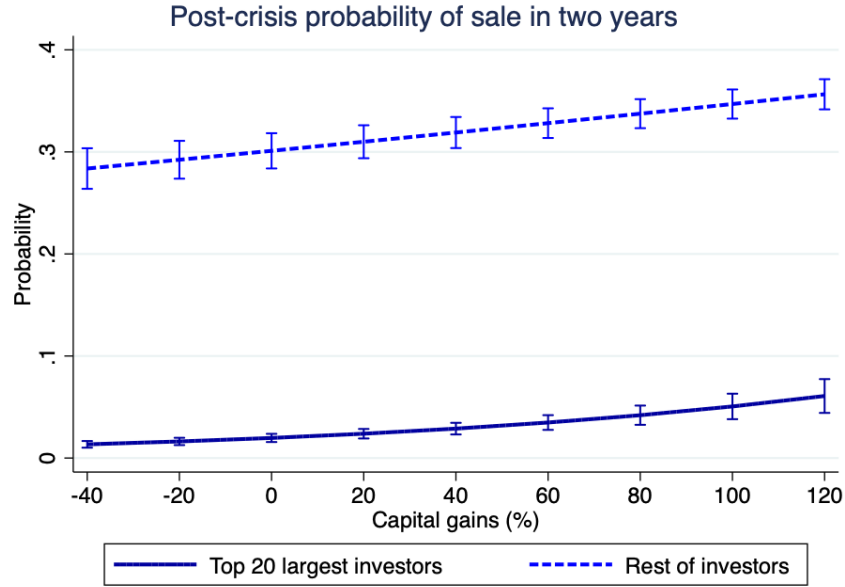


Figure 7. Probability of sale in two years post-crisis by investor size. The figure plots the estimated probability of short-term sale (sale within two years from the month of purchase) for the properties purchased by investors post-crisis, for the largest institutional investors in the single-family rental market, and the rest of the investors. The vertical lines show the 90% confidence intervals. The probabilities are derived from the estimation of the logit model (3) described in section 4.2, and shown in Table 4.

Tables

Table 1. Summary statistics
Panel A - Property and County level

	Pre-crisis				Post-crisis			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Sale in two years	0.30	0.46	0	1	0.30	0.46	0	1
Capital gain (%)	15.25	79.21	-170	253	32.86	95.59	-236	262
Avg. population growth (%)	1.74	1.92	-1.65	11.25	1.13	0.95	-7.13	12.17
Avg. income growth (%)	5.53	2.16	-2.89	20.11	4.16	1.59	-15.12	10.76
Avg. unempl. rate change (pp)	-0.43	0.35	-1.7	0.95	-0.94	0.41	-2.35	1.55
Observations	1,115,296				953,266			

Panel B - MSA level

	Obs	Mean	SD	Min	Max
Institutional investors' market share (%)	332	12.45	7.79	3.10	41.26
Local institutional investors' market share (%)	332	6.48	6.05	0.00	37.03
Individual investors' market share (%)	332	5.83	3.20	0.66	27.82
Local individual investors' market share (%)	332	4.31	2.87	0.00	23.56
Individual investors' market share ₀₀₋₀₆ (%)	332	7.94	5.61	0.00	56.96
Momentum	332	0.48	0.30	-0.70	0.93
Momentum ₀₀₋₀₅	332	0.12	0.48	-0.92	0.91

Panel A presents summary statistics of the key variables at the property purchase level. The sample consists of all residential property purchases by institutional and individual investors in 2003-2004, and 2013-2014, which we track until their next sale. Capital gains are calculated based on hedonic regression. Population growth, per capita income growth and unemployment rate change are at the county level. Panel B presents summary statistics for the sample of all MSAs with complete data. The variables are average annual values from 2009 to 2017, unless denoted otherwise. Detailed description of the variables and data sources is in Appendix A.

