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Leaving Households Behind: Institutional Investors and the U.S. Housing Recovery*

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Abstract

Ten years after the mortgage crisis, the U.S. housing market has rebounded significantly with house prices now near the peak achieved during the boom. Homeownership rates, on the other hand, have continued to decline. We reconcile the two phenomena by documenting the rising presence of institutional investors in this market. Our analysis makes use of housing transaction data. By exploiting heterogeneity in zip codes' exposure to the First Look program instituted by Fannie Mae and Freddie Mac that affected investors' access to foreclosed properties, we establish the causal relationship between the increasing presence of institutions in the housing market and the subsequent recovery in house prices and decline in homeownership rates between 2007 and 2014. We further demonstrate that institutional investors contributed to the improvement in the local labor market by reducing overall unemployment rate and by increasing total employment, construction employment in particular. Local housing rents also rose.

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1 Introduction

Between 2007 and 2009, the U.S. economy experienced its worst recession since the Great Depression. The crisis was particularly severe in the housing market, where house prices fell 31 percent at the trough from the peak at the national level. Homeownership rates also declined. Following the crisis, house prices rapidly recovered in most areas, but homeownership rates continued to collapse to historic lows. In 2016, while the national house price index recovered nearly to its 2006 peak level, the national homeownership rate hovered at 63 percent, the lowest in recent history (Figure 1).[1]

This paper reconciles these observations by documenting a rising share of institutional investors in the housing market after the crisis. We classify a transaction as having an institutional buyer or seller if it is bought or sold by a company instead of a named individual. Our study is based on property-level transaction data from CoreLogic Solutions, a national vendor supplying mortgage and real estate data and analytics. We focus our analysis on the illiquid single-family housing market in the 20 cities covered by the S&P CoreLogic Case-Shiller 20-City Composite Home Price Index.[2] We document that the institutional investor-purchased share of single-family homes has been mostly flat during the early 2000s but picked up significantly since the mortgage crisis broke out in 2007.[3] This phenomenon is widespread but particularly prominent in high-priced areas such as Miami and San Diego, as well as in high-foreclosure areas such as Las Vegas and Atlanta, where prices had soared during the housing bubble and where, during the crash, prices dropped significantly.[4] This finding is in strong contrast to the experience of the booming years before the crisis, when individual investors were mostly responsible for home purchases (Haughwout, Lee, Tracy, and van der Klaauw 2011, Gao and Li 2015, Chinco and Mayer 2016, Bayer, Mangum, and Roberts 2016, Gao, Sockin, and Xiong 2017, and Albanesi 2018).

Several factors drove this trend. First, since the outbreak of the mortgage crisis, banks have been subject to greater regulation, especially after the passage of the Dodd-Frank Wall Street Reform and Consumer Protection Act. As a result, they contracted mortgage supply. Individual borrowers in turn found mortgage access difficult as they had to turn to other potentially more expensive creditors. Second, a consistent rigid downward trend in housing prices since the crisis further prevents many households from buying without credit or with little credit. For foreclosed-upon borrowers, it takes at least three to five years to qualify for a new mortgage after a foreclosure

[1] Meanwhile, total housing units have been increasing albeit slowly and homeowner vacancy rates have returned to their 2000 levels.

[2] The 20 major U.S. metropolitan areas are Atlanta, Boston, Charlotte, Chicago, Cleveland, Dallas, Denver, Detroit, Las Vegas, Los Angeles, Miami, Minneapolis, New York, Phoenix, Portland, San Diego, San Francisco, Seattle, Tampa and Washington, D.C.

[3] The trend retreated somewhat after 2014.

[4] The observations on Atlanta and Las Vegas are consistent with case studies on these two cities by Immergluck (2013) and Mallach (2013), respectively.

(Goodman, Zhu, and George 2014). This creates a buying opportunity for institutions with better access to finance. As these institutions enter into the housing market and turn their purchased properties into rentals, house prices begin to recover while homeownership rates continue to decline.[5]

To investigate the extent to which institutional investors' presence affects the local housing market, we conduct analysis using an instrumental variables approach to deal with the endogeneity concern that institutional investors buy on net in areas where house prices are about to recover and homeownership rates are about to decline. Our instrument is the fraction of foreclosure sales covered by the First Look program, a program that was instituted by Fannie Mae beginning in August 2009 and by Freddie Mac beginning in September 2010. The program gave homeowners and nonprofit organizations an opportunity to bid on Fannie Mae and Freddie Mac's real estate owned (REO) properties before they became available to investors.[6] Specifically, under the program, for the first 15 days that a property is on the market, offers can be accepted only from homeowners and nonprofits. The period has since been extended to 20 days, 30 in Nevada. We also explore other instruments including zip codes' heterogeneous exposure to lenders subject to the Federal Reserve System's Comprehensive Capital Analysis and Review (CCAR) stress test after the crisis following Gete and Reher (forthcoming) and the conforming loan limit instrument popularized by Loutskina and Strahan (2015) as a credit supply shock.

Our main results can be summarized as follows: For the period between 2007 and 2014, the significant rise in institutional buyers net of institutional sellers in the single-family residential market contributed to 9 percent of the increase in the real house price growth and 28 percent of the changes in homeownership rates. The effects are stronger in cities with low supply elasticity and in states with nonjudicial foreclosure laws. Additionally, we find that institutional buyers on net also led to improvement in the local labor market by reducing the local unemployment rate and by raising local total employment, construction employment in particular. Local housing rents also rose as a result.

Our paper belongs to the small but growing literature that studies the dynamics of the post-crisis housing market. In particular, our paper complements that of Gete and Reher (forthcoming) by showing that, when mortgage supply contracts, opportunities are created for institutional investors that have better access to credit than individual borrowers. These investors purchase residential properties and then often turn them into rental properties. In other words, these institutions are responsible for the rental increase in the post-crisis housing market studied in Gete and Reher

[5]Global capital inflow as well as institutions chasing yields as a result of the lackluster bond market performance also contributed to the trend (Lambie-Hanson, Li, and Slonkosky 2018).

[6]When a loan securitized by Fannie Mae or Freddie Mac defaults, the servicer initiates foreclosure proceedings, including ultimately scheduling a foreclosure auction, if the borrower does not cure the default. If at the foreclosure auction the property does not receive an adequate bid from a third party buyer, the property is "bought back" by the lender and becomes real estate owned (REO). A large majority of properties brought to foreclosure auction do become REO. At this time, the title to the property is conveyed to Fannie Mae/Freddie Mac, and the GSE uses a real estate agent to market the property for sale.

(forthcoming). However, we point out that the presence of these institutional investors also helps local house prices recover when they participate in the market as buyers. These results are consistent with prior case studies of investor activity that relied on interview evidence and narrower data analysis to argue that investors exerted a stabilizing force when house prices were declining (Lambie-Hanson, Herbert, Lew, and Sanchez-Moyano 2015). Note that these results stand in contrast to the role of investors during the boom leading to the house crisis, suggesting that the presence of investors varies importantly with the macroeconomic environment.

Our paper also complements those of Molloy and Zarutskie (2013), Mills, Molloy and Zarutskie (2017), and Allen, Rutherford, Rutherford and Yavas (2018), by studying a more representative sample of the nation and by focusing on the overall housing market, distressed as well as non-distressed. More importantly, our instrumental variable approach allows us to make a causal statement by linking the market development directly with the emergence of institutional investors as separate large asset holders. Finally, we also investigate the impact of institutional presence on the local labor market as well as the local rental market.

The rest of the paper is organized as follows. In section 2, we describe the data used for our main analysis. In section 3, we present our empirical model and discuss the main results of the paper as well as the robustness of our results along many dimensions. Section 4 analyzes the impact on the local labor market and the local rental market. Section 5 concludes.

2 Data and Investor Classification

2.1 Description of Datasets

We use and combine the following datasets in our paper:

CoreLogic Solutions Deeds Data: This is our main dataset and it contains property-level information on deed and mortgage transactions as well as foreclosure actions, as originally electronically keyed at county registries (or recorders) of deeds. For each transaction, among other things, the dataset provides the names of the buyer(s) and seller(s); the nature of the transaction: whether it is a purchase or mortgage refinance, whether it is a regular sale or distressed sale such as foreclosure or REO (real estate owned) sale, whether it is an arm's length transaction or a nominal transfer between parties (for example, family members transferring properties at nominal prices among each other); the transaction price; the address; and the transaction date.

CoreLogic Solutions Home Price Index Data: We use the single-family combined home price index (HPI) at the zip code level, which includes all sales, regular as well as distressed. This "repeat sales index" matches house price changes on the same properties in the public record files and then computes separate indexes by zip codes. Since the data are from public records, the HPI

is representative of all sales in the market.[7]

Black Knight McDash Data (formally known as Lender Processing Services Inc. (LPS) Applied Analytics): These data comprise mainly the servicing portfolios of the largest residential mortgage servicers in the U.S. They cover approximately two-thirds of installment-type loans in the residential mortgage servicing market. The data provide detailed dynamic information on mortgages each month including performance status and the severity of delinquency, as well as the investor type, which we use to construct our instrument.

