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Institutional Investors and the U.S. Housing Recovery*

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Abstract

We study the house price recovery in the U.S. single-family residential housing market since the outbreak of the mortgage crisis, which, in contrast to the preceding housing boom, was not accompanied by a rise in homeownership rates. Using comprehensive property-level transaction data, we show that this phenomenon is largely explained by the emergence of institutional investors. By exploiting heterogeneity in a county's exposure to local lending conditions and to government programs that affected investors' access to residential properties, we estimate that the increasing presence of institutions in the housing market explains over half of the increase in real house price appreciation rates between 2006 and 2014. We further demonstrate that institutional investors contribute to the improvement of the local housing market by reducing vacancy rates as they shorten the amount of time distressed properties stay in REO. Additionally, institutional investors help lower local unemployment rates by increasing local construction employment. However, institutional investors are responsible for most of the declines in the homeownership rates.

Keywords: Institutional investor; House Price; Homeownership; Foreclosure; Mortgage Crisis
JEL Classification: G01; G12; G20; G28; R21; R31

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1 Introduction

Between 2006 and 2009, the U.S. economy experienced its worst recession since the Great Depression. The crisis was particularly severe in the residential housing market, where national-level house prices fell 31 percent from peak to trough. In addition to this large decline in house prices, homeownership rates fell. Following the crisis, house prices rapidly recovered in almost all areas; homeownership rates, however, collapsed to a level not seen in the U.S. since the 1960s (Figure 1).[1]

We demonstrate in this paper that these post-crisis housing dynamics are largely driven by the emergence of a new class of investors, institutional investors. We classify a transaction as having an institutional buyer or seller if the property 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 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 2006. 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.[2]

This finding strongly differs from the experience of the booming years before the crisis in two aspects. First, the sharp rise in house prices during the booming years was accompanied by strong increases in homeownership rates (Figure 1). Second, although investors also played important roles in driving up house prices during the booming years, these investors were mostly individual investors (Haughwout, Lee, Tracy, and van der Klaauw 2011, Gao and Li 2015, Chinco and Mayer 2016, Bayer, Mangum, and Roberts 2016, and Gao, Sockin, and Xiong 2019).[3] We further identify the top 20 institutions that were active in the single-family residential family market during the period of our study. Their emergence, however, is more recent and their overall market share remains small.

Several factors likely drove the emergence of institutional investors. First, the turmoil that disrupted financial markets during the financial crisis, especially the decline in house prices in late 2006, caused bank capital to deteriorate significantly. In response, many banks adopted substantially more stringent lending standards and terms on their borrowers to protect their liquidity and balance sheets (Bassett, Chosak, Driscoll, and Zakrajsek 2014). The passage of the Dodd-Frank Wall Street Reform and Consumer Protection Act in 2010 imposed additional regulatory burden on many banks. As a result, banks contracted mortgage supply, making mortgage access difficult or costly

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

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

[3] Using lender reports of purchase types in the mortgage service data from Black Knight McDash, we corroborate these earlier findings.

for individual borrowers. Second, a consistent rigid downward trend in housing prices since the crisis eroded existing owners' equity, making it harder for them to move. In the most severe cases, many borrowers with negative equity experienced foreclosure. For foreclosed-upon borrowers, it takes at least three to five years to qualify for a new mortgage after a foreclosure (Goodman, et al. 2014). This delay created a buying opportunity for institutions with better access to finance. As these institutions entered into the housing market and turned their purchased properties into rentals, house prices began to recover but homeownership rates continued to decline.[4]

To counter this trend, beginning in August 2009, Fannie Mae instituted its First Look program. To promote homeownership and neighborhood stabilization, this initiative gave homeowners and nonprofit organizations an opportunity to bid on its real-estate-owned (REO) properties before they became available to investors. Under the program, for the initial days that a property is on the market, offers can be accepted only from homeowners and nonprofits. The period was 15 days at the start, but has since been extended nationally to 20 days and to 30 days in Nevada. Freddie Mac offered a very similar program beginning in September 2010.[5]

We investigate in this paper the extent to which institutional investors' presence affects the local housing market using an instrumental variable approach. Our first instrument is a Bartik shift-share instrument that identifies credit supply shocks at the county level following Gilchrist, et al. (2018). These supply shocks affect an individual's ability to obtain funding and, hence, his or her demand for properties. Our second instrument is the fraction of foreclosure sales covered by the First Look program. These fractions reflect the availability of properties on the market for investors.[6]

Our main results can be summarized as follows: For the period between 2006 and 2014, the significant rise in institutional buyers in the single-family residential market contributed to 58 percent of the increase in the real house price growth. The effects are stronger in cities with low housing supply elasticity and in areas with no rent control or stabilization policies. Additionally, we show that the institutional investors contributed to the recovery in the local housing market by reducing vacancy rates as they shortened the amount of time a distressed property stays in REO. Finally, we demonstrate that institutional buyers also led to improvement in the local labor market by raising local total employment, construction employment in particular, and therefore reducing local unemployment rates. However, these institutional investors are responsible for 75 percent of

[4]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).

[5]After 2016, Fannie Mae and Freddie Mac became supportive of institutional purchases of single-family residential homes by guaranteeing some of the loans made to these institutions.

[6]After 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.

the fall in the homeownership rates during the sample period.

Understanding the drivers of the recovery of the single family housing market is important not only for housing economics but also for policy makers. While institutional investors in this market help lower operational cost through economy of scale and reduce the cost of capital through diversification, whether their participation in this market is sustainable and how that contradicts/complements the existing government policies that aim at promoting household homeownership rates remain to be seen. In that respect, our paper serves as a first step towards informing policy makers of the issues at hand.[7]

In terms of literature review, our paper belongs to the small but growing literature that studies the dynamics of the post-crisis housing market. In particular, our paper complements those of Molloy and Zarutskie (2013), Lambie-Hanson, et al. (2015), Mills, et al. (2017), and Allen, et al. (2018) by studying a representative sample of the nation and by focusing on the overall housing market, distressed properties as well as non-distressed properties. 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 asset holders. Additionally, we investigate channels through which institutional investors affect the local housing market, days in REO and vacancy rate, and their impact on the local labor market.

Our paper is also related to the literature that studies the effects of credit booms and busts on economic outcomes such as employment, building permits, wages, and rents. This literature includes Chodorow-Reich (2014), Mian and Sufi (2014), Duygan-Bump, et al. (2015), Greenstone, et al. (forthcoming), Glancy (2017), Mondragon (2018), Gilchrist, et al. (2018), Gete and Reher (2018), Siemer (2019), and Garcia (2019). We share with this literature a common feature, in that we rely on local economic variation to infer the importance of credit supply. As a matter of fact, one of our identification strategies follows exactly that of Gilchrist et al. (2018), i.e., we rely on observable changes in bank balance sheets that have been orthogonalized with respect to changes in local demand conditions to construct shocks to the supply of home mortgage credit at the local level.

Finally, this paper also contrasts with the earlier literature that argued that lax lending standards have led to the emergence of individual investors in the residential housing market, which were responsible for the housing bubble prior to its bust. This large literature includes Haughwout, et al. (2011), Gao and Li (2015), Chinco and Mayer (2016), Bayer, Mangum, and Roberts (2016), and Gao, Sockin, and Xiong (2019). In contrast to the pre-crisis individual investors who extrapolated from past house price appreciation in making their purchase decisions, institutional investors during the housing recovery were more active in areas that have experienced house price contraction.

The rest of the paper is organized as follows. In section 2, we describe the data used for our main

[7] In a recent paper, Eisfeldt and Demers (2018) analyze total returns to single family rentals that help shed light on the potential returns of single family rentals to individual as well as institutional investors.

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 several dimensions. Section 4 analyzes the impact of institutional investors on REO sales, property vacancy rate, as well as 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, which 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, 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 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 county 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 county. Since the data are from public records, the HPI is representative of all sales in the market.[8] The house price index is merged with the housing transaction data, which is collapsed to the county level.