Table 2. Hedonic regression

Year	2003	2004	2013	2014
	Log Price			
Size	0.130*** (0.002)	0.129*** (0.002)	0.129*** (0.002)	0.130*** (0.002)
Age	-0.225*** (0.017)	-0.236*** (0.014)	-0.203*** (0.016)	-0.202*** (0.016)
Last renovation	-0.407*** (0.018)	-0.396*** (0.015)	-0.494*** (0.016)	-0.514*** (0.017)
Zipcode dummies	Yes	Yes	Yes	Yes
R-squared	0.617	0.630	0.700	0.703
Observations	135,940	181,639	135,348	125,017

Standard errors are in parentheses. The years indicate the year of the purchase of the property. Size is the size of the property, measured in log square feet, age is the number of years from the time the property was built, and last renovation is the number of years since the last renovation. The coefficients and standard errors for age and last renovation are multiplied by 100. Each observation is a property. ***sig. at 1%.

Table 3. Probability of short-term sale and investors

	Short-term sale (sale in two years from purchase)		
Capital gain	0.297*** (0.029)	0.428*** (0.031)	0.466*** (0.028)
Capital gain $\times$ Post-crisis		-0.232*** (0.038)	-0.248*** (0.046)
Post-crisis		0.018 (0.061)	-0.074 (0.052)
County-level controls	No	No	Yes
Observations	2,068,562	2,068,562	2,041,615
Number of counties	924	924	895

Robust standard errors are in parentheses. The coefficients and standard errors of capital gains and the interaction are multiplied by 100. The county controls are the average growth in population, growth in per capita income, and change in unemployment rate for two years from the property purchase. Table A1 tests the robustness of the results to different durations. ***sig. at 1%.

Table 4. Post-crisis: Probability of short-term sale and investors

	Short-term sale (sale in two years from purchase)	
Capital gain	0.210*** (0.034)	0.208*** (0.028)
Capital gain $\times$ Top investors	0.765*** (0.130)	
Top investors	-3.069*** (0.133)	
Capital gain $\times$ Out-of-town buyer		-0.108* (0.060)
Out-of-town buyer		-0.041 (0.088)
Capital gain $\times$ Foreign buyer		0.098 (0.080)
Foreign buyer		-1.200*** (0.089)
County-level controls	Yes	Yes
Observations	946,797	858,567
Number of counties	892	823

Robust standard errors are in parentheses. The coefficients and standard errors of capital gains and the interaction are multiplied by 100. The county controls are the average growth in population, growth in per capita income, and change in unemployment rate for two years from the property purchase. Table A1 tests the robustness of the results to different durations. ***sig. at 1%.

Table 5. Housing price momentum and investors' share

Years	2000-2005	2009-2017
	Price momentum	
Investors' share _{$m,00-05$}	0.011** (0.005)	
Investors' share _{$m,09-17$}		-0.006** (0.003)
Observations	321	320

Standard errors are in parentheses. Momentum is the one-year serial autocorrelation of annual log real price changes, calculated from quarterly prices. Controls are the log population, log income and log real price in 2007 in the first and second columns, and 1999 in the third column. All models include state dummies. Each observation is an MSA. ***significant at the 1% level; **significant at the 5% level.

ONLINE APPENDIX (Not for Publication)

A Detailed Description of Database

In this section we describe our data sources, how we cleaned the data, and the key variables used in our analysis.

Investors’ purchases

The investors’ data come from the Zillow Transaction and Assessment Dataset (ZTRAX), a large new raw database of U.S. deeds data. The transactions database of ZTRAX contains all property ownership transfers that are documented in the County deeds. Each record contains the date of the transfer, the address of the property, the type of the property, the sale price, and the names of the buyer and seller. We keep transactions between January 1st, 2000 and December 31st, 2017. We restrict the data to ownership transfers, dropping observations that refer exclusively to mortgages or foreclosures.¹⁰ We drop transactions with deed type “Life Estate”, since this is not an immediate transfer of ownership. We also drop transactions that had “Cancellation” in the deed type. We restrict the data to residential property transfers based on the ZTRAX property land use standard codes, which include both single-family and multi-family properties. Table A2 contains the classification of the property land use standard codes in single-family and multi-family from ZTRAX. This amounts to 139 million transactions nationally. We then drop transactions with purchase price missing or smaller than \$10,000, a common practice with deeds data (Bernstein, Gustafson and Lewis 2019; Stroebe1 2016). This leaves 85 million transactions.

With the previous cleaning criterion, most of the transactions are dropped in the non-disclosure states. These states or counties do not require that the sale price is submitted to the county office. Specifically, all transactions are dropped in five non-disclosure states: Mississippi, Missouri, Montana, Utah and Wyoming. We keep in our data seven non-disclosure states, with a total of 28 MSAs, in which some of the transactions record sales price.¹¹ Additional results,

¹⁰The mortgage and foreclosure deeds have a separate corresponding deed for the ownership transfer.