Home Mortgage Disclosure Act (HMDA): HMDA records the vast majority of home mortgage applications and approved loans in the United States for both purchases and mortgage refinances. The data provide, among other things, mortgage applicants' application status, income, race, ethnicity, loan amount, purpose of borrowing, occupancy type, and, importantly for this paper, the name of their mortgage lenders.

Individual Income Tax Zip Code Data: We use income tax data from the Internal Revenue Service to obtain, at the zip code level, average household income as proxied by average adjusted gross income and total population as proxied by total returns filed.

Other Data: We obtain county-level homeownership rates from the American Community Survey via the Census Bureau; county-level unemployment rates from the Bureau of Labor Statistics; MSA-level rent price indices from Zillow Research at Zillow.com/data downloaded from January 2018 to August 2018; MSA-level housing supply elasticity from Saiz (2010); and finally, county-level eviction rates from the Eviction Lab at Princeton University.[8]

2.2 Identifying Institutional Investors

Several strategies have been used in the literature to identify investor activities in the housing market. For individual investors who borrowed mortgages, mortgage loan data often provide information on occupancy status reported either by mortgage borrowers as in HMDA (Gao and Li 2015, and Gao, Sockin and Xiong 2018) or by mortgage servicers as in Black Knight McDash Data (Gao and Li 2015). Using mortgage data, however, allows us to identify only individual investors who borrowed mortgages. This limitation can be serious during the housing crisis when many foreclosed properties were purchased with cash. Second, self-reports may be inaccurate. By matching credit bureau and mortgage data, Elul and Tilson (2015) find that borrowers often misrepresent their occupancy status as owner occupants rather than residential real estate investors. The occupancy fraud rate ranges from an estimated low of 1.54 percent in Kansas to an estimated high of 15.30

[7]Note that when there are not sufficient repeated house sales, as sometimes happens in small zip codes, the house price index is recorded as missing. These observations are not used in our analysis.

[8]More information about the Eviction Lab at Princeton University can be found at https://evictionlab.org. The lab was founded by Matthew Desmond in 2017. The data collected by the lab are composed of formal eviction records from 48 states and the District of Columbia. Informal evictions that happened outside the courtroom, as when landlords pay renters to leave or execute illegal lockouts, are not captured by the dataset.

percent in Hawaii. Fisher and Lambie-Hanson (2015) also find considerable misreporting in HMDA of investor status in Massachusetts.

Researchers working with credit bureau data used the number of first-lien mortgages to identify real estate investors (Haughwout, Lee, Tracy and van der Klaauw 2011). The idea is that people reporting multiple first-lien mortgages must own more than one property, and the additional ones would then be either vacation homes or rental properties. This multi-first-lien mortgage approach, unfortunately, also does not capture all-cash transactions and transactions by nonindividuals who would not have a credit report at any credit bureau. Additionally, the methodology does not help identify the location of investment properties, making it hard to assess the impact of investor behavior.

Using similar transaction data as in this paper, Bayer, Mangum and Roberts (2016) separate buyers into different categories according to the length of housing tenure, i.e., investors would be those who buy residential real estate with the aim of quickly of reselling it for a profit. Giacoletti and Westrupp (2017) also use a similar strategy. The caveat with this approach is that it may overstate the underlying investor activity, as households sometimes end up buying and selling properties within a short period for reasons related to their jobs or family situation instead of profits. Conversely, this approach may instead understate the true investor activity, as it does not capture those investors who are unable but not unwilling to "unload" their properties quickly or who buy to let.[9]

In this paper we focus on institutional investors, because these investors can be easily identified from their names listed in the Deeds dataset. For example, we classify all buyers/sellers with "LLC," "Corporation," "Partnership," "Trust," "Enterprise," "Company," "Construction," "Building," "Real Estate," "Holdings," or numbers other than first, second, third, and fourth in their names as institutional buyers/sellers. To further ensure the accuracy of our methodology, for each MSA, we check, based on their market share, the top 20 buyers/sellers in each city each year and classify them accordingly. In the case that these buyers/sellers' names are not indicative, we search online for their information. The advantage of our approach is that it is straightforward and less prone to classification errors since institutions clearly buy single-family houses for investment purposes.[10] However, this approach does miss individual investors who purchased homes using their own names. As a result, our measurement generally serves as a lower bound of true investor activity.

As an effort to further study the identities of the institutional investors, we adopt a top-down strategy. From a variety of industry reports, Amherst Capital Market Reports in particular, we gather the names of the top 20 institutions that have bought in the single-family housing market.

[9]For instance, in our analysis, we find many institutional investors holding on to their properties for 2, 3, or even longer years.

[10]Although it is possible that there are individual home buyers who purchase their primary residences using LLCs or Trusts for tax or privacy reasons, the real estate attorneys we spoke to assured us that the number of such individuals is negligible. We nevertheless exclude living trusts from our analysis.

Large investors often buy properties under a variety of names. The way we identify purchaser names affiliated with these large firms is to link together buyers that use the same mailing address. We manually inspect each buyer record to confirm that it is, indeed, part of the larger company, rather than being erroneously linked as a result of sharing the same attorney, for example.

Of the identified institutions, we are careful to exclude government agencies, nonprofit organizations, banks, thrifts, credit unions, builders and housing construction companies, as well as relocation companies. Table 1 lists key words used to classify these institutions. We exclude government agencies and nonprofit organizations from the analysis because these agencies do not operate for profit and are often given incentives to transact during the crisis, as we discuss later. Banks, thrifts, savings and loans companies, as well as credit unions are, for the most part, sellers in foreclosure and REO sales. Builders and construction companies of new homes are active in the single-family housing market as sellers during the housing boom. But they are rarely seen in the transactions after the market crashed.[11] Finally, we do not count living trusts as institutional buyers or sellers.

2.3 Descriptive Statistics

2.3.1 Data Construction

To provide background, we study single-family house purchases between 2000 and 2014, a period that spans housing boom, bust, and recovery. To further control the sample size, we narrow our analysis to housing transactions in the 20 major metropolitan areas covered by the S&P CoreLogic Case-Shiller 20-City Composite Home Price Index from Standard & Poor's/Haver Analytics.[12] From this dataset, we keep only arm's length transactions with a sales price of at least $1,000. We also exclude foreclosure sales that are nominal transfers between borrowers and banks or banks and agencies such as Fannie Mae and Freddie Mac. However, foreclosure sales to third parties are included in the analysis.

The final sample contains in total 11.8 million single-family purchase transactions between 2000 and 2014. Of the 20 MSAs that we analyze, the Los Angeles MSA has the most transactions, at 1.3 million, which amounts to almost 12 percent of the total transactions, followed by the New York MSA with 1.2 million. The Chicago MSA is third with over one million transactions during this period.

[11] To check the accuracy of our identification of builders, we merge the transaction data with the 2014 CoreLogic Solutions tax accessors' data, which contain information on the year in which the house was built. Focusing on properties that provide such information and with year built after 1900, the median age of houses sold by builders and construction companies that we identified is less than 1 year and the mean is 3 years. The other properties, on the other hand, have a median age of 30 years and mean of 34 years. Unfortunately, we do not have good coverage of tax accessors' data for the other years.

[12] See footnote 2 for a list of the 20 cities.

2.3.2 Single-Family Transactions, House Prices, and Foreclosure Sales

Figure 2 describes the real house price growth rates and the homeownership rates of the 20 Case/Shiller MSAs combined and of four selected cities: Atlanta, Las Vegas, New York, and Washington D.C. We choose to depict these four cities in the figures for illustration purposes only because they represent different types of housing markets. The real house price growth rate in the region, as depicted in panel a of Figure 2, was between 9 and 13 percent between 2000 and 2006, but fell to negative 20 percent in 2008. By 2013, however, the average house price growth rate had nearly returned to its pre-crisis level. Not surprisingly, among the four cities, Las Vegas had the most dramatic run-up in house prices during the boom years and the most dramatic decline during the bust. In 2013, its real house price growth rate remained 10 percentage points below the peak (30 percent) achieved in 2004. Interestingly, Atlanta had muted house price appreciation during the boom years, and the fall in house prices was also less than the average, but it had a very impressive recovery. In 2013, its real house price growth rate was about 8 percentage points higher than the rates seen during the boom years. Washington D.C., on the other hand, had a nice boom, a bad bust, and a lackluster recovery. New York City followed roughly the average 20-city pattern.

In panel b of Figure 2, we see that, for the average MSA, the homeownership rate had been increasing between 2000 and 2005, albeit at a decreasing speed. Starting in 2006, however, the homeownership rate began its steady fall. In 2014, it was only a touch above 60 percent. The movements of the homeownership rates were quite different across the four cities. Las Vegas had the greatest fall but started to recover in 2012. The homeownership rate moved within a much narrower range for Atlanta and Washington D.C. than for the other cities. New York City had an early rise in the homeownership rate, followed by a persistent decline.