Black Knight McDash Data: This data comprises 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 provides detailed dynamic information on mortgages each month including performance status and the severity of delinquency, as well as the occupancy type. We use information provided by occupancy type to estimate the share of purchases with mortgages by individuals for investment purposes. We also use foreclosure investor information to construct our second 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 provides, among other things, mortgage applicants' application status, income, race, ethnicity, loan amount, purpose of borrowing, occupancy type, and, importantly for this paper,

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

the name of their mortgage lenders, for us to replicate the Gilchrist, et al. (2018) instrument.

Other Data: The Call Report data is also used together with HMDA to construct the Gilchrist, et al. (2018) instrument. 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; tract-level residential property vacancy rate from HUD-USPS aggregated to the county level; county-level rent 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.[9]

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 by mortgage borrowers as in HMDA (Gao and Li 2015, and Gao, Sockin and Xiong 2019) and Black Knight McDash Data (Gao and Li 2015). Using mortgage data, however, allows us to identify only those who borrow. This limitation can be serious during the housing crisis when many properties especially 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 1.3 percent in Iowa to an estimated high of 15.5 percent in California. Fisher and Lambie-Hanson (2012) 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, et al. 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 locally.

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 prop-

[9]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.

erties 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 to "unload" their properties quickly or who buy to let.

In this paper we focus on institutional investors, because these investors can be easily identified from their names listed in the CoreLogic Solutions 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. 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. However, this approach does miss individual investors who purchased homes using their own names. As a result, our benchmark measurement generally serves as a lower bound of true investor activity.

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 seldom seen in the transactions after the market crashed.[10] Finally, we do not count living trusts or family trusts as institutional buyers or sellers.

After we classify buyers as institutional investors, we also try to identify the largest investors and to link together the different names they buy under, so that we can compare their behavior to that of smaller investors. From a variety of industry reports, Amherst Capital Market Reports in particular, we gather the names of the top 20 institutions that bought in the single-family housing market. 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. Figure 2 illustrates the steps we take in identifying large institution buyers/sellers. We repeat the process

[10]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 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.

three times.[11]

2.3 Individual Investors with Mortgages

To facilitate comparison with the boom years, we would also like to identify individual investors. Unfortunately, we cannot distinguish between individual investors and homeowners at the transaction level using our public records data. Black Knight McDash data provides information on occupancy type for each mortgage, whether it is for primary residence, second home, or investment property. We, thus, estimate the fraction of noninstitutional buyers with mortgages that are for second or investment homes at the county level as follows.[12] Using first liens for single family homes from the Black Knight McDash data, we construct the share of mortgages originated each year between 2000 and 2014 to individuals (that is, not to institutions) who will not be occupying the property as their primary residence. We multiply that fraction with the share of individual buyers in the CoreLogic Solutions Deeds data who take out a mortgage to purchase their property. This gives us an estimate of the fraction of individual investors who used mortgages to purchase their properties.

2.4 Cash Purchasers

The CoreLogic Solutions Deeds data also provides information on transactions. If a buyer takes out a mortgage, the dataset contains information such as the interest rate of the loan as well as the maturity of the mortgage. Cash purchases are defined as those purchases recorded without mortgages.

2.5 Descriptive Statistics

2.5.1 Data Construction

We study single-family house purchases between 2000 and 2014, a period that spans housing boom, bust, and recovery. We include in our sample all metropolitan statistical areas (MSAs) excluding those in Alaska and Hawaii. Our data, therefore, covers mostly urban areas. 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. Foreclosure sales to third parties are included in the analysis. We then collapse the data by county and by year.

[11] For example, we first identify the mailing addresses of all buyers whose names contain "Blackstone." From each affiliated mailing address, we obtain the names that do not contain "Blackstone." Then we identify the mailing address affiliated with these buyers and repeat the above steps.

[12] We group the investment homes and second homes together for two reasons. First, HMDA records do not distinguish between the two types of properties. More important, in practice, the distinction between the two may not be obvious. Second, many families rent out their second homes for part of the year.

Excluding county-year observations that have fewer than 10 transactions in that year, the final sample covers 935 counties and 315 MSAs. Not surprisingly, these MSAs are the largest in the nation. Figure 3 illustrates the geographic coverage of our data. Areas not shaded by any color are not in our sample.

2.5.2 Single-Family Transactions, House Prices, Foreclosure Sales, and Homeownership Rates

Figure 4 displays the real house price growth rates, total number of transactions, foreclosure rate, and the homeownership rates of the average county in our dataset as well as four selected MSAs, Atlanta, Cleveland, Las Vegas, and San Francisco. The four MSAs are selected for their diverse housing conditions. The real house price growth rate for an average county, as depicted in panel a of Figure 4, was between 3 and 9 percent between 2000 and 2006, but fell to almost negative 20 percent in 2008. By 2013, however, the average house price growth rate had nearly returned to its pre-crisis level. In panel b of Figure 4, we plot the total number of transactions. For the average county, the volume of total housing transactions went up significantly between 2000 and 2005. However, this volume plummeted in 2006 and bottomed out in 2008. Despite a slight recovery in 2009, its level came down again and the volume in 2014 remained about 5,000 units below that of 2000.

Turning to panel c of Figure 4, prior to 2006, foreclosure sales were almost non-existent for the average county. They shot up to over 15 percent of total sales by 2009. The decline in foreclosure sales after 2009 was more gradual than the increases. About 8 percent of total sales were foreclosure sales in 2014. Figure 4 panel d charts the dynamics of the homeownership rate. Note that county-level homeownership rates are not available at annual frequency before 2005. According to the figure, homeownership rates began to drop in 2007 for the average county and consistently fell afterwards until 2014, the end of our sample period.

The four MSAs exhibit a similar pattern as the average county but with different magnitude. For example, Las Vegas experienced the most dramatic price cycle; it is the largest market of the four MSAs as evidenced by its large transaction volume. It had the highest foreclosure rates during the housing bust and the lowest homeownership rates. San Francisco experienced the least house price fluctuations between 2000 and 2014 and has a relatively high homeownership rate. Atlanta and Cleveland tracked the nation on average in terms of house price movements, but had much higher foreclosure rates.

2.5.3 The Rise of Institutional Investors

Figure 5 depicts institutional investors' purchasing of single-family homes for the average county. We use four different definitions. The first illustrated in panel a is our benchmark definition, purchases by institutions only. According to the figure, the share of transactions with institutional buyers

hovered at around 7 percent prior to the crisis. The share picked up significantly in 2007, reaching a peak of almost 14 percent in 2013. To see the geographic disparity of the institutional purchase activity, we go back to Figure 3. Note that the map has darker and darker shades of blue as we move from year 2000, to 2006, and to 2014. Additionally, we observe more institutional activities on the east coast, on the west coast, and in the southeastern United States.

Adding individual investors with mortgages to the institutional share using information from the mortgage service data as discussed earlier, we obtain a broader definition of real estate investors, that is, one that includes both institutional investors and individual investors with mortgages. As we see from panel b, the new series is at a higher level. More important, in addition to 2013, another local peak was achieved in 2005 right before the crisis. This indicates that individual investors are responsible for the first peak, consistent with the earlier findings in the literature cited in our literature review.

Another interesting observation during housing recovery is the rise of cash purchases by individuals. Many of these purchases are associated with purchasing of foreclosed properties. Assuming that individuals that use cash to purchase are investors, a likely exaggeration, we obtain the most expansive definition of investor purchases as illustrated by panel c in Figure 5. There, we clearly see a sharp rise in 2007. The decline is also sizable after 2011.

Finally, to take into consideration institutional sales, we subtract institutional sales from institutional purchases to obtain net institutional purchases. The net purchases series, at a much lower level, exhibits a similar trend as the institutional purchases series. Its first peak was reached in 2008, and the second peak was reached in 2013 (panel d Figure 5).

Of the four cities that we charted, Atlanta and Las Vegas have the most rise of institutional buyers by most of the measurement though there is some correction in 2014. San Francisco has the most cash purchases while Cleveland has the least.

2.5.4 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.[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. It is worth noting that large institutions' share of single-family purchases or sales was close to zero in 2007. Despite the rise that

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

began after 2010, in 2014 their shares remained small: The average share of large institutions as buyers was 1.47 percent.