¹¹The final dataset contains the following MSAs in non-disclosure states: Anchorage, Alaska; Boise City, Idaho; Alexandria, Baton Rouge, Hammond, Houma-Thibodaux, Lafayette, Lake Charles, Monroe, New Orleans-Metairie and Shreveport-Bossier City, Louisiana; Kansas City and Wichita, Kansas; Albuquerque, New Mexico; Bismarck and Fargo, North Dakota; Amarillo, Austin-Round Rock, Brownsville-Harlingen, Corpus Christi, Dallas-Plano-Irving, El Paso, Fort Worth-Arlington, Houston-The Woodlands-Sugar Land, Killeen-Temple, Lubbock, McAllen-Edinburg-Mission and San Antonio-New Braunfels, Texas.

not reported here, contain our cross-sectional analysis, dropping completely all non-disclosure MSAs. The results hold with the same significance and even stronger results for the relevance tests for our instrumental variable.

To identify *institutional investors*, we first use the ZTRAX classification of buyer names into individual and non-individual names. The non-individual names frequently end with the words “LLC”, “LP”, “INC”, “TRUST”, “CORPORATION”, “PARTNERS”, but they also contain entity names without the description in the end of the name.¹² Thorough inspection of the data confirms that the classification by ZTRAX of individual and non-individual names is as expected, with very minimal (human) errors. Our institutional investors’ identifier contains the deeds where the buyer has a non-individual name. From these names we filter out names of relocation companies, non profit organizations, construction companies, national and regional authorities, banks, Ginnie Mae, Fannie Mae, Freddie Mac and other mortgage loan companies and credit unions, homeowner associations, hospitals, universities (not when is university housing), churches, airports, and the state, names of the county, city and municipality. To identify relocation companies, non profit organizations and construction companies we use public data of lists of the top relocation companies, non profit organizations and construction companies in the U.S. We also manually check the names of the 200 largest non-individual buyers in each state using online search engines to classify them in the right category, and iterate this procedure several times to ensure the largest buyers are correctly classified.

To further increase the accuracy of the largest institutional investors’ classification we collect from industry reports and news reports the names of the top 20 institutional investors in the single-family rental market. For example Amherst Capital’s 2018 market commentary report¹³ provides a comprehensive list of the top 20 single-family rental institutions and the number of homes owned based on their calculations. We also collect the names of the residential real estate companies that belong to the S&P 500 Real Estate Index, most of which are apartment REITs. We then search for the names of these top investors and their subsidiaries in the ZTRAX database and ensure they are classified as institutional investors. We use public SEC filings and other business websites to track down the names of the subsidiaries of these large investors. This procedure results in calculating the exact holdings of the top single-family and multi-family institutional investors.

To classify non-institutional buyers into *individual investors* we start from the ZTRAX classification of buyer names as names of individuals. We calculate the number of purchases

¹²For example "Invitation Homes" and "Invitation Homes LP" are both included as non-individual names.

¹³Amherst Capital report is retrieved from <https://www.amherstcapital.com/documents/20649/22737/Amherst+Capital+Market+Commentary+-+April+2018+vF/f06bd51a-44c7-4f8f-87e3-ca8d795bf42a> Last visited: 03-05-2019.

of each individual name within the MSA within the given year and the year before. We define individuals that are investors as individuals who purchase more than one property within the MSA in the given year and the year before.

We calculate the market share of investors as the dollar value of investors' purchases (either individual or institutional, or local institutional investors) divided by the dollar value of all purchases, by institutional and individual investors and homeowners. Using the dollar value, accounts correctly for purchases of buildings with multiple units.