In Figure 3, we plot the total number of transactions and share of foreclosure sales of the 20 MSAs combined and of four selected MSAs: Atlanta, Las Vegas, New York City, and Washington D.C. According to Figure 3 panel a, for the average MSA, the volume of total housing transactions went up sharply between 2000 and 2005. It started to plummet in 2006 and bottomed out in 2008. Despite the recovery after 2010, its level in 2014 remained 10,000 units below that of 2000. The four MSAs all experienced a similar cycle, though the peak and trough time differed by a year or two. Turning to panel b of Figure 2, for the average MSA, prior to 2006, foreclosure sales were almost non-existent. They shot up to over 30 percent of total sales by 2009. The decline in foreclosure sales after 2009 was more gradual than the increase. In 2014, about 10 percent of total sales remained foreclosure sales. Not surprisingly, Las Vegas had the greatest rise in foreclosure rates among the four cities, followed by Atlanta. New York City, by comparison, had a foreclosure rate of only about 10 percent in its worst year.

2.3.3 The Rise of Institutional Investors

Figure 4 depicts institutional investors' purchasing and selling of single-family homes in the 20 MSAs combined and for the selected cities. According to Figure 4 panel a, the share of transactions with institutional buyers hovered at around 5 percent prior to the crisis. It picked up significantly starting in 2007, reaching a peak of almost 14 percent in 2013. Institutional purchases had a small run-up during the boom years (2000 to 2004) for Atlanta and Las Vegas but a much larger run-up during the recovery. At the peak, over 20 percent of the purchases were by institutional buyers for the two cities. The share of institutional purchases was much smaller in New York City and Washington D.C. during our sample period, but the cities nevertheless experienced an increase in the share.

Turning to institutional sales as depicted in panel b of Figure 4, for the average city, not counting builders selling new properties and financial institutions selling foreclosed properties, the share was flat at around 6 percent before picking up slightly after 2007. For the chosen four cities, with the exception of the New York MSA, the shares exhibited a U shape. For the New York MSA, the share of institutional sellers declines steadily and slowly through our sample period.

In panel c of Figure 4, we plot shares of net institutional buyers in the single-family residential market. As can be seen, the net share has been going up since 2000 on average but the increase is more prominent after 2007. Of the four cities displayed, Washington D.C. is the only one that experienced a decline in the net share of institutional purchases after 2007. Finally, institutional buyers constitute a larger share of housing transaction in foreclosure sales than in regular sales, as depicted in panel d of Figure 4. We do not plot the share of institutional purchases in regular nonforeclosure transactions, as they resemble those of the overall transactions in panel a of Figure 4 closely.

2.3.4 Identities of Institutional Investors

We have described the identification of the top 20 institutions active in the single-family residential housing market in the data section. These institutions are Blackstone (Invitation Homes), American Homes 4 Rent, Colony Starwood, Progress Residential, Main Street Renewal, Silver Bay, Tricon American Homes, Cerberus Capital, Altisource Residential, Connorex-Lucinda, Havenbrook Homes, Golden Tree, Vinebrook Homes, Gorelick Brothers, Lafayette Real Estate, Camillo Properties, Haven Homes, Transcendent, Broadtree, and Reven Housing REIT. Of the 20 firms, Blackstone is a private equity financial firm. Tricon American Homes, Cerberus Capital, Golden Tree, and Transcendent all have dealings with investment management, hedge fund, or private equity firms. American Homes 4 Rent, Colony Starwood, Silver Bay, Altisource Residential, Connorex-Lucinda, Havenbrook Homes, Broadtree, and Reven Housing REIT are REITs (Real Estate Invest-

ment Trust).[13]

Over our sample period, these large institutions have also increased their presence both as buyers and as sellers in single-family housing, but only in selected markets. As buyers, they are most active in Charlotte, Miami, Atlanta, and Tampa. With the exception of Dallas, they have not particularly increased their presence in the sellers' market. More importantly, these large institutions did not appear to be more active in the foreclosure market than in the regular market. It is worth noting that large institutions' share of single-family purchases or sales was close to zero in 2007. Despite the rise that began after 2010, in 2014 their shares remained small: The average share of large institutions as buyers was 1.57 percent, and the average share as sellers was 0.21 percent.

At the other end of the spectrum are individual investors who set up Limited Liability Companies (LLCs) with cryptic names when purchasing properties. LLCs help homeowners and investors avoid not only publicity, but also scams, identity theft, and frivolous lawsuits. Unlike large institutions, LLCs have increased their presence as buyers in all 20 MSAs, particularly so in San Francisco, Los Angeles, Miami, and San Diego. Additionally, depending on the cities, they were more active in either the regular market or the foreclosure market. On the sale side, except in Phoenix, Tampa, and the regular market of Dallas and Denver, LLCs have generally increased their presence. The other interesting difference between LLCs and large institutions is that LLCs' presence in the single-family housing market, though small, started much earlier, in 2006 on average.

3 Institutional Investors and the Housing Recovery

3.1 Sample Construction

In the last section, we documented the rising presence of institutions as both buyers and sellers in the single-family housing market. We showed that this phenomenon occurred after the mortgage crisis, more specifically since 2007. In this section, we study how this rising presence of institutional buyers and sellers affected the recovery of the local housing market. To that end, we focus our benchmark analysis on the periods between 2007 and 2014.[14] Our large property-level dataset allows us to collapse the data to the zip code level, which is important as it presents far more heterogeneity than does a city, let alone a state. In particular, we construct, by zip code and by year, the percentage of individual house purchases and sales by institutions, and then merge by zip code and by year with zip-code-level average household adjusted gross income and total number of households who file tax returns each year from the Internal Revenue Service, the zip-code-level CoreLogic Solutions house price indexes for single-family housing, unemployment rates at the county level from the Bureau of Labor Statistics, and county-level homeownership rates from the Census Bureau.

[13]Note that this list overlaps significantly with Mills, Molloy, and Zarutskie (2017).

[14]The availability of data including annual zip-code-level income and population also limits our ability to study earlier years.

Our final sample consists of 24,167 observations spanning 4,259 zip codes in the 20-MSA sample. The majority of the zip codes, 98 percent, are present in all 8 years from 2007 to 2014. Table 2 presents the summary statistics of the variables used in our analysis. As can be seen from the table, the average share of institutional buyers is 9.6 percent, while the average share of institutional sellers is 7.6 percent between 2007 and 2014. During this period, the zip-code-level real house prices fall on average 1.6 percent annually, again with substantial heterogeneity. Homeownership rates average 63 percent, but the average changes are negative with large variances. The population size is quite homogeneous across zip codes, with both mean and median at around 16 to 17 thousand. Unemployment rates are high for almost all zip codes, averaging about 7 percent. Real average household income has a mean of $32,000 and a median of $27,000 in 1982 dollars, and the growth rate of the real average income was nearly zero during this period.

3.2 Estimation Strategy

Our baseline specification explores the panel nature of our dataset and is described as follows,

$$y_{i,t} = \beta_0 + \beta_1 x_{i,t} + \beta_2 Z_{i,t-1} + \epsilon_{i,t}, \tag{1}$$

where i indexes zip code and t year; $y_{i,t}$ is the dependent variable, which for the benchmark case is the real zip-code-level house price growth rate and changes in homeownership rate; of the explanatory variables on the right-hand-side of the equation, $x_{i,t}$ represents the net share of institutional buyers at zip code i and in year t; $Z_{i,t-1}$ includes all other control variables including the one-period lagged total population growth, changes in unemployment rate and foreclosure rate, growth in real average household income, as well as MSA and time fixed effects.[15] The variable of interests is β_1, which captures the effect of net institutional buyers on the local market.

If we estimate equation (1) using Ordinary Least Squares (OLS), our estimates will be biased because common shocks can drive house price dynamics, homeownership rates, and institutional investors' participation in the local housing market. For instance, a large fraction of institutional investors in the local housing market may be a response to local economic conditions rather than a cause of the housing and economic cycles. To resolve this identification issue, we use a two-stage least squares (2SLS) for the regression analysis, an extension of the OLS. Specifically, in the first stage we estimate

$$x_{i,t} = \gamma_0 + \gamma_1 q_{i,t} + \gamma_2 Z_{i,t-1} + \upsilon_{i,t}, \tag{2}$$

where $q_{i,t}$ are the instrumental variables that are related to $x_{i,t}$ but unrelated to the error term $\epsilon_{i,t}$ in equation (2).

[15] The large number of zip codes relative to sample size precludes us from using zip code fixed effects.