3 Institutional Investors and the Housing Recovery

3.1 Sample Construction

In the last section, we documented the rising presence of institutions as buyers in the single-family housing market. We showed that this phenomenon occurred after the mortgage crisis, more specifically since 2006. In this section, we study how this rising presence of institutional buyers affected the recovery of the local housing market. To that end, we focus our benchmark analysis on the periods between 2006 and 2014.[14] Our large property-level dataset allows us to collapse the data to the county level. Counties are small enough to capture the impact of investor buyers on local house price movements, but they are large enough to have data available at an annual level on control variable and outcome measures.[15] In particular, we construct a dataset of the percentage of individual house purchases by institutions by county and by year. Then we merge this information with county-level household median income and total population from the Census Bureau, the county-level CoreLogic Solutions house price indexes for single-family housing, the county-level share of individuals with mortgages that are for investment purposes from the Black Knight McDash data, unemployment rates at the county level from the Bureau of Labor Statistics, and county-level homeownership rates from the Census Bureau.

Our final sample consists of 7,278 observations spanning 935 counties of 315 MSAs. Table 2 presents the summary statistics weighted by the number of transactions used in our analysis. According to the table, the average share of institutional buyers is 11.7 percent. If we include individual investors with mortgages, the average share rises to 17.2 percent. If we add cash purchases by individuals, the average share jumps to a large 38.1 percent of total transactions during our sample period. Subtracting shares of institutional sales from the share of institutional purchases, we obtain a net purchase of 2.4 percent by institutions in terms of total transactions. During this period, the county-level real house prices fall on average 4.0 percent annually, again with substantial heterogeneity. Homeownership rates are 65.5 percent on average, but typically changes are negative with large variances. The population size is also quite heterogeneous across counties, with the median half as large as the mean. Real average median household income has a mean of $24,900 and a median of $23,500 in 1982 dollars. The growth rate of the real median income was slightly negative from 2006 to 2014. Unemployment rates were high for almost all counties, averaging about

[14] The availability of data including county-level homeownership rates and vacancy rates also limits our ability to study earlier years.

[15] Data at the zip code level is less uniformly available, and sometimes it is too noisy. Also, county borders are more stable over time than zip codes.

6.8 percent.

3.2 Estimation Strategy

Our baseline specification exploits 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 county and t year; $y_{i,t}$ is the dependent variable, which for the benchmark case is the real county-level house price growth rate; of the explanatory variables on the right-hand side of the equation, $x_{i,t}$ represents the share of institutional buyers at county i and in year t; $Z_{i,t-1}$ includes all other control variables including the lagged one-period total population growth, changes in unemployment rate and foreclosure rate, growth in real median household income, as well as county and year fixed effects.[16] The variable of interests is β_1, which captures the effect of 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 and institutional investors' participation in the local housing market. To resolve this identification issue, we use two-stage least squares (2SLS) for the regression analysis, an extension of 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).

3.3 Instruments

3.3.1 Mortgage Supply Shocks

Our first instrument is a county-level credit supply shock measure constructed according to Gilchrist, et al. (2018), who, in turn, builds on Khwaya and Mian (2008) and Greenstone, et al. (forthcoming). The basic idea is to first use the banks' income and balance sheet data to isolate the portion of the statistical credit supply effects arising from differences in the banks' asset quality and capital positions, and then use the estimated time-varying local credit demand shocks to orthogonalize the supply-side effects based on bank health to obtain a local supply-side instrument for the growth of home mortgage lending.

Specifically, using HMDA 2003 to 2016 matched with the banks' income and balance sheet

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

statements obtained from Call Reports,[17] we first decompose variation in the growth of the number of mortgage loan originations $\Delta lnL_{j,i,t}$ (j denotes bank; i county; and t year) into the within-county and between-county components,

$$\Delta lnL_{j,i,t} = S_{j,t} + D_{i,t} + \varepsilon_{j,i,t}, \tag{3}$$

where $S_{j,t}$ denotes a time-specific bank fixed effects, and $D_{i,t}$ denotes a time-specific county fixed effect. We use the bank market shares as weights for the decomposition as given by

$$b_{j,i,t} = \frac{L_{j,i,t}}{\sum_{j \in \mathscr{B}_{i,t}} L_{j,i,t}}, \tag{4}$$

where $\mathscr{B}_{i,t}$ denotes a set of banks that are active lenders in county i year t.

The estimated bank fixed effects $\hat{S}_{j,t}$ is next used to estimate the following panel regression in order to isolate a portion in the bank-specific credit-supply shift due to changes in bank health,

$$\hat{S}_{j,t} = \beta BankHealth_{j,t} + \eta_j + \lambda_t + \upsilon_{j,t}, \tag{5}$$

where $BankHealth_{j,t}$ denotes a vector of bank health variables that influence the willingness and abilities of banks to intermediate credit. These variables include charge-off rate on real estate loans; charge-off rate on C&I loans; lagged tier-1 leverage ratio; lagged share of real estate loans; lagged share of C&I loans; and lagged log of total assets. The portion of the credit-supply shift that is due to changes in bank health is then constructed as

$$\widetilde{S}_{j,t} = \hat{\beta} BankHealth_{j,t}. \tag{6}$$

An estimate of a county-level shift in credit supply is calculated as a weighted average of bank-specific supply effects estimated above,

$$\widetilde{S}_{i,t} = \frac{b_{j,i,t-1}}{\sum_{j \in \mathscr{B}_{i,t-1}}} \widetilde{S}_{j,t}, \tag{7}$$

where

$$b_{j,i,t} = \frac{L_{j,i,t}}{\sum_{j \in \mathscr{B}_{i,t}} L_{j,i,t}}, \tag{8}$$

and $\mathscr{B}_{i,t}$ denotes a set of banks that are active lenders in county i year t.

To further purge any local demand effects from the county-level measures of bank health, we

[17] Institution-year observations in which the institution serves less than three counties in a particular year are excluded.

then estimate the following regression,

$$\widetilde{S}_{i,t} = \gamma \hat{D}_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t}, \tag{9}$$

where county level population is used as weights, $\hat{D}_{i,t}$ denotes the county level demand effects estimated in equation (3), η_i are county fixed effects, and λ_t are time fixed effects. The residual $\hat{\varepsilon}_{i,t}$ capture variation in bank health across counties that is orthogonal to the estimated changes in local credit demand as well as time and county fixed effects, and are our first instrument.

See Gilchrist, et al. (2018) section 3.1 for further details of the construction of the instrument. In the top panels of Figure 6, we chart the supply shock in 2006 and 2014. As can be seen, areas that had positive supply shocks in 2006 received negative supply shocks in 2014, and vice versa. In the left panel of Figure 7, we also chart the dynamics of the supply shock and the institutional purchases for the average county; as can be seen, the two series are highly negatively correlated.

3.3.2 The First Look Program

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 initial days that a property is on the market, offers can be accepted only from homeowners and nonprofits. The period was 15 days to start, and has since been extended to 20 days nationally, and 30 days in Nevada. Freddie Mac offered a very similar program beginning September 2010. Given that the average REO length is a little over 5 months, these delays were nontrivial. [18]

We construct our second instrument to take advantage of the fact that these initiatives affected areas differently depending on the areas' exposure to the GSEs. In counties 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, and focusing on single-family foreclosure and REO sales, we calculate the average share of distressed mortgages that list Fannie Mae as investors in 2009 and Fannie Mae or Freddie Mac after 2009 for each county 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 including economic

[18] 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.

factors at the county level in addition to time and local fixed effects, exposure to Fannie Mae and Freddie Mac's First Look program is uncorrelated with other drivers of house price growth rates. The exposure to the program, however, is correlated with investor purchases in the single-family residential housing market.

In the bottom two panels of Figure 6, we chart the share for the country in 2006 and 2014. The share has gone up significantly from 2006 to 2014 especially in the east and southeast areas. In the right panel of Figure 7, we also chart, for the average county, the dynamics of the share of REO and foreclosure sales that list GSE as investors and the institutional shares purchases. Starting from 2010, these two series are highly negatively correlated as we argued above.