We also code the number of units of each purchase. The number of units is coded initially by ZTRAX, in the tax assessment dataset, which we merge with the transactions dataset, using the RowID unique identifier. We use the property type code (PropertyLandUseStndCode) to fill in the missing number of units. Specifically, we fill in number of units 2 if number of units is missing and the property type is duplex or multifamily dwelling (generic any combination 2+). We fill in number of units 3 for triplex, 4 for quadruplex, and 5 for apartment building (5+ units) or court apartment (5+ units). We fill in number of units 100 for apartment building (100+ units). With this criterion, when the number of units is missing we assign the lower bound of the number of units to the property, inferred by the qualitative description. For the rest of the multi-family property types and all the types we classify as single-family in Table A2 that do not specify number of units, we assign 1 unit. We double-check with the sales price and confirm that these refer to single-unit purchases. For our analysis of single-unit purchases we exclude from the sample all purchases of properties of two or more units.

The holding duration is the duration between the purchase and sale of the property. We define long-term investments the purchases that are held for more than one year, and short-term investments the purchases that are sold within a year, to illustrate the descriptive statistics of the ZTRAX data.

Finally, we use the crosswalk file from Census Bureau to match the County FIPS codes in ZTRAX to the Census Bureau MSA's 2017 core based statistical area (CBSA) code. For submetro areas of the largest MSAs, we use the CBSA division code. In total we match 411 CBSAs in the data. Tables A3 to A6 contain descriptive statistics of the ZTRAX data (before merging with other variables).

Other variables

We also rely on the following data sources to get data at the county-year level and then aggregate to MSA-year level using the 2017 CBSA and CBSA division codes:

- Population: Data come from the U.S. Census Bureau, from 1990 to 2017.
- Median Income: Data on come from the Zillow Median Household Income dataset, from 1990 to 2017.
- Unemployment rate: Data on unemployment rate come from the Bureau of Labor Statistics, from 1990 to 2017.

To summarize, there are 332 MSAs with the full set of average housing variables and investors' market share for the years 2009-2017, control variables beginning in 2000, and tax-returns for the year 2007.

Extra Figures

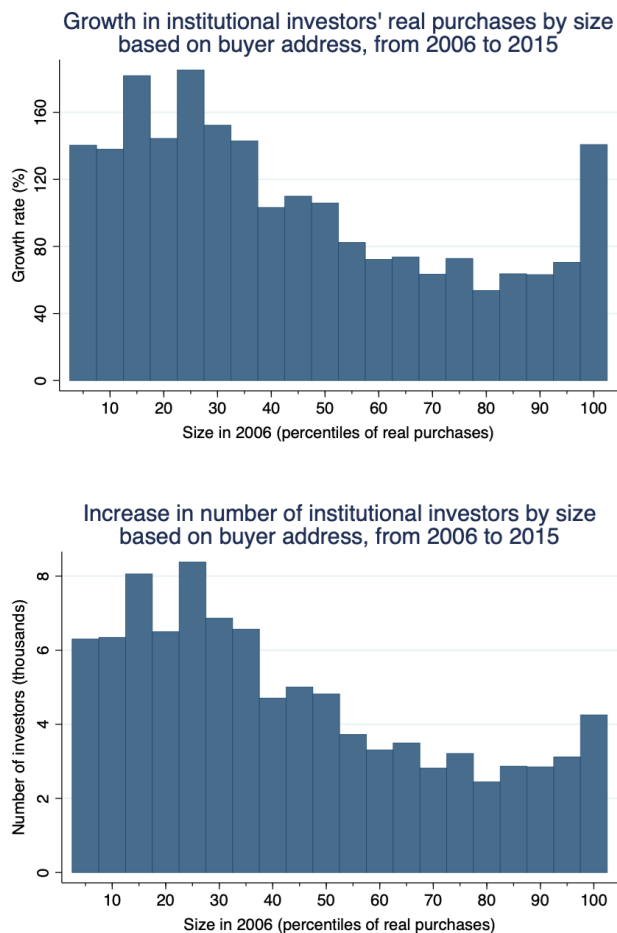


Figure A1. Size distribution of institutional investors: The top figure plots the growth in real dollar purchases, and the bottom figure the increase in the number of institutional investors, from 2006 to 2015 in each percentile segment of real purchases. The percentile cutoffs are the dollar values of the cutoffs in 2006. All dollar purchases are in 2006 dollars. The size of an investor is the sum of purchases with the same mailing address in each year.¹⁴