3.3 Instrument

Beginning in August 2009, with the goal of promoting homeownership and thus contributing to neighborhood stabilization, Fannie Mae instituted its First Look program, which gave homeowners and nonprofit organizations an opportunity to bid on its REO properties before they became available to investors. Under the program, for the first 15 days that a property goes on the market, offers can be accepted only from homeowners and nonprofits. The period has since been extended to 20 days, 30 in Nevada. Freddie Mac offered a very similar program beginning September 2010.[16]

We construct our instrument to take advantage of the fact that these initiatives affected areas differently depending on the areas' exposure to the GSEs. In zip codes where Fannie Mae and Freddie Mac hold a larger share of the distressed mortgages, a smaller share of REOs ought to be purchased by investors, due to the First Look program. Local house prices are affected by the program only through their impact on the buyer composition. Using Black Knight McDash Data, formally known as Lender Processing Services Inc. (LPS) Applied Analytics, and focusing on single-family foreclosure and REO sales, we calculate the average share of distressed sales that list Fannie Mae as investors in 2009 and Fannie Mae or Freddie Mac after 2009 for each zip code and then merge the series with the dataset that we built using the CoreLogic Solutions Deeds data. The series takes a value of zero prior to 2009.

Our key identification assumption is that, once we control for various factors, exposure to Fannie Mae and Freddie Mac's First Look program is uncorrelated with other drivers of house price growth rates as well as changes in homeownership rates. The exposure to the program, however, is correlated with institutional buying and selling in the single-family residential housing market. In Table 2 under the heading of "variables related to instruments," we report the average shares of foreclosures that list either of the two agencies as investors without interacting with the time period. In Figure 5, we chart the share for the whole sample and for the four selected MSAs (note that this is different from the instrument where we impose a value of zero for years prior to 2009). On average, between 2007 and 2014, a third of the foreclosure sales list Fannie Mae or Freddie Mac as investors. The shares went up very slightly during our sample period.

3.4 Main Results

We present our benchmark estimation results using OLS as well as 2SLS estimation techniques in Table 3. All analyses are weighted by the number of housing transactions in the zip code. As seen in the table, in the OLS analysis where no instrument is used, a one-percentage-point increase in the net share of institutional buyers leads to an increase in the real house price growth rate of 1.2 basis

[16] Fannie Mae and Freddie Mac later became supportive of institutional purchases of single-family residential homes. In 2017, Fannie Mae guaranteed a 10-year, interest-only $1 billion loan to Blackstone's Invitation Homes. At the outset of 2018, Freddie Mac followed suit, investing $11 million of a $1 billion pilot program to back institutional investment in affordable single-family homes. Our data end in December 2014.

points. For the other explanatory variables, a one-percentage-point increase in past real HPI growth rate increases the current one by 29 basis points, suggesting strong auto-regressive properties in real house price appreciation. Areas that had high unemployment rates or high foreclosure rates in the previous period had lower house price recovery. Lagged real average household income growth, on the other hand, contributes positively to the current house price appreciation rate.

In the 2SLS estimation where instruments are used, a one-percentage-point increase in the net share of institutional buyers now leads to an increase of 42 basis points in real house price growth rates. In percentage terms, these numbers amount to 25 percent of real house price growth rates. The effects of the other explanatory variables remain similar to those in the OLS regression analysis.

Turning to homeownership rates, a one-percentage-point increase in net institutional buyers lowers changes in the homeownership rate by 0.6 basis point in the OLS analysis and 4.8 basis points in the 2SLS analysis. Put in percentage terms, a one-percentage-point increase in net institutional buyers lowers percentage point changes in the homeownership rate by 9 percent.

The two rows near the bottom of Table 3 report our under identification test and weak instrument test. Given P-values of near zero for both tests, our model rejects both null hypotheses that the model was under identified or the instrument was correlated with other endogenous regressors.

Table 4 presents the first-stage regression results of the 2SLS analysis of the real house price growth rate. We omit the first-stage results for the homeownership rates as they are the same as those reported in Table 4. Net shares of institutional buyers are negatively correlated with lagged zip-code real house price growth, lagged zip-code population growth, lagged changes in county unemployment rate, as well as lagged growth rate of real average household income at the zip code level, but are positively correlated with lagged changes in zip code foreclosure rate. The result that net institutional buyers respond negatively to lagged house price growth rates is particularly interesting, as it contrasts with the individual investors' behavior during the housing boom. According to Gao et al. (2017), individual investors responded strongly and positively to lagged real house price growth rates, suggesting that they were forming their expectation of future house price movements from the recent experience, i.e., they are momentum traders. Our analysis here suggests that the institutional investors during the housing recovery acted like contrarians, by targeting low growth areas expecting a turnaround in house prices in those areas.

Importantly, our instrument affects net institutional purchases negatively and statistically significantly. In particular, areas that are affected by the First Look programs had lower shares of net institutional buyers, as one would predict.

To arrive at an estimate of the overall impact of institutional buyers and sellers on the local housing market, we time the average effect from these estimations with changes in net institutional buyers and sellers, and then divide by their mean during the period. Specifically, between 2007 and 2014, shares of net institutional buyers went up by 2.47 percentage points. The overall net effect

is 1.03 percentage points for house price growth rates and negative 12 basis points for changes in homeownership rate, or 9 percent for changes in house price growth rates and 28 percent for changes in homeownership rates.

3.5 Robustness Analysis

We conduct several robustness tests. First, we conduct our analysis without the weights (transaction volume), i.e., we treat all zip codes the same and do not overweight large and active areas. Then we use alternative instruments. The third robustness analysis focuses solely on the recovery period of 2010 to 2014. For the fourth, we study how the results vary with the housing supply elasticity as constructed by Saiz (2010). For the last test, we study how the effect of institutional buyers and sellers changes with the foreclosure laws in the state, i.e., whether the state has judicial foreclosure or nonjudicial foreclosure. The results are reported in Table 5.

When we do not weight our observations, the effect of institutional buyers on net is smaller on house price growth rates but slightly larger on changes of homeownership rates. Specifically, a percentage point increase in net institutional buyers increases house price growth rates by 22 basis points as opposed to 42 basis points but reduces changes in homeownership rates by 5.4 basis points as opposed to 4.8 basis points. This suggests that institutions had bigger price effect in larger areas or areas with more housing transactions.

For alternative instruments, we first follow Gete and Reher (forthcoming). Specifically, we exploit the heterogeneity across zip codes in exposure to lenders which suffered regulatory shocks following the Dodd-Frank Act, passed after the crisis. The rationale is that zip codes that had greater exposure to lenders more affected by the passage of Dodd-Frank will suffer more from tightened lending standards.[17] The construction of the instrument takes two steps. In the first step, we estimate a probability of loan denial using HMDA data controlling for a key variable, whether the loan was from a lender subject to the stress test in that particular year, as well as other control variables including borrowers' income, their requested loan-to-income ratio, borrowers' race, and zip code and time fixed effects. The coefficient of the key variable, which measures whether the loan was from a lender subject to the stress test that year, is our stress shock. In the second step, we weight the coefficient by the zip code lagged mortgage application shares of these stress-test-affected lenders. For more details on the construction of the instrument, see the appendix in Gete and Reher (forthcoming). For years prior to the implementation of the stress test, the instrument takes the value of zero.

[17] Buchak, Matvos, Piskorski and Seru (forthcoming) use similar regulatory burden measures across space to study the impact on traditional lenders. They argue that shadow banks come in and fill some of the gap; however, these shadow banks typically charge higher prices. Gilchrist, Siemer and Zakrajsek (2018) also use similar identification strategies to study the real effects of changes in mortgage supply. A related study by Acharya, Berger, and Roman (2018) finds that stress-tested banks reduced their supply of corporate loans especially to relatively risk borrowers.

Then we use the conforming loan limit instrument popularized by Loutskina and Strahan (2015) as a credit supply shock. Mortgages below the conforming limit benefit from the guarantee of government sponsored enterprises such as Fannie Mae and Freddie Mac. Prior to 2008, these limits were uniform and determined at the national level. After 2008, the Economic Stimulus Act revised the methodology so that the conforming limit is tied to the cost of living in a given county. As in Loutskina and Strahan (2015), we calculate the percentage of mortgage loan applications that had an amount within 5 percent +/- of the federal limit prior to 2008 and within 5 percent of the average county limit excluding its own county post 2008 as in Gete and Reher (forthcoming).[18]

In Table 2 under the heading "Variables related to instruments," we report that the average denial rates for mortgages made by banks subject to the stress test is about one-percentage-point higher than those for mortgages made by other banks or institutions not subject to the stress test after 2010. Between 2007 and 2014, on average about 1.1 percent of the mortgages made are within 5 percent of the conforming mortgage limit.

Results using the new instruments are reported in the last four columns of Table 5. As can be seen, the use of the stress-test instrument doubled the effect of net institutional buyers on house price growth rates and nearly tripled the effect on changes in homeownership rates. The conforming loan limit instrument, by contrast, increased the impact of net institutional buyers on house prices a bit but the impact on changes in homeownership rates becomes insignificant.

Turning to Table 6, we see that during the recovery period of 2010 to 2014, institutions had a smaller effect on house prices but a larger effect on changes in homeownership rates. This is consistent with the documented observation discussed in the data section that institutional buyers were more active in the distressed market, which were much larger during the crisis period of 2007 to 2009 than during the recovery period of 2010 to 2014. Owners of the houses that were in the distressed market have already lost their houses and, hence, their homeownership. The impact of institutional purchases on homeownership in that market stems only from institutional buyers crowding out potential home buyers. In the nondistressed market, however, the homeownership impact comes from both this crowding out effect and the effect of individual sellers losing their homeownership (provided that they don't purchase another house).