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 county. As seen in the table, in the OLS analysis where no instrument is used, a one-percentage-point increase in the share of institutional buyers leads to an increase in the real house price growth rate of 12 basis points. For the other explanatory variables, a one-percentage-point increase in past real HPI growth rate increases the current one by 40 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 median household income growth also contributes negatively 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 1.3 percentage points in real house price growth rates. The effects of the other explanatory variables remain similar to those in the OLS regression analysis except that growth in real median household income no longer affects house price growth statistically significantly. 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. Shares of institutional buyers are negatively correlated with lagged real house price growth, lagged changes in county unemployment rate, as well as lagged growth rate of real median household income at the county level, but are positively correlated with lagged changes in county population as well as the foreclosure rate. The result that shares of 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, Sockin, and Xiong (2019), 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 were momentum traders. Our analysis here suggests that 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 instruments affect share of institutional purchases negatively and statistically significantly. In particular, areas that are affected positively by the credit supply shock to individuals or by the First Look programs had lower shares of institutional buyers, as one would predict.

To arrive at an estimate of the overall impact of institutional buyers on the local housing market, we multiply the marginal effect from these estimations by changes in institutional buyers, and then divide by changes in the real house price growth rates and homeownership rates during this period, respectively. Specifically, during our sample period, shares of institutional buyers went up by 4.2 percentage points. The growth rate of real house prices increased by 9.3 percentage points. As a result, changes in institutional purchases explain 58 (=4.2*1.3/9.3) percent of the changes in house price growth rates.

3.5 Robustness Analysis

We conduct several robustness tests. First, we use several different definitions of investors. Then we study the effects associated with large institutional buyers and small LLCs. The third robustness analysis focuses on different samples, areas with low housing supply elasticity as identified by Saiz (2010) and areas with rent controls.

3.5.1 Alternative Definitions of Investors

Using alternative definitions of investors as discussed in the data section, we repeat our analysis and present the results in Table 5. In the second column, we use the definition of institutional investors plus individual investors with mortgages. There we see that the effect on house price growth rates associated with a one-percentage point increase in the share of transactions by this group of buyers, at 2.65, is much larger than the benchmark.

Turning to the third column, adding individual cash buyers to institutional buyers and individual investors with mortgages yields a smaller marginal effect on house prices than the benchmark for each percentage change in the share of these buyers, 0.70 versus 1.34. Finally, in column 4, net institutional buyers have a somewhat larger marginal effect than the benchmark definition of institutional investors on changes in the house price growth rates, 1.73 versus 1.34.

3.5.2 Large versus Small Institutional Buyers

We now investigate whether large and small institutional buyers affect the housing market differently. The large institutional buyers are those affiliated with the top 20 institutions discussed in

section 2. Figure 8 depicts the geographic distribution of these large institutional buyers in 2014. As can be seen, these large institutions concentrate in the south and southeast of the country.

We term institutional buyers that take the form of limited liability companies as small institutional buyers. The regression results are reported in Table 6. As we see from the table, the marginal effect is much larger for the large institutional buyers and is roughly the same for institutional buyers in total as for LLCs. However, from 2006 to 2014, the share of large institutional buyers of total purchases increases from virtually zero to 1.47 percent while the share of LLC purchases goes up by 4.04 percentage points. So in percentage terms, the LLCs' purchase activities overall have a larger effect on the rise of local house price growth rates. It is worth emphasizing that large institutions arrive after 2010 in the residential housing market, much later than the LLCs do.

3.5.3 Alternative Samples

We present our results pertaining to different samples in Table 7. In terms of housing supply elasticity, we report the results using only MSAs whose supply elasticities ranked at the bottom half of our sample (see Table 1 of Saiz 2010). Note that Saiz (2010) only ranks metro areas with population exceeding 500,000. We conjecture that because of their inelastic supply, everything else the same, any changes in demand would have bigger effects here than they would in more elastic areas. Indeed, as expected, in these cities, the effect associated with institutional buyers is larger for house price growth rates.

One law that affects the profit margin of real estate investors is the rent control or stabilization policy that limits the amount of rent and the amount that rent can be increased in any year. Thus, rent control/stabilization (or just generally more tenant-friendly climates in these places) makes it less likely that investors choose to rent out properties, rather than reselling them. If that is the case, then in places with these renter-friendly rules, investors will have a less stabilizing influence on house prices, because they won't be keeping that supply off the for-sale market.

All the rent control laws and regulations are passed by cities. As of 2018, cities with rent control are located in California, District of Columbia, Maryland, New Jersey, and New York. As the next analysis, we focus our analysis to the areas excluding counties in these four states that contain cities with rent control or stabilization laws. The prediction is that all else equal, investors exert larger impact on the local housing market when there is no rent control than they will when there is rent control. Our results are presented in the second column of the bottom panel of Table 7. Indeed, in areas with no rent controls, the marginal effect on local house price growth effects is larger than that in the benchmark sample.

4 Transmitting Mechanism and Impact on the Local 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, we now investigate the transmitting mechanism through which institutional investors' purchases of single family homes impact the local housing market. In particular, we examine changes in the number of days distressed properties spent in REO and changes in vacancy rates associated with residential properties. Then we investigate the local labor market and rental market. Specifically, we estimate regressions similar to those in the baseline case, except that we replace house price growth rate with the dependent variables that we are interested in: days in REO, vacancy rates, county unemployment rate, and employment growth rate. We also add lagged values of the new dependent variable as an additional explanatory variable.

4.1 Days in REO and Vacancy Rates

We obtain days of distressed single-family homes in REO by county and by year using the Black Knight McDash Data. Counties that experienced no REO sales during certain period are dropped out of the sample. Residential property vacancy rate comes from HUD's aggregated USPS administrative data on address vacancies. A vacant address is an address that delivery staff on urban routes have identified as being vacant (not collecting mail) for 90 days or longer.

We present the results in Table 8. According to column 2, a one-standard deviation increase in institutional buyers' share of total transactions reduces the average REO time by 1.3 months (0.2*6.4), or 22 percent. In terms of the county-level vacancy rates for residential properties, we find that institutional buyers also significantly reduce vacancy rates as reported in column 3 of Table 8. Specifically, during our sample period, a one-standard deviation increase in institutional buyers' share in total purchases reduces the vacancy rate by 0.9 percentage point (0.14*6.4), or 26 percent. The fact that the presence of institutional buyers lowers vacancy rates of residential properties suggests that these investors have bought vacant foreclosed properties, have rented out their purchased properties, or have done both.

4.2 The Local Labor Market

After purchasing a house, institutional investors 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, thereby reducing local unemployment rates. Unfortunately, we do not observe this rehabilitation or redevelopment 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 in their local market.

Table 9 summarizes our results. According to Table 9, a change in institutions' presence as buyers in the local market decreases the local unemployment rate and increases total local employment growth, especially employment growth in the construction sector. Specifically, a one-standard deviation increase in the share of institutional purchases reduces the changes in unemployment rates by about 36 basis points, raises the growth of total county employment by 3.5 percentage points, and increases the growth of employment in the construction sector by 7.6 percentage points. These effects are sizable.

4.3 The Homeownership Rates and the Local Rental Market

Although we do not observe institutional activities after institutional investors purchase the houses, we do observe their additional buying and selling activities up until 2014. Of those who bought and sold in our sample between 2006 and 2014, according to our data, institutions had an average and median tenure of 1 year.[19,20] Our analysis on the impact of institutional buyers on local county-level homeownership rates, reported on the second column of Table 10, indicates that a one-standard deviation increase in the share of institutional buyers subtracted 3 percentage points from the local homeownership rates.

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 county-level rental index for single-family houses from Zillow.com.[21] In Table 10 column 3, we report our results. In terms of county-level rent-price ratio, the impact from the institutional buyers is positive but not statistically significant.[22]

Next we turn to the county eviction rates, which we obtained from the Eviction Lab at Princeton University. Unfortunately the eviction rates do not differentiate between housing types and are for all housing in the county. These rates also should be viewed as a lower bound as they do not capture informal evictions occurring outside the courtroom. Turning to column 4 of Table 10, we do not find any effect of rising institutional buyers on the local eviction rates. In other words, our analysis does not provide evidence that institutional landlords may be more ruthless in that they

[19]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 longer than reported here.

[20]In 2013, Blackstone's Invitation Homes issued the first single-family rental securitization. By 2015, there were 23 of these securitizations. 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.