¹⁴Using the investor's (legal entity) name as the unique identifier for the investor might overestimate the number of small investors: the same investor might have a slightly different name in different deeds, due to name variations or typos, so not all the investor's purchases are added together, and we end up with overestimating small investors. This would apply for both the years we are comparing. Manual checks show that this is not a large concern. Alternatively, using the investor's mailing address might overestimate the number of medium-large investors: different investors might use the same mailing address in case they own the same property at a different time, so more than one investors' purchases are added together. Moreover the very large investors like the REITs, might use more than one

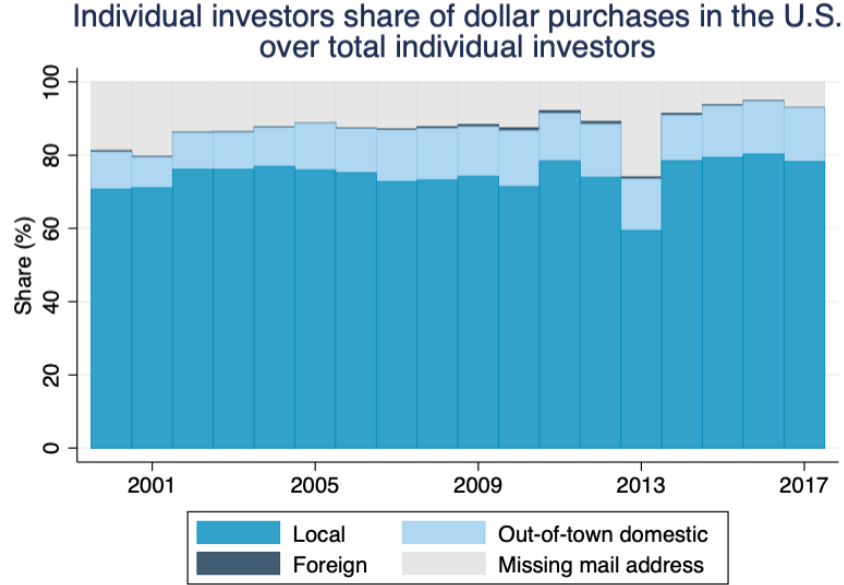


Figure A2. Local and out-of-town individual investors. The figure plots the market share of individual investors’ dollar purchases split into local, out-of-town domestic and foreign investors. We define local investors as the ones who have their mailing address in the same MSA as the property they purchase. Out-of-town domestic investors are the ones who have their mailing address in the U.S., but outside the MSA of the property they purchase. Foreign investors are the ones who have a mailing address outside the U.S. The investors’ data are annual MSA averages, for 411 U.S. MSAs, between 2000 and 2017.

mailing addresses, so we end up underestimating the number of investors in the top one percent, but overestimating the number of medium-large investors. We use these alternative calculation to derive an upper and lower bound for the growth of investors by size.