In terms of housing supply elasticity, we report the results using only cities whose supply elasticities constitute the top 25 percent of the sample. These cities are Atlanta, Charlotte, Dallas, Denver, Phoenix, and Washington D.C. These cities had more built up (large supply of new houses) during the boom period. We conjecture that because of their elastic supply, everything else the same, any changes in demand would have smaller effects here than they would in less elastic areas. Indeed, as expected, in these cities, the effect associated with net institutional buyers is much smaller for house price growth rates and is not statistically significant for changes in homeownership rates compared

[18]Grundl and Kim (2018) study the marginal effect of lowering government mortgage guarantees and find that lowering the limit increased the government guarantee significantly but homeownership rates modestly.

with the benchmark case where we utilize the whole sample.

As we have repeatedly pointed out, institutional buyers are much more active in the distressed market. States, however, differ in their foreclosure laws. In some states, foreclosure sales have to go through state courts, i.e., the foreclosure sales there are judicial foreclosure. While a nonjudicial foreclosure often takes a few months, a judicial foreclosure can take years. Because in nonjudicial states, foreclosures came on faster (as documented in Mian, Sufi, and Trebbi 2010, and Gerardi, Lambie-Hanson, and Willen 2013), it is likely that investors are more equipped to absorb the glut of properties in those places as they often purchase more properties than individual homeowners and are less reliant on mortgage financing. Furthermore, nonjudicial states include some of the places that had big run-ups in house prices in the crisis and big busts, along with a lot of the newer single-family housing that investors like (Raymond, Duckworth, Miller, Lucas, and Pokharel 2018).[19] The states with nonjudicial foreclosure laws in our sample are Arizona, California, Georgia, Michigan, Nevada, North Carolina, and Washington. For these reasons, we expect institutional buyers and sellers to play larger roles in states with nonjudicial foreclosures than in states with judicial foreclosures. In the last two columns of Table 6, we report analysis using only observations in states with nonjudicial foreclosure laws. As predicted, the results are indeed much larger than our benchmark, both for house price growth rates and for the changes in homeownership rates.

4 The Impact on the Local Labor Market and the Local Rental Market

Having established a causal relationship between the increase in institutional activities in the single-family housing market and the recovery of the local house prices, as well as the decline in homeownership rates, we now investigate investors' impact on the local labor market and rental market.

4.1 Impact on the Local Labor Market

After purchasing a house, institutional owners may engage in housing rehabilitation before renting out or selling the home. These activities in turn help drive the local economy by creating more jobs, and hence reducing local unemployment rates. Unfortunately, we do not observe this rehabilitation or redevelopement effort directly. Instead, in this subsection, we examine how the county-level unemployment rate and county-level total employment, as well as employment in the construction sector, respond to the increasing presence of institutional buyers and sellers in their local market.

Table 7 summarizes our results. To arrive at these results, we estimate regressions similar to those in the baseline case, except that we replace house price growth rate/changes in homeown-

[19] Ghent (2014) discusses the historical evolution of state foreclosure policies and argues that there is no clear regional pattern to judicial foreclosure.

ership rate by the dependent variables that we are interested in: county unemployment rate and employment growth rate. We also add lagged values of the new dependent variable as an additional explanatory variable.

According to Table 7, on average, a change in institutions' presence as net buyers in the local market decreases the local unemployment rate and increases total local employment growth, especially employment growth in the construction sector. Overall during our sample period, changes in institutional shares in the housing market contributed to about 5 percent of the changes in unemployment rates, 16 percent of the increase in the growth of total county employment, and 33 percent of the increase in the growth of employment in the construction sector.

4.2 Impact on the Local Rental Market

Although we do not observe institutional activities after they purchase the houses, the fact that local homeownership rates continued to decline while institutional buyers kept increasing suggests that many institutional buyers may have chosen to rent their houses out instead of selling them, i.e., they "buy and let." Indeed, of those who bought and sold in our sample between 2007 and 2014, institutions had an average and median tenure of 1 year, and about 21 percent of them held their houses for 2 years or longer. By comparison, individuals who bought and sold during our sample period had a mean and median house tenure of 3 years, and 73 percent of them had a tenure longer than 2 years.[20,21]

To assess the impact of institutional presence on the local rental market, we turn to local rent growth rates and eviction rates. We obtain our MSA-level rental index for single-family houses from Zillow.com.[22] The county eviction rates come from the Eviction Lab at Princeton University. The eviction rates, however, do not differentiate between housing types and are for all housing in the county. These rates serve as a lower bound as they do not capture informal evictions occurring outside the courtroom.

In Table 8, we report our results. In terms of real rent growth rates, we find that a percentage increase in net institutional buyers raised the growth rates of the rent index by 4.6 basis points. Overall, institutional investors' buying and selling explains 36 percent of the changes in the rent growth rates during our sample period. This result is consistent with Gete and Reher (forthcoming).

Turning to local eviction rates, we do not find any effect of rising institutional buyers on the local

[20]Note that many institutions and individuals didn't buy and sell during our sample periods, so the average holding periods for either category in actuality are much longer than reported here.

[21]In 2013, Blackstone's Invitation Homes issued the first single-family rental securitization. By 2015, there were 23 of these securitization. And the single-family bond securitization market was estimated to be a $12.65 billion market, with Blackstone's Invitation Homes unit having a leading market share of 42.1 percent through its seven offerings totaling $5.32 billion. American Homes 4 Rent stands second at $2.08 billion followed by Colony Starwood at $1.75 billion.

[22]For the purpose of disclosure, we retrieved the data several times on dates between January 2018 and August 2018.

eviction rates. In other words, our analysis does not provide evidence that institutional landlords may be more ruthless in that they raise rents more and evict tenants more as depicted by the media.[23] Using the eviction data in 2015 for Fulton County, Georgia, Raymond, Duckworth, Miller, Lucas, and Pokharel (2018), however, find that large institutional landlords defined as those holding 15 or more rental properties are much more likely than small landlords to file eviction notices even after controlling for past foreclosure status, property characteristics, tenant characteristics, and neighborhood. Many of their thus identified big corporate owners overlap with the 20 large institutions we identified such as American Homes 4 Rent, Colony American Homes, Progressive Residential, Silver Bay Realty Trust, and Starwood Waypoint Residential Trust.

5 Conclusions

In this paper, using detailed housing transaction data we document a rising trend of institutions as buyers and sellers in the single-family housing market immediately following the mortgage crisis. This trend lasted well into 2014. We argue that this rising trend has led to a house price recovery without homeowners. Our empirical strategy exploits heterogeneity in zip codes' exposure to First Look programs initiated by the FHFA in the aftermath of the mortgage crisis.

Our main finding is that between 2007 and 2014, institutional investors have helped local house price recovery but depressed local homeownership rates. Furthermore, these effects associated with institutional investors on house price growth are weaker in areas with large housing supply elasticity but stronger in areas with nonjudicial foreclosure laws. We further demonstrate that institutional investors improved labor market in terms of both lowered unemployment rates and increased employment in construction. Additionally, institutional investors' buying and selling in the single-family housing market affected the local rental market, raising rental price growth rates, but had no effect on eviction rates.

[23] See, among others, "Wall Street: America's New Landlord, Kicks Tenants to the Curb,"Forbes, January 3, 2017. https://www.bloomberg.com/news/articles/2017-01-03/wall-street-america-s-new-landlord-kicks-tenants-to-the-curb, and "Here's What it's Like, When Wall Street is Your Landlord," Huffington Post, July 21, 2014. http://www.huffingtonpost.com/2014/07/21/invitation-homes-problems_n_5606403.html.