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

[22]This result is in contrast with Gete and Reher (2018) who find that tightened lender conditions cause both local rents and local rent-to-price ratio to rise. Part of the difference comes from the unit of observation. When using MSA-level rent indexes, we also find that local rent-price indexes rise with the increase in the share of institutional buyers though the effect on the rent-price ratio becomes statistically insignificant. Our results are consistent with those in Eisfeldt and Demers (2018), that is, the rent yield and house prices moved in different directions at the MSA level for single family homes

raise rents more and evict tenants more as depicted by the media.[23] However, these results may be due to the limitation of our eviction data and should be taken with grain of salt. Using the eviction data for Fulton County, Georgia for 2015, 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 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 trend of institutions as buyers 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 counties' exposure to changes in local lending conditions and to the First Look programs initiated by the GSEs in the aftermath of the mortgage crisis.

Our main finding is that between 2006 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 stronger in areas with low housing supply elasticity and in areas with no rent control or stabilization laws. Our results are robust to alternative definitions of investors, including individual investors with mortgages, individual cash purchases, or using net institutional purchases. We further demonstrate that the main transmitting mechanisms come from reduction in time distressed properties spend in REO and in vacancy rates. Finally, we show that institutional investors also help improve labor market in terms of both lowered unemployment rates and increased employment in construction. We do not, however, find significant evidence that institutional investors' buying in the single-family housing market affects the local rental market, either rental price growth rates or eviction rates at the county level through 2014. Future research includes studying the post-purchase behavior of these institutional buyers and their longer term economic impact on the local economy.

[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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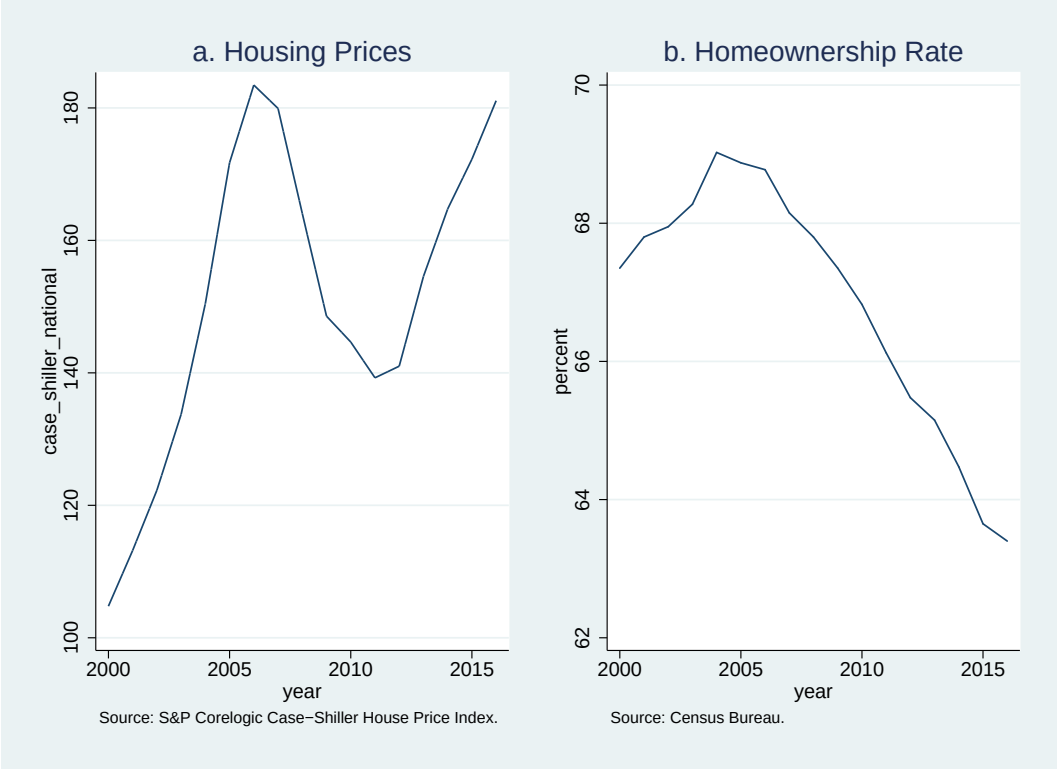