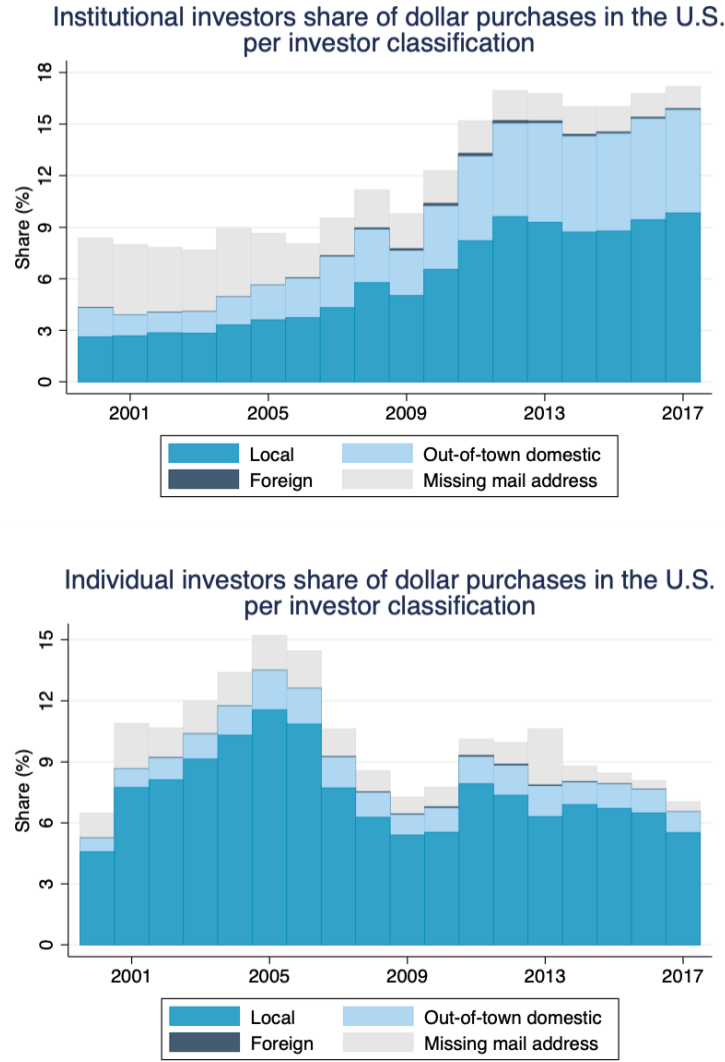


Figure A3. Local and out-of-town investors. The top figure plots the market share of institutional investors' dollar purchases over total purchases, and the bottom figure the market share of individual investors' dollar purchases over total purchases split into local, out-of-town domestic and foreign investors. We define local investors as the ones who have their mailing address in the same MSA as the property they purchase. Out-of-town domestic investors are the ones who have their mailing address in the U.S., but outside the MSA of the property they purchase. Foreign investors are the ones who have a mailing address outside the U.S. The investors' data are annual MSA averages, for 411 U.S. MSAs and MSA divisions, between 2000 and 2017.

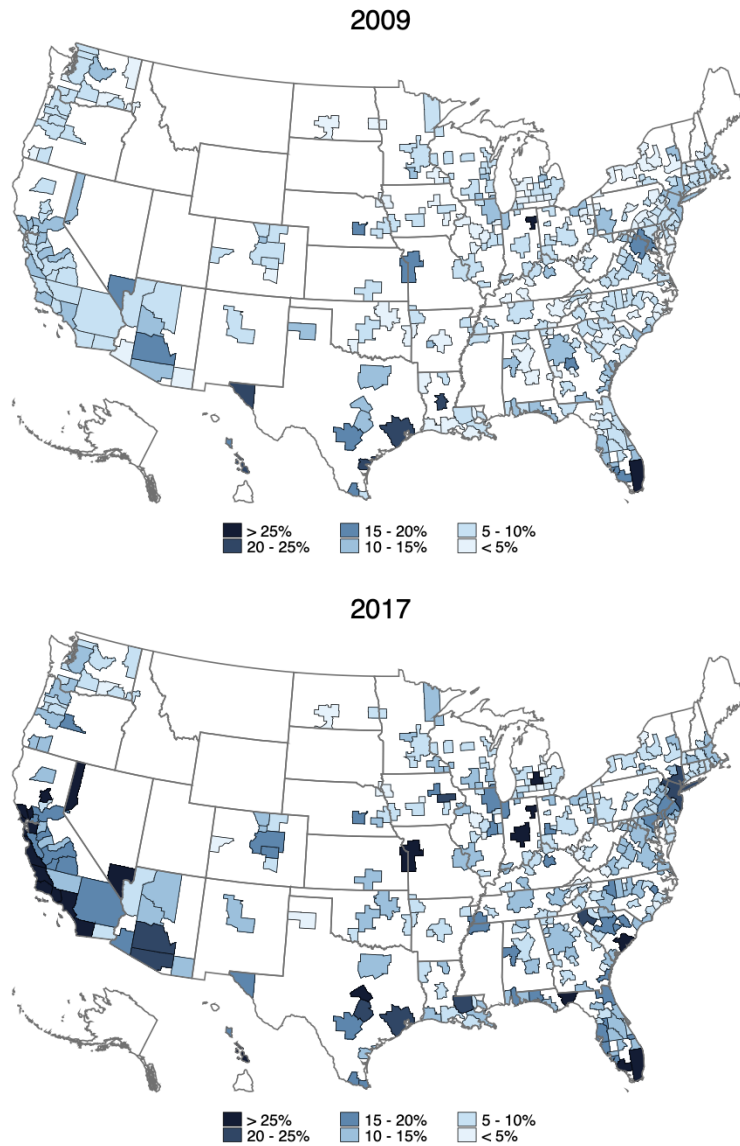


Figure A4. Share of institutional investors per MSA. The top panel plots the market share of the dollar purchases by institutional investors per MSA in 2009 and the bottom panel in 2017.