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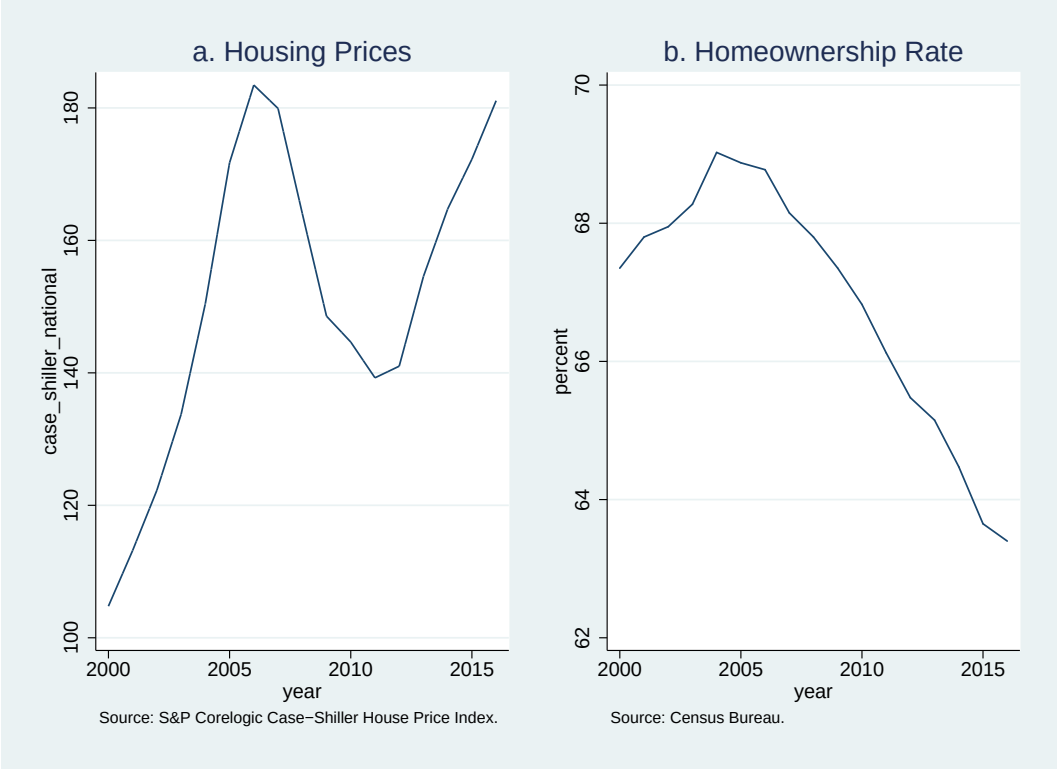

Figure 1: **U.S. Residential House Price and Homeownership Rate**

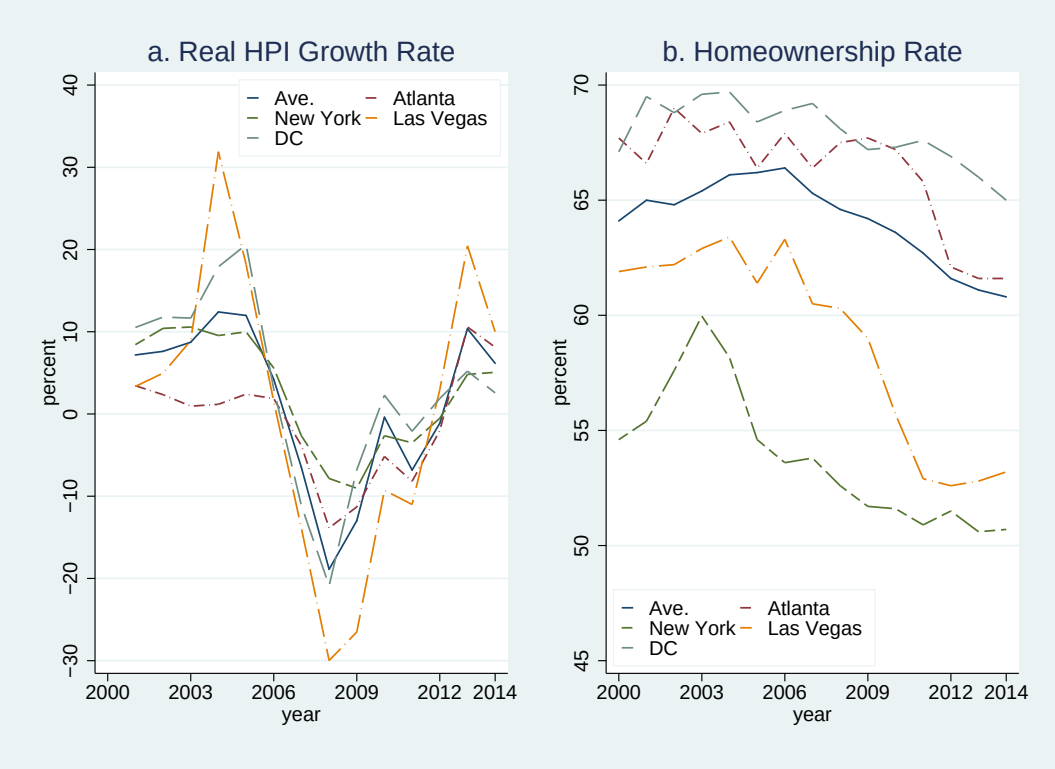

Figure 2: **House Price Growth Rate and Homeownership Rate.** This figure describes the real house price growth rates and homeownership rates on average of the 20 MSAs covered by the S&P CoreLogic Case-Shiller 20-City Composite Home Price Index and four selected MSAs - Atlanta, Las Vegas, New York City, and Washington D.C. The selection of the four MSAs is based on their diverse housing market conditions. The real house price index is obtained by deflating the nominal MSA house price index from CoreLogic Solutions by the headline Consumer Price Index. Data source: CoreLogic Solutions; U.S. Census Bureau.

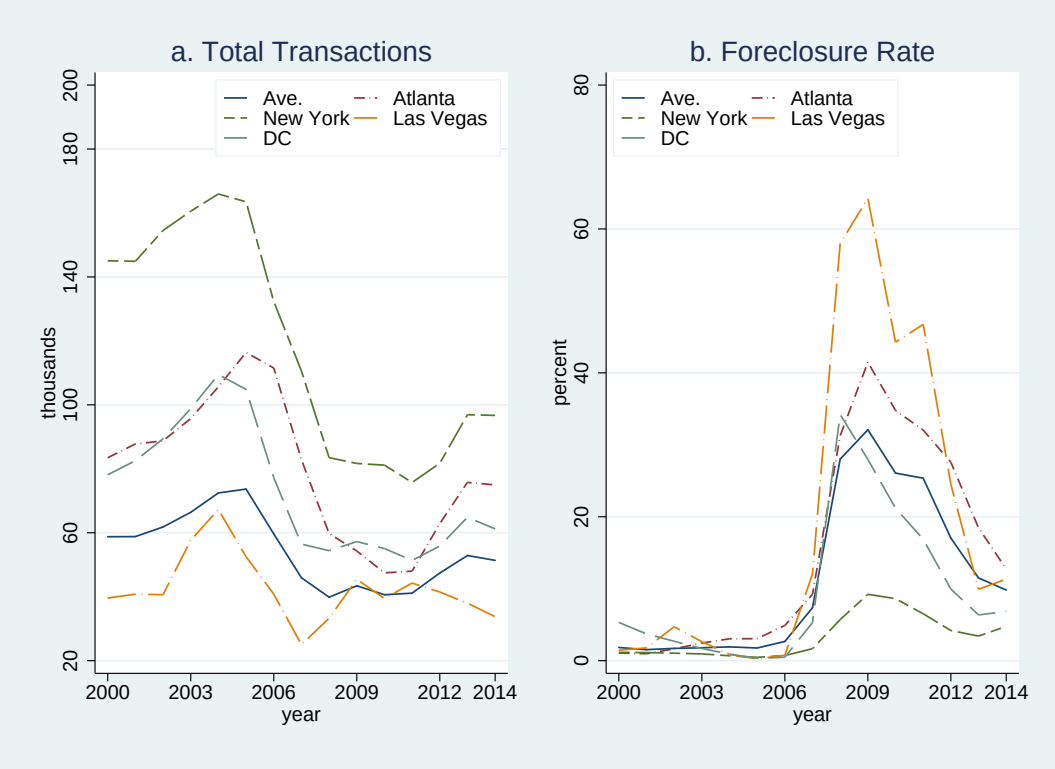

Figure 3: **Housing Transactions and Foreclosure Rate.** This figure describes housing transaction volume and shares of foreclosure sales on average of the 20 MSAs covered by the S&P CoreLogic Case-Shiller 20-City Composite Home Price Index and four selected MSAs - Atlanta, Las Vegas, New York City, and Washington D.C. The selection of the four MSAs is based on their diverse housing market conditions. Note that because we exclude nominal REO (real estate owned) sales and not all REO sales lead to foreclosure sales which we do include in our data, our foreclosure sales measurement understates the extent of housing distress in the economy. Data source: CoreLogic Solutions.