Figure 1: **U.S. Residential House Price and Homeownership Rate**

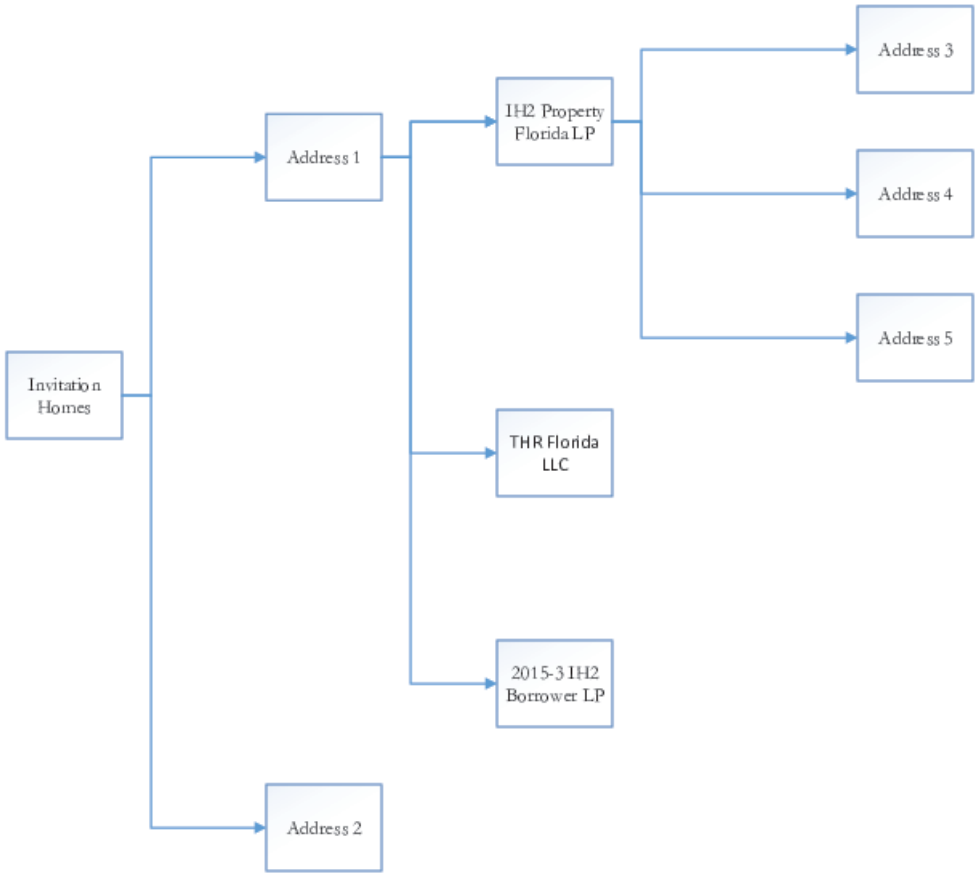

Figure 2: **Top-down Strategy to Indentify Large Institution Buyers.**

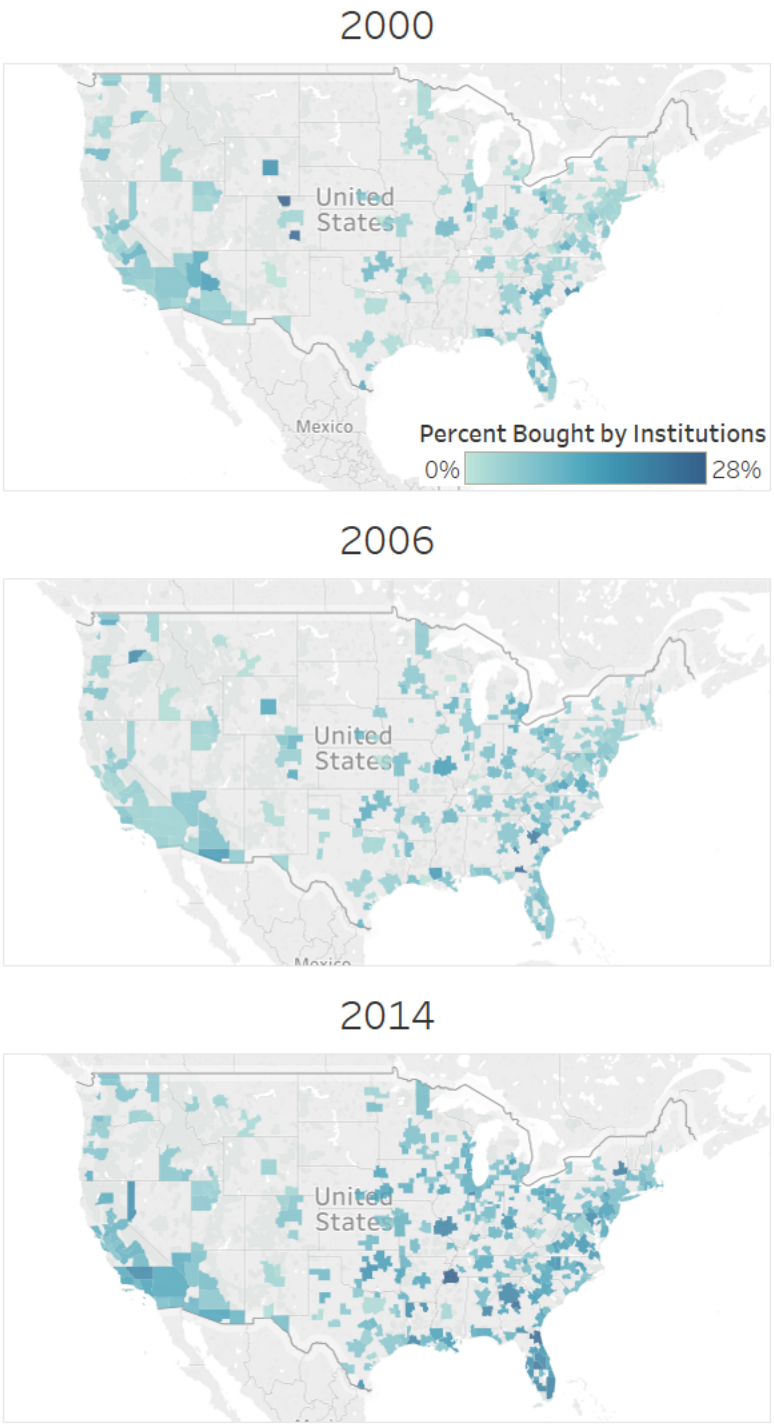

Figure 3: **Institutional Purchases.** Areas not shaded by blue are not covered by our data. Data source: CoreLogic Solutions.

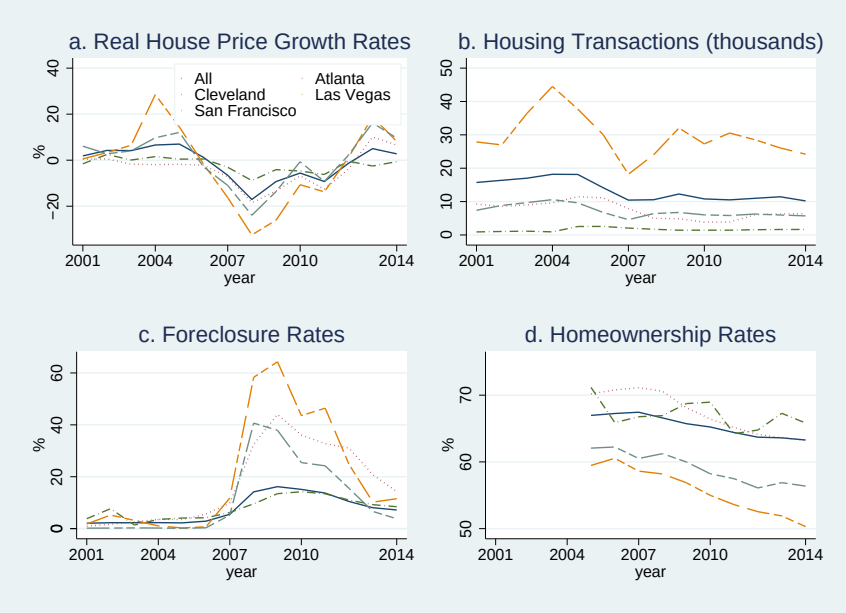

Figure 4: **Housing Conditions.** This figure describes selected housing statistics of all the counties on average and four selected MSAs in our dataset. The four MSAs are chosen because of their differing housing conditions. The real house price index is obtained by deflating the nominal county-level house price index from CoreLogic Solutions by the headline Consumer Price Index. The county-level homeownership rates are not available before 2005. Data source: CoreLogic Solutions; U.S. Census Bureau.

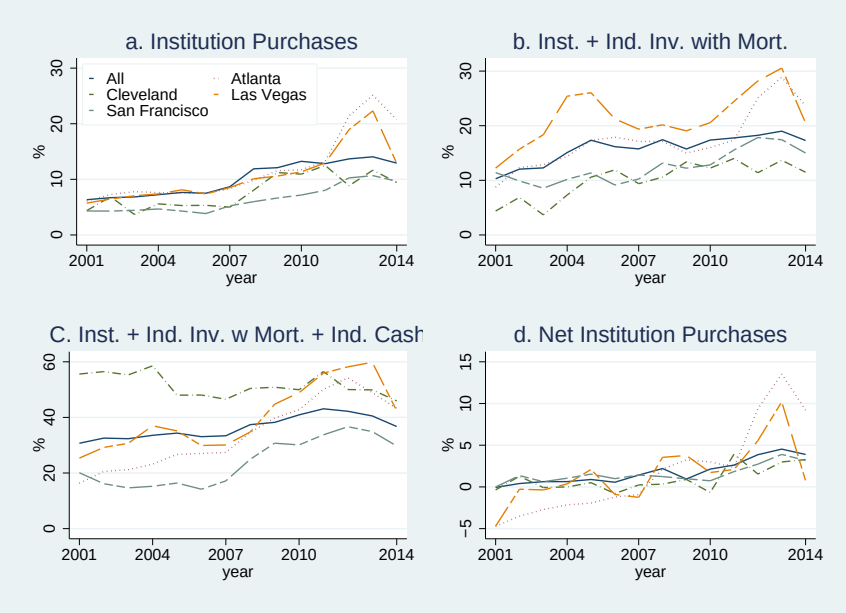

Figure 5: **Investor Activities.** This figure depicts investors' purchase of single-family homes for the country on average and for four selected MSAs. Individual investors with mortgages are estimated by taking the product of the share of individual mortgage purchases from CoreLogic Solutions and the share of individual mortgage purchases that are for investment properties calcuated from the Black Knight McDash Data. Cash purchases by individuals are identified by the CoreLogic Solutions Deed Data. Net institutional purchases are defined as institutional purchases net of institutional sales. Institutional sales are identified similarly as institutional purchases. Data source: CoreLogic Solutions and Black Knight McDash Data.