Extra Tables

Table A1. Robustness: Probability of short-term sale and investors

	Sale in 18 months	Sale in 1 year
Capital gain	0.497*** (0.030)	0.555*** (0.032)
Capital gain $\times$ Post-crisis	-0.267*** (0.047)	-0.311*** (0.048)
Post-crisis	0.028 (0.055)	0.170*** (0.059)
County-level controls	Yes	Yes
Observations	2,041,615	2,041,615
Number of counties	895	895

Robust standard errors are in parentheses. The coefficients and standard errors of capital gains and the interaction are multiplied by 100. The county controls are the average growth in population, growth in per capita income, and change in unemployment rate for two years from the property purchase. ***sig. at 1%.

Table A2. Land use and buildings' classification

Single-family: single family residential; townhouse; row house; mobile home; cluster home; seasonal, cabin, vacation residence; bungalow; zero lot line; patio home; manufactured, modular, prefabricated homes; garden home; planned unit development; rural residence; residential general; inferred single family residential.

Multi-family: condominium; cooperative; landominium; duplex (2 units, any combination); triplex (3 units, any combination); quadruplex (4 units, any combination); apartment building (5+ units); apartment building (100+ units); high-rise apartment; garden apartment, court apartment (5+ units); mobile home park, trailer park; dormitory, group quarters (residential); fraternity house, sorority house; apartment (generic); multifamily dwelling (generic any combination 2+); boarding house rooming house apt hotel transient lodging; residential condominium development (association assessment); residential income general (multi family).

This table shows the classification of homes into single-family and multi-family based on the ZTRAX land use standard codes.¹⁵

¹⁵We excluded from the data the following land use standard codes that do not refer to homes: "residential common area", "timeshare", "residential parking garage" and "miscellaneous improvement".

Table A3. Investments by institutional investors by type of property

	Obs	Mean	SD	P10	P90
2000-2009 (data per MSA)					
Share of value of purchases (%)					
Single-family	3,413	9.4	15.0	1.9	22.9
Multi-family	2,892	26.4	23.4	5.5	62.0
Purchases (\$ billions)					
Single-family	3,413	0.16	0.96	0.0005	0.30
Multi-family	2,892	0.13	0.55	0.0004	0.26
Number of transactions					
Single-family	3,413	652	4,535	5	1,217
Multi-family	2,892	177	598	2	385
2010-2017 (data per MSA)					
Share of value of purchases (%)					
Single-family	3,236	10.9	11.4	3.4	23.6
Multi-family	2,908	39.9	24.6	11.8	77.7
Purchases (\$ billions)					
Single-family	3,236	0.20	0.66	0.001	0.44
Multi-family	2,908	0.23	1.19	0.0004	0.38
Number of transactions					
Single-family	3,236	728	1,760	17	1,759
Multi-family	2,908	256	875	2	516

This table presents summary statistics of the presence of institutional investors by type of property in the U.S. The sample consists of 411 MSAs, including MSA divisions. The variables are calculated at the MSA-year level. The top panel shows summary statistics for investors over the 2000-2009 period and the bottom panel over the 2010-2017 period.¹⁶ Appendix A describes the variables and data sources. The classification of single-family and multi-family homes is in Table A2. P10 denotes the 10th percentile and P90 the 90th percentile.

¹⁶The statistics are calculated for MSA-years with at least one purchase by institutional investors of the respective property type. There are 503 MSA-years with zero single-family purchases and 512 with zero multi-family purchases by institutional investors during 2000-2009. There are 1024 MSA-years with zero single-family purchases and 360 with zero multi-family purchases by institutional investors during 2010-2017.