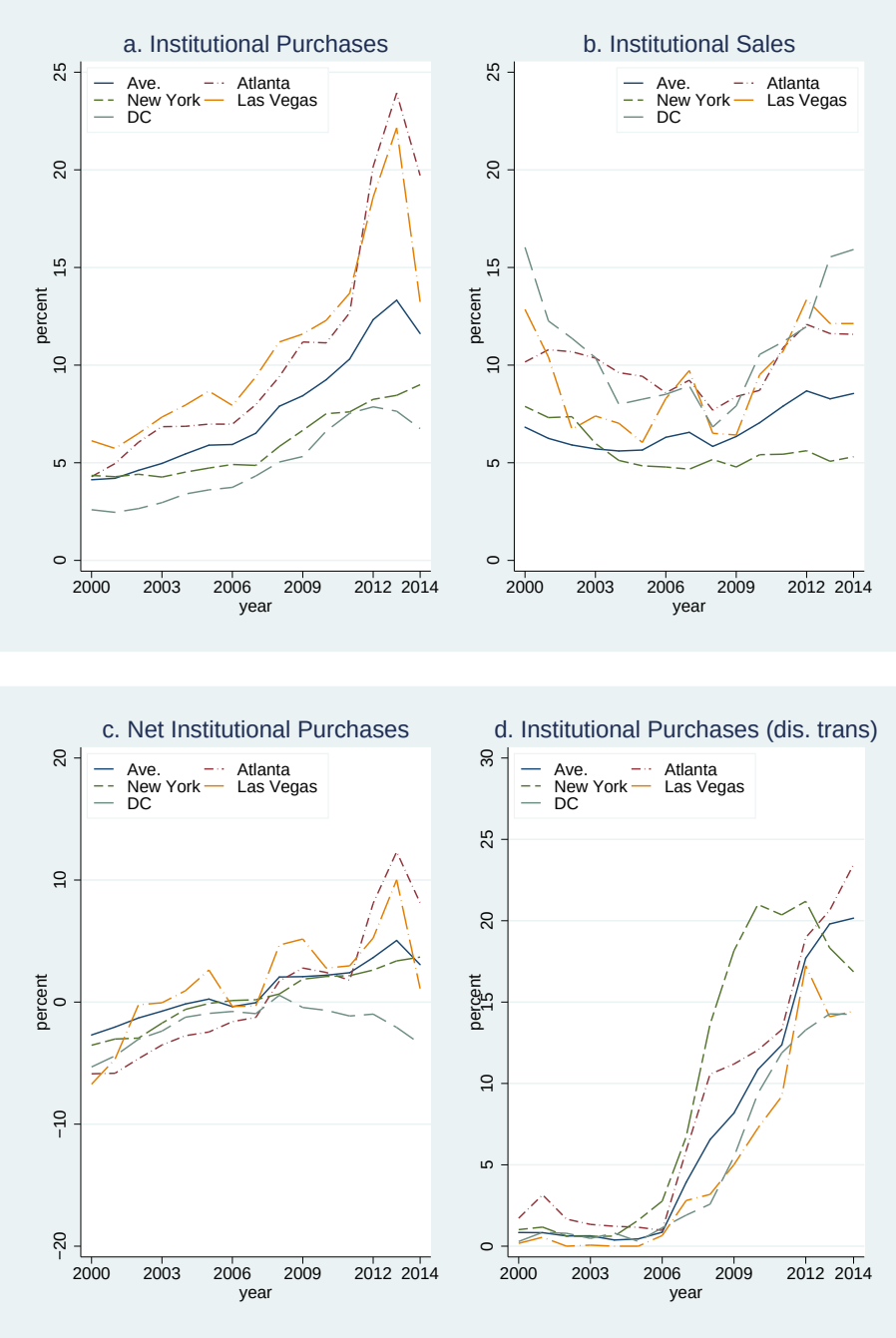

Figure 4: **Institutional Investor Activities.** This figure depicts institutional investors' buying and selling of single-family homes in the 20 MSAs covered by S&P CoreLogic Case-Shiller 20-City Composite Home Price Index on average and for four selected MSAs. Distressed transactions refer to foreclosure sales. Net institutional purchases are institutional purchases net of institutional sales. Data source: CoreLogic Solutions.

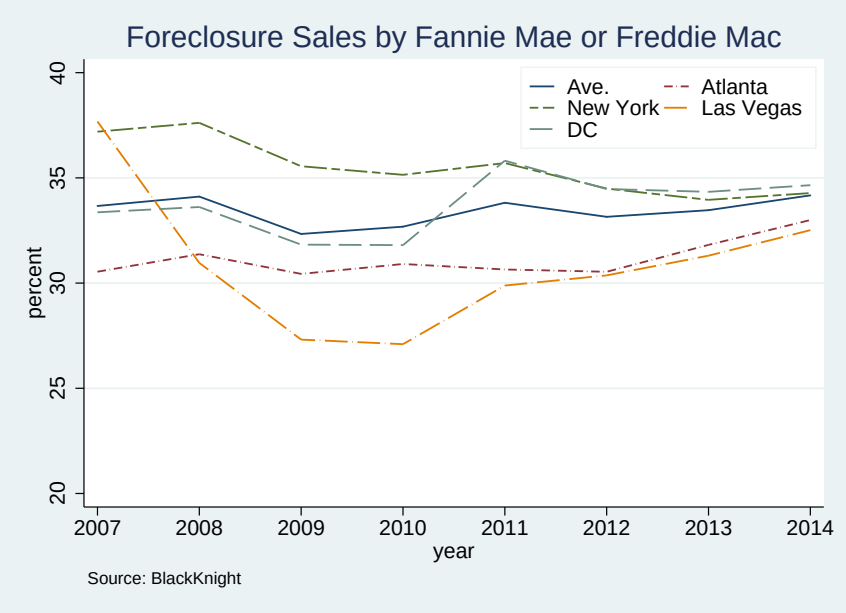

Figure 5: **Foreclosure and REO Sales by Fannie Mae and Freddie Mac** This figure reports the share of foreclosure and REO sales that list Fannie Mae or Freddie Mac as investors. Data source: Black Knight McDash Data.

Table 1: **Classifying Institutions**

Categories	Identifying Key Words
Government agencies	City of; County of; Fannie Mae; Federal Deposit Insurance (FDIC); Federal Home Loan Banks; Federal Housing Administration (FHA); Freddie Mac; Small Business Administration (SBA); State of; U.S. Department of Housing and Urban Development (HUD); Township; Veterans Administration; Veterans Affairs
Nonprofit organizations	Affordable housing; Baptist Church; Catholic; Christian church; Church of; Community development fund; Community housing works; Community land trust; Episcopal; God; Gospel; Habitat for Humanity; Methodist; Neighborhood redevelopment; Neighborhood rehab; Presbyterian
Commercial banks, credit unions, thrifts, mortgage companies	American Bank; Bank of America; Bank of New York; Bank One; Bankers Trust; Bear Sterns; Capital One; Chase; Citi Bank; Citi Mortgage; Citizens Bank; Coast Bank; Commerce Bank; Commercial Bank; Countrywide; Credit Suisse; Credit Union; Deutsche Bank; E Trade; Flagstar Bank; First Union; HSBC; IndyMac; JP Morgan; Lasalle Bank; Lehman Brothers; Loan & Thrift; Morgan Stanley; Mutual Bank; National Bank; Norwest Bank; Old Kent Bank; Pacific Bank; ProvidentBank; Regions Bank; RBC Bank; Silverton Bank; Sovereign Bank; Standard Bank; State Bank; Sterling Bank; Suntrust; Wachovia; TCF Bank; Treasury Bank; Union Bank; United Texas Bank; View Bank; Virtual Bank; Washington Mutual; Wells Fargo; World Food Bank; World Savings Bank
Builders and construction companies	American Homes; Ashton (city name) Residential; Arvida of JMB; Bowen Family Homes; Centex Homes; Colony American Homes; Continental Homes; CP Morgan; Coscan Washington; David Weekley Homes; Dell Webb Community; DR Horton; GL Homes; Greystone Nevada; Hedgewood Properties; Highland Home; Homeland Legacy; John Wieland HMS; KB Homes; Legacy Communities; Lennar Corp; Lewis Homes; Levitt Homes; McCar Homes; Melody Homes; Mercedes Homes; Meritage Homes; Minto Communities; Morrison Homes; Mulvaney Homes; NVRL Permabilt; Pulte Homes; Quadrant Corp; RH of Texas; Rottlund Co; Richardson; Housing Group; Richport Prop.; Ryan Homes; Ryland GRP; Scenic Homes; Shapell Industries; Shea Homes; Toll Brothers; Watt Homes; Westbrooke Homes; Western Pacific Housing; William Lyon Homes; Woodside Homes
Relocation Companies	Relocation; Mobility; Cartus Corp; Prudential relocation; Cendant Mob

Note: Institutional buyers/sellers are buyers/sellers that are not named individuals but also do not belong to any of the institutional categories defined in the table. We also exclude family trusts.
Data Source: CoreLogic Solutions.