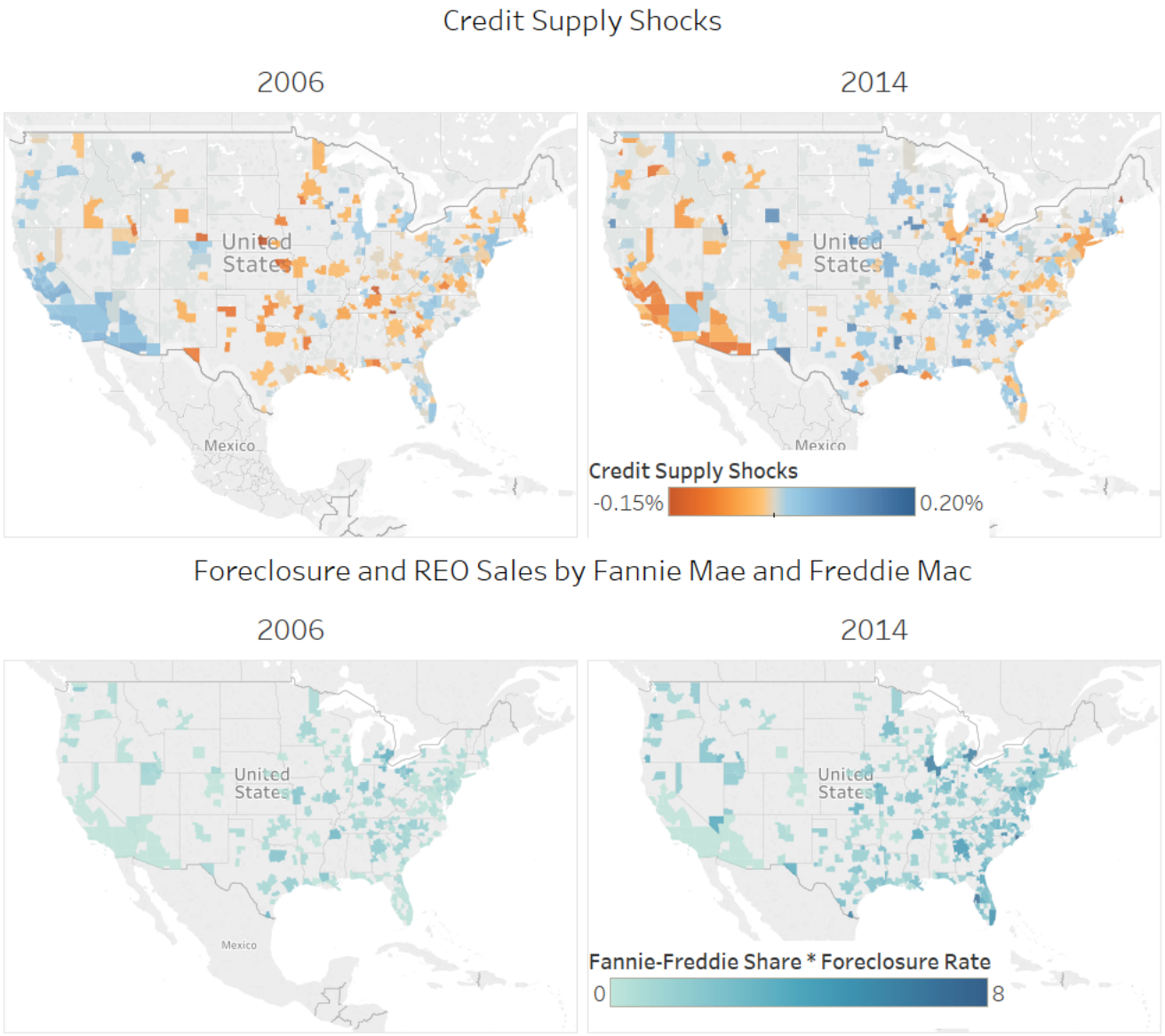

Figure 6: **Credit Supply Shocks and Foreclosure and REO Sales by Fannie Mae and Freddie Mac.** This figure reports credit supply shocks constructed according to Gilchrist et al. (2018) in the top panel and the share of foreclosure and REO sales that list Fannie Mae or Freddie Mac as investors in the bottom panel. Figures on the left are for year 2006. Figures on the right are for year 2014. Data source: HMDA and Black Knight McDash Data.

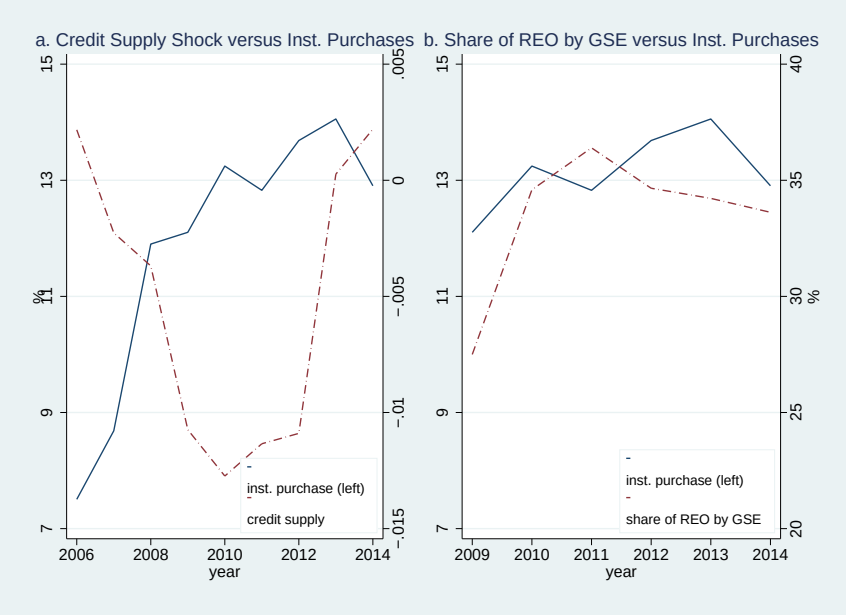

Figure 7: **Instruments.** This figure presents the dynamics of the two instruments used in the paper and that of the institutional purchases. Data source: CoreLogic Solutions, HMDA, and Black Knight McDash.

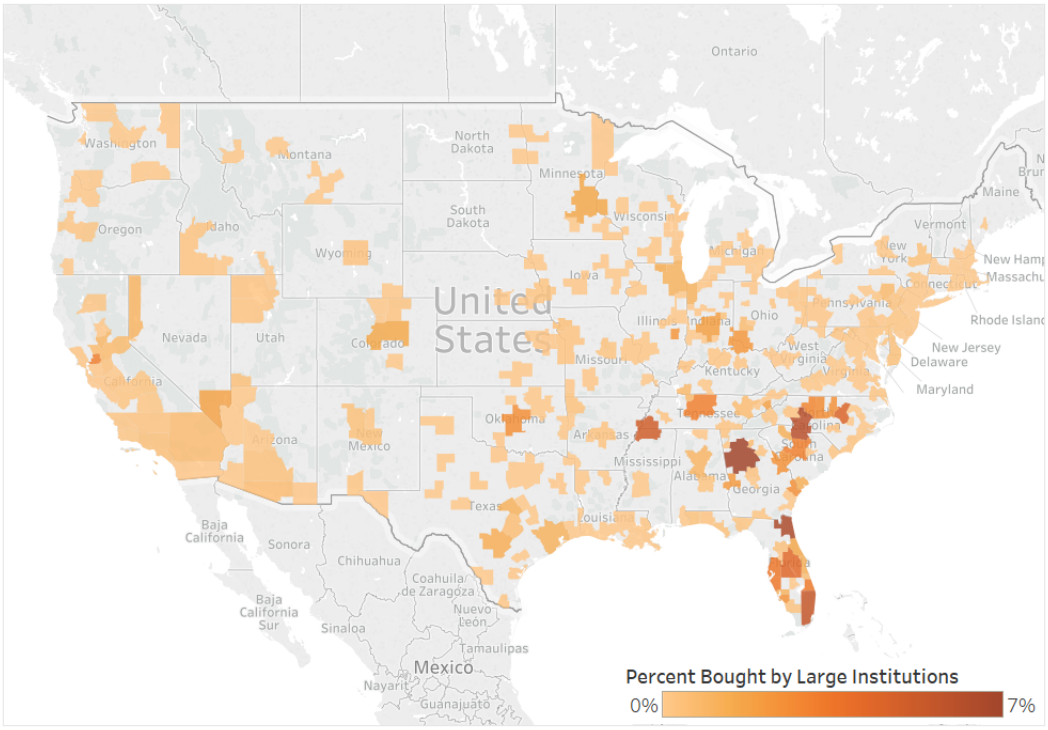

Figure 8: **Share of Large Institution Buyers (2014).** This figure presents the distribution of large institutional purchases in 2014. See main text of the paper for the names of the 20 large institutions. Data source: CoreLogic Solutions.