Table A4. Investment horizon of institutional investors

	Obs	Mean	SD	P10	P90	Not sold (%)
2000-2009 (data per MSA)						
Long-term holding duration (days)						
Single-family	3135	1809.5	522.5	1317.2	2324.4	44.8
Multi-family	2488	2103.1	632.9	1424.5	2791.0	48.4
Short-term holding duration (days)						
Single-family	2939	153.9	39.9	112.2	196.2	0.0
Multi-family	2059	147.5	63.2	72.7	220.9	0.0
2010-2017 (data per MSA)						
Long-term holding duration (days)						
Single-family	2478	874.2	322.6	463.8	1297.5	79.2
Multi-family	1780	1003.1	405.0	483.5	1528.6	80.8
Short-term holding duration (days)						
Single-family	2906	149.8	42.9	101.4	192.6	0.0
Multi-family	1894	141.3	62.7	65.5	216.3	0.0

This table presents summary statistics of the investment horizon of legal entities in the U.S. The sample consists of 411 MSAs, including MSA divisions. The variables are calculated at the MSA-year level. The top panel shows summary statistics over the 2000-2009 period and the bottom panel over the 2010-2017 period. Not sold percentage is the percentage of purchases for which we do not calculate the holding duration since we do not observe a sale up to the end of 2017. The classification of single-family and multi-family homes is in Table A2.

Table A5. Investments by individuals by type of property

	Obs	Mean	SD	P10	P90
2000-2009 (data per MSA)					
Share of value of purchases (%)					
Single-family	3255	8.8	8.8	2.8	15.4
Multi-family	2792	14.4	13.4	3.7	28.0
Purchases (\$ billions)					
Single-family	3255	0.27	0.83	0.001	0.59
Multi-family	2792	0.11	0.67	0.0003	0.18
Number of transactions					
Single-family	3255	1165	2830	8	2911
Multi-family	2792	380	1164	3	853
2010-2017 (data per MSA)					
Share of value of purchases (%)					
Single-family	3133	5.9	6.7	2.2	9.3
Multi-family	2613	8.5	9.7	1.9	17.3
Purchases (\$ billions)					
Single-family	3133	0.14	0.50	0.001	0.26
Multi-family	2613	0.10	1.21	0.0002	0.73
Number of transactions					
Single-family	3133	587	1726	10	1354
Multi-family	2613	209	819	2	396

This table presents summary statistics of the presence of individual investors by type of property in the U.S. The sample consists of 411 MSAs, including MSA divisions. The variables are calculated at the MSA-year level. The top panel shows summary statistics for investors over the 2000-2009 period and the bottom panel over the 2010-2017 period¹⁷. Individual investors are defined as individuals who purchase more than one properties in an MSA in a given year and the year before. Share is the share of dollar value of purchases by individual investors to the total dollar value of all purchases in the respective market (i.e. total market, single-family or multi-family). The classification of single-family and multi-family homes is in Table A2.

¹⁷The statistics are calculated for MSA-years with at least one purchase by individual investors of the respective property type. There are 661 MSA-years with zero single-family purchases and 1124 with zero multi-family purchases by individual investors during 2000-2009. There are 135 MSA-years with zero single-family purchases and 655 with zero multi-family purchases by individual investors during 2010-2017.

Table A6. Investment horizon of individual investors

	Obs	Mean	SD	P10	P90	Not sold (%)
2000-2009 (data per MSA)						
Long-term holding duration (days)						
Single-family	3021	1886.3	421.4	1465.2	2249.6	41.9
Multi-family	2492	1998.9	526.3	1492.1	2530.0	40.0
Short-term holding duration (days)						
Single-family	2928	147.1	45.2	95.8	189.6	0.0
Multi-family	2136	148.5	66.1	57.3	223.7	0.0
2010-2017 (data per MSA)						
Long-term holding duration (days)						
Single-family	2335	964.4	364.1	473.3	1461.6	82.0
Multi-family	1596	1042.1	424.5	493.9	1595.0	81.1
Short-term holding duration (days)						
Single-family	2786	138.6	49.0	74.9	188.7	0.0
Multi-family	1673	135.0	70.8	36.0	218.7	0.0

This table presents summary statistics of the investment horizon of individual investors in the U.S. The sample consists of 411 MSAs. The variables are calculated at the MSA-year level. The top panel shows summary statistics over the 2000-2009 period and the bottom panel over the 2010-2017 period. Individual investors are defined as individuals who purchase more than one properties in an MSA in a given year and the year before. Holding duration is the duration between the purchase and sale of the property, measured in days. We define long-term investments the holdings of more than one year, and short-term investments the purchases that are sold within a year. Not sold percentage is the percentage of purchases for which we do not calculate the holding duration since we do not observe a sale up to the end of 2017. The classification of single-family and multi-family homes is in Table A2.