Table 2: **Summary Statistics**

	2007-2014				
variable	mean	median	s.d.	min	max
Share of institutional buyers (%)	9.620	7.453	7.723	0	100
Share of institutional sellers (%)[1]	7.558	6.154	5.582	0	100
Net institution purchases (%)	2.064	1.376	6.565	-100	100
Real house price growth rate (%)	-1.645	-0.972	10.149	-36.275	30.437
Homeownership rate (%)	63.433	62.729	10.356	18.152	90.688
Changes in homeownership rate (%)	-0.542	-0.573	1.501	-9.611	9.621
Population (thousands)	17.345	16.320	7.576	0.682	98.117
Unemployment rate (county level) (%)	7.056	6.642	2.563	1.950	17.700
Changes in unemp. rate (county level) (%)	0.046	-0.442	1.551	-3.308	7.975
Real average household income (thousands, 1982 $)	32.077	26.923	21.454	11.614	463.858
Growth rate of real average hh income (%)	0.096	0.084	4.732	-15.993	18.976
Variables related to instruments					
Share of foreclosed properties that list Fannie Mae or Freddie Mac as investors (%)[2]	33.387	32.876	9.093	0	100
Differences in denial rates by stress lenders post 2010 (%)	1.086	0.95	0.87	0	7.263
Share of mortgage apps with loan within 5% of[3] conforming loan mortgage limit (%)[4]	1.098	0.505	2.510	0	100
Number of observations	24,167 (4,259 zip codes)				

This table presents summary statistics for variables used in the empirical analysis. 1. We don't classify REO sales as institutional sales. 2. The share of foreclosure or real estate owned properties that are owned by Fannie Mae or Freddie Mac (merged at zip code level from Black Knight McDash Data, see the main text of the paper for details). 3. Weighted difference in denial rates by lenders subject to stress tests measures the difference in mortgage application denial rates for single-family homes by lenders subject to stress tests and by lenders not subject to stress tests, weighted by the zip code's single-family mortgage application share by lenders subject to stress tests. See the main text for details. 4. The share of single-family mortgage applications with mortgages whithin 5 percent of the FHFA conforming loan limit. Data source: CoreLogic Solutions, Black Knight McDash Data, and HMDA.

Table 3: **Benchmark Estimation**

	OLS		2SLS	
Dependent variable: Real HPI gr. rate (%)	coeff.	s.e.	coeff.	s.e.
Net share of institutional buyers (%)	0.012***	0.006	0.419***	0.087
Lagged real hpi growth rate (%)	0.289***	0.006	0.319***	0.011
Lagged growth rate in population (%)	0.001	0.002	0.076***	0.016
Lagged changes in foreclosure rate (%)	-14.246***	0.396	-16.389***	0.598
Lagged changes in unemployment rate (%)	-2.010***	0.057	-1.678***	0.099
Lagged growth rate of real average hh income (%)	0.049***	0.005	0.076***	0.016
Lagged share of foreclosure/REO sales that list Fannie Mae or Freddie Mac as investors (%)	0.023***	0.004	0.032***	0.002
MSA and year dummies	yes		yes	
Instruments	no		yes	
Adjusted R-squared	0.807		0.777	
Under identification test (P-value)			0.000	
Weak-instrument Anderson-Rubin Wald Test (P-value)			0.000	
	OLS		2SLS	
Depend. variable: changes in homeownership rate (%)	coeff.	s.e.	coeff.	s.e.
Net share of institutional buyers (%)	-0.006***	0.002	-0.048***	0.022
Lagged changes in homeownership rate (%)	-0.373***	0.006	-0.379***	0.007
Lagged real hpi growth rate (%)	0.025***	0.002	0.0226***	0.003
Lagged growth rate in zip code population (%)	0.001	0.001	-0.005	0.004
Lagged changes in foreclosure rate (%)	0.275***	0.109	0.530***	0.152
Lagged changes in unemployment rate (%)	0.067***	0.016	0.035	0.025
Lagged growth rate of real average hh income (%)	-0.001	0.002	-0.002	0.002
Lagged share of foreclosure/REO sales that list Fannie Mae or Freddie Mac as investors (%)	0.006***	0.001	0.005***	0.001
MSA and year dummies	yes		yes	
Instruments	no		yes	
Adjusted R-squared	0.234		0.211	
Under identification test of the equation (P-value)			0.000	
Weak-instrument Anderson-Rubin Wald Test (P-value)			0.000	
Number of observations	24,167 (4,259 zip codes)			

This table presents the Ordinary Least Squares and Two-Stage Least Squares estimation results for the benchmark model. The sample includes all regular and foreclosure sales. The dependent variables are the real house price growth rate and the percentage point changes in homeownership rate. The instrument used in the 2SLS estimation is lagged share of foreclosure sales of properties owned by Fannie and Freddie times the time dummy indicating that the year is after 2008. * indicates statistical significance at 10 percent level; ** at 5 percent level; and *** at 1 percent level. Data source: CoreLogic Solutions and Black Knight McDash Data.

Table 4: **Benchmark Estimation: First Stage**

	Net Institutional Purchases (%)	
variable	coeff.	s.e.
Lagged real house price growth rate (%)	-0.084***	0.008
Lagged growth in zip code population (%)	-0.149***	0.010
Lagged changes in foreclosure rate (%)	5.294***	0.469
Lagged changes in unemployment rate (%)	-0.858***	0.067
Lagged grow rate of real average hh income (%)	-0.023***	0.006
Lagged share of foreclosure/REO sales that list Fannie Mae or Freddie Mac as investors (%)	-0.018***	0.004
MSA and year dummies	yes	
Instrument:		
Lagged share of Fannie/Freddie loans in foreclosure after 2010	-0.102***	0.009
Number of observations	24,167	

This table presents the first stage of the Two-Stage Least Squares estimation results for the benchmark model. The dependent variable is the percentage of net purchases by institutions. * indicates statistical significance at 10 percent level; ** at 5 percent level; and *** at 1 percent level. Data source: CoreLogic Solutions and Black Knight McDash Data.

Table 5: **Robustness Tests**

	Unweighted by		Alternative Instruments			
Dependent variable:	Transactions		Instrument 1		Instrument 2	
Real HPI Growth Rate (%)	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Net share of institutional buyers (%)	0.222***	0.098	0.875***	0.207	0.657***	0.117
Other controls	yes		yes		yes	
MSA and year dummies	yes		yes		yes	
Dependent variable:						
Changes in Homeownership (%)	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Net Share of institutional buyers (%)	-0.054***	0.026	-0.143***	0.047	-0.006	0.026
Other controls	yes		yes		yes	
MSA and year dummies	yes		yes		yes	
Number of observations	24,167					

This table presents some alternative Two-Stage Least Squares estimation results. The dependent variable is the real house price growth rate for the top panel and changes in homeownership rate for the bottom panel. Instrument 1: the weighted difference in denial rates between banks subject to stress test and banks not subject to stress test; instrument 2: percentage of mortgage applications with loan amount with 5 percent of the country's conforming loan limit excluding the zip code where the loan is located. * indicates statistical significance at 10 percent level; ** at 5 percent level; and *** at 1 percent level. Data source: CoreLogic Solutions, Black Knight McDash Data, and HMDA.

Table 6: **Robustness Tests (continued)**

Dependent variable:	Recovery Period (2010-2014)		High Elasticity (top quartile)		Nonjudicial Foreclosure	
Real HPI growth rate (%)	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Net share of institutional buyers (%)	0.233***	0.118	0.315***	0.101	1.232***	0.381
Other controls	yes		yes			
MSA and year dummies	yes		yes			
Dependent variable:						
Changes in homeownership (%)	coeff.	s.e.	coeff.	s.e	coeff.	s.e.
Net share of institutional buyers (%)	-0.072**	0.038	-0.023	0.031	-1.487***	0.065
Other controls	yes		yes			
MSA and year dummies	yes		yes			
Number of observations	13,399		11,009		8,498	

This table presents some alternative Two-Stage Least Squares estimation results. The dependent variable is the real house price growth rate for the top panel and changes in homeownership rate in the bottom panel. Cities with high elasticities refers to areas with housing elasticity ranked within the top quartile of the sample and they include Atlanta, Charlotte, Dallas, Denver, Phoenix, and Washington D.C. States with nonjudicial foreclosure in our sample include Arizona, California, Georgia, Michigan, Nevada, North Carolina, and Washington. * indicates statistical significance at 10 percent level; ** at 5 percent level; and *** at 1 percent level. Data source: CoreLogic Solutions and Black Knight McDash Data.

Table 7: **Impact on the Labor Market**

Dependent variable:	Changes in Unemp. Rate (%)		Growth in Total Employment (%)		Growth of Construction Employment (%)	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Net share of institutional buyers (%)	-0.042***	0.011	0.162***	0.074	0.737***	0.133
Other controls	yes		yes		yes	
MSA and year dummies	yes		yes		yes	
Number of observations	24,167					

This table presents some alternative Two-Stage Least Squares estimation results. * indicates statistical significance at 10 percent level; ** at 5 percent level; and *** at 1 percent level. Data source: CoreLogic Solutions and Black Knight McDash Data.

Table 8: **Impact on the Rental Market**

Dependent variable:	Growth of Rental Price Index		Changes in Eviction Rates	
	coeff.	s.e.	coeff.	s.e.
Net share of institutional buyers (%)	0.046***	0.022	-0.004	0.014
Other controls	yes		yes	
MSA and year dummies	yes		yes	
Number of observations	24,167		17,518	

This table presents some alternative Two-Stage Least Squares estimation results. The rent index is the MSA level rent index from Zillow deflated by headline consumer price index. County eviction rates come from the Eviction Lab at Princeton University for the bottom panel. * indicates statistical significance at 10 percent level; ** at 5 percent level; and *** at 1 percent level. Other data source: CoreLogic Solutions and Black Knight McDash Data.