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: Benchmark Model**

	2006-2014				
variable	mean	median	s.d.	min	max
Share of institutional buyers (%)	11.72	10.45	6.43	0	85.57
Share of institutional buyers plus individual investors with mortgages (%)[1]	17.17	16.00	7.02	0	85.62
Share of institutional buyers plus individual investors with mortgages plus individual cash purchases (%)	38.13	36.03	18.85	0	100
Share of institutional buyers net of sellers (%)[2]	2.45	1.83	4.44	-73.91	85.57
Share of purchases by 20 big institutions (%)	0.41	0	1.31	0	20.95
Foreclosure rates (%)	9.96	6.71	9.92	0	100
Real county house price growth rate (%)	-3.97	-3.26	8.54	-38.95	20.08
Homeownership rate (%)	65.51	65.66	8.69	18.15	90.69
Population (thousands)	1086	534	1684	1.64	10038
Real median household income (thousands, 1982 $)	24.85	23.52	5.84	11.46	54.61
Growth rate of real median hh income (%)	-0.14	-0.17	4.03	-17.16	20.57
Median REO time (months)[3]	5.79	5.00	2.11	1	30
Vacancy rate for residential properties (%)[4]	3.26	3.00	1.93	0.000	17.60
County unemployment rate (%)	6.78	6.16	2.73	1.95	28.85
County employment growth rate (%)	0.42	0.90	5.21	-20.00	19.97
County construction employment growth rate (%)	-0.64	-0.10	11.24	-34.92	30.83
Growth in rent-price ratio (%)[5]	-0.011	-0.34	6.32	-28.43	35.54
Eviction rate (%)	3.42	2.97	2.34	0	24.16
Number of observations	7,278 (935 counties)				

This table presents summary statistics for variables used in the empirical analysis. 1. We obtain the share of individual investors with mortgages from the residential mortgage servicing database provided by Black Knight McDash Data. Then we multiply the share with the fraction of transactions listed with mortgages in our Deed data and add it to the share of institutional buyers we constructed. 2. We don't classify REO sales as institutional sales. 3. Months in REO (real-estate-owned) is calculated using single-family housing data obtained from the Black Knight McDash data averaged to the county level. Those sold in auctions are assigned a value of zero. 4. The vacancy rate for residential properties comes from HUD's aggregated USPS administrative data. An address is considered vacant if delivery staff on urban routes have identified it as being vacant (not collecting mail) for 90 days or longer. 5. County-level rent index is available since 2010. The data is available since 2008. Data source: CoreLogic Solutions, Black Knight McDash Data, HMDA, Zillow Research at zillow.com downloaded between January 2008 and August 2008, and Princeton Eviction Lab.

Table 3: **Benchmark Estimation**

	OLS		2SLS	
Dependent variable: Real HPI gr. rate (%)	coeff.	s.e.	coeff.	s.e.
Share of institutional buyers (%)	0.116***	0.017	1.344***	0.016
Lagged real HPI growth rate (%)	0.399***	0.014	0.532***	0.024
Lagged growth rate in population (%)	0.098***	0.016	-0.010	0.019
Lagged changes in foreclosure rate (%)	-19.321***	1.061	-12.180***	1.530
Lagged changes in unemployment rate (%)	-1.584***	0.104	-0.419**	0.207
Lagged growth rate of real median hh income (%)	-0.098***	0.016	-0.015	0.021
County and year dummies	yes		yes	
Instruments	no		yes	
Under identification test (P-value)			0.000	
Weak-instrument Anderson-Rubin Wald Test (P-value)			0.000	
Adjusted R-squared	0.775		0.571	
Number of observations	7,278			

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. 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: 2SLS First Stage**

	Institutional Purchases (%)	
variable	coeff.	s.e.
Lagged real house price growth rate (%)	-0.024**	0.009
Lagged growth in county population (%)	0.055***	0.010
Lagged changes in foreclosure rate (%)	0.633	0.976
Lagged changes in unemployment rate (%)	-0.744***	0.081
Lagged growth rate of real median hh income (%)	-0.029***	0.013
MSA and year dummies	yes	
Instrument:		
Credit supply shock at county level	-2.623***	0.964
Lagged share of Fannie/Freddie loans in foreclosure after 2009	-0.205***	0.028
Number of observations	7,278	

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: Alternative Definitions of Investors**

Dependent variable: Real HPI Growth Rate (%)	Institution + individual investors with mortgages		Institution + individual with mortgages + ind. cash purchase		Net institution investors	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Share of investors (%)	2.649***	0.658	0.700***	0.246	1.726**	0.281
Other controls	yes		yes		yes	
County and year dummies	yes		yes		yes	
Uncentered R-squared	0.075		0.246		0.562	
Number of observations	7,278					

This table presents some alternative Two-Stage Least Squares estimation results using different definitions of investors in the single-family residential housing market. The dependent variable is the real house price growth rate. See the main text of the paper and the note in table 1 for the construction of individual investors with mortgages. * 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 6: **Robustness Tests: Big Institutions and LLCs**

Dependent variable: Real HPI Growth Rate (%)	Twenty Big institution purchases		Limited Liability Companies (LLCs)	
	coeff.	s.e.	coeff.	s.e.
Share of investors (%)	3.942***	0.743	1.493***	0.233
Other controls	yes		yes	
County and year dummies	yes		yes	
Uncentered R-squared	0.558		0.714	
Number of observations	7,278			

This table presents some alternative Two-Stage Least Squares estimation results using different definitions of investors in the single-family residential housing market. The dependent variable is the real house price growth rate. See the main text of the paper for the 20 big institutions that we identify. LLCs are those institutions that have LLC in the name. * 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: **Robustness Tests: Alternative Samples**

Dependent variable:	Low housing supply elasticity area (bottom half of ranked)		Areas with no rent controls or stabilization	
Real HPI growth rate (%)	coeff.	s.e.	coeff.	s.e.
Share of institutional buyers (%)	2.059***	0.592	1.459***	0.231
Other controls	yes		yes	
County and year dummies	yes		yes	
Uncentered R-squared	0.389		0.524	
Number of observations	1,176		4,805	

This table presents some alternative Two-Stage Least Squares estimation results. The dependent variable is the real house price growth rate. See Table 1 on Saiz (2010) for the construction of the housing supply elasticity rank of MSAs with population over 500,000. As of 2018, four states (California, New York, New Jersey, and Maryland) and the District of Columbia have localities in which some form of residential rent control is in effect. We classify a county as having a rent control or stabilization policy if it contains a city which has that policy. * 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: **Transmitting Mechanism: Days in REO and Vacancy Rates**

Dependent variable:	Median days of single-family houses in REO (months)		Vacancy rate of residential properties (%)	
	coeff.	s.e.	coeff.	s.e.
Share of institutional	-0.181***	0.047	-0.141***	0.081
Other controls	yes		yes	
County and year dummies	yes		yes	
Uncentered R-squared	0.345		0.050	
Number of observations	7,278		5,705	

Months in REO (real-estate-owned) is calculated using single-family housing data obtained from the Black Knight McDash data averaged to the county level. Those sold in auctions are assigned a value of zero. The county level residential property vacancy rates are available after 2007. * indicates statistical significance at 10 percent level; ** at 5 percent level; and *** at 1 percent level. Vacany rates are missing for many areas in the earlier years. Data source: CoreLogic Solutions, Black Knight McDash Data, and Census Bureau/Haver Analytics.

Table 9: **Impact on the Labor Market**

Dependent variable:	Unemployment Rate (%)		Growth in total employment (%)		Growth of construction employment (%)	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Share of institutional buyers (%)	-0.056***	0.032	0.537*	0.291	1.186***	0.478
Other controls	yes		yes		yes	
County and year dummies	yes		yes		yes	
Uncentered R-squared	0.648		0.197		0.271	
Number of observations	7,278					

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 10: **Impact on the Housing Market**

Dependent variable:	Homeownership rate (%)		Growth of rent-price ratio (%) (2011-2014)		Eviction rates (%)	
data period						
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Share of institutional buyers (%)	-0.516***	0.099	1.439	2.242	0.031	0.035
Other controls	yes		yes		yes	
County and year dummies	yes		yes		yes	
Uncentered R-Squared	0.287		0.004		0.235	
Number of observations	7,278		2,286		5,750	

This table presents some alternative Two-Stage Least Squares estimation results. The rent index is the county-level rent index from Zillow deflated by headline consumer price index. The rent-price index is obtained by taking the ratio of the Zillow county-level rent index and the house price index at the county level also from Zillow. The rent index is only available from 2010. 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.