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Second-Home Buying and the Housing Boom and Bust

Daniel García*

May 3, 2019

Abstract

The effects of the surge in second-home buying (homeowners acquiring nonprimary residences) on the housing boom and bust remain an open question partly because reliable geographic data is currently unavailable. This paper constructs local data on second-home buying by merging credit bureau data with mortgage servicing records. The identification strategy exploits the fact that the vacation share of housing in 2000 predicts second-home origination shares during the boom years, while also uncorrelated with other boom-bust drivers including proxies for local housing expectations, the use of alternative and privately securitized mortgages, and supply constraints. Areas with plausibly exogenous increases in second-home buying experienced a sharper boom and bust. Overall, second-home buying could explain about 30 percent and 10 percent of the run-up in construction employment and house prices, respectively, from 2000 to 2006.

JEL codes: R12, R21, R31

Keywords: Real estate investors, speculation, housing boom

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1 Introduction

The record-high level of second-home buying (homeowners acquiring nonprimary residences) was a central feature of the 2000s housing boom.[1] Bhutta (2015) shows that second-home buyers contributed more to aggregate mortgage debt during the boom years than did all first-time buyers. Second-home buyers were typically over-leveraged, and despite having middle to high income and credit scores, experienced higher default rates than average during the recession (Haughwout et al. (2011); Albanesi et al. (2017); Albanesi (2018)). The macroeconomic effects could have been sizable; Chinco and Mayer (2016) find that second-home buying significantly contributed to mispricing in housing during the boom years. However, their data covers only 21 US cities, and more comprehensive studies have so far been limited by lack of adequate data.

This paper is the first to measure second-home buying based on property location with broad coverage of the US economy, by combining credit bureau data with mortgage servicing records. To estimate the effects of second-home buying on economic activity during the housing boom and bust, I use as an instrument the vacation share of housing from the 2000 census, to isolate the variation in second-home buying purely explained by differences in physical local amenity values versus other factors such as variation in housing market expectations. I find that localities with larger increases in second-home buying experienced a more pronounced boom and bust – stronger growth in house prices and construction employment from 2000 to 2006, and sharper declines in activity from 2006 to 2010. Overall, a partial equilibrium aggregation exercise suggests second-home buying could explain about 30 percent and 10 percent of the run-up in construction employment and house prices, respectively, over 2000-2006.

The main novelty of this paper from a data perspective is to use the Credit Risk Insight Servicing McDash (CRISM) dataset, which merges credit bureau data (Equifax) with mortgage servicing records (Black Knight McDash). I identify buyers of second-homes as those having 2 or more first-lien mortgages (same as Haughwout et al. 2011; Bhutta 2015

[1] In the literature, buyers of second-homes (nonprimary residences) are often referred to as property or real estate investors. Instead, I use the terms second-home buyers or nonprimary residence buyers, because some second-homes may have a strong consumption motive in addition to an investment one.

and others) and merge second-home identifiers with property location from Black Knight McDash. I define the second-home origination share as the ratio of new home purchase loans for nonprimary residences to total new home purchase loans at the county-level.

There is a strong and positive ordinary least squares (OLS) association between the county-level second-home origination share and house price changes during the housing boom years. Variation in the second-home origination share explains almost 55 percent of the variation in house price changes from 2000 to 2006 at the county-level. This association may reflect different factors. The possibility assessed in this paper is that second-home buying may have pushed up activity and prices during the boom years. On the other hand, local house price expectations could have attracted second-home buyers investing in real estate. For example, many booming areas had high second-home origination shares, including the home counties of Los Angeles, Las Vegas, Miami, and Phoenix. These localities also had high shares of alternative (not fixed rate) and privately securitized mortgage (PLS), making it challenging to isolate the causal effects of any single determinant of the housing boom.

To disentangle causality, I use an instrument for second-home origination shares – the vacation share of housing from the 2000 census – which is uncorrelated with proxies for local housing expectations and other drivers of the housing boom such as the use of alternative and PLS mortgages as well as supply constraints. The identification strategy exploits the fact that predetermined, physical differences in amenity values help explain significant geographic variation in second-home buying. Areas with high vacation shares have appealing physical qualities, such as warm winters and a waterfront. These areas include localities in sand states such as in Florida and California, but also localities along the Eastern Seaboard, close to the Great Lakes, and in locations with appealing terrain such as near the Ozark Mountains. In fact, there is enough variation in the vacation share of housing to allow for specifications with state fixed effects, which yield coefficient estimates that are very similar to specifications without them.

The main concern with instrument validity is that the vacation share of housing may be correlated with other drivers of the housing boom. Vacation localities do differ along some observables, for example, they tend to have older, whiter, and more rural populations. While I can control for these observables, unobserved characteristics such as housing expectations

may partly explain why vacation localities had larger increases in second-home origination shares during the boom. However, judging by the debt behavior of locals, it does not appear that house price expectations were significantly stronger in vacation localities than elsewhere. Had locals in vacation areas expected stronger appreciation, they may have taken out more home equity loans and mortgages or bought more nonprimary residences than local elsewhere. Instead, the vacation share of housing is not significantly associated with changes in mortgage or home equity loan debt balances during the boom or with second-home origination shares when measured at borrower (rather than property) location. Moreover, the vacation share of housing is also uncorrelated with various drivers of the boom, including the local share of subprime borrowers, the use of alternative and PLS mortgages, and housing supply elasticities. I also verify that vacation localities activity is not generally cyclical, with yearly changes in house prices not statistically different in vacation localities during both recession and non-recession years, using local house price data going back to the 1970s. In fact, trends in house prices and construction employment are essentially identical before 2000, with differential patterns emerging only after 2000, when second-home buying began to increase.

The results show that second-home buying (when instrumented using the 2000 share of vacation housing) contributed significantly to the boom and bust in housing activity over 2000-2010. Areas where the share of second-home originations increased more experienced faster growth in construction employment and house prices from 2000 to 2006. All else equal, in localities where the share of second-home originations increased by 10 percentage points more from 2000 to 2006, growth in construction employment and house prices was stronger on average by 12 percentage points and 17 percentage points, respectively.

However, over the next years, the effects of second-home activity turn contractionary. Areas with larger increases in second-home originations shares from 2000 to 2006 contracted more severely from 2006 to 2010. On average, in localities with 10 percentage point higher second-home origination shares in 2000-2006, changes in delinquency rates were higher on average by 2 percentage points, and declines in house price and construction employment were 10 percentage points and 11 percentage points stronger on average, respectively, over 2006-2010. These results are new evidence pointing to the damaging effects during the

housing bust of second-home loans issued during the boom, consistent with Haughwout et al. (2011) and Albanesi (2018) who find that second-home buyers had significantly higher default rates than average.

Overall, localities with plausibly exogenous stronger increases in second-home origination shares during the boom years expanded more from 2000 to 2006, but contracted more sharply from 2006 to 2010, with the effects roughly offsetting. When looking at changes in construction employment and house prices from 2000 to 2010 (or 2000 to 2014), the estimated effects are close to zero and not significant.

The effects of the increase in second-home buying appear concentrated in the housing sector. The employment effects are not significant for either total private employment excluding construction or nontradable employment, over both the 2000-2006 and 2006-2010 periods. It is possible that the overall employment effects were larger but are not captured by the county-level models, for example, loan losses likely affected the overall health of the financial system, in turn having an effect on aggregate employment. However, the lack of significant results in the county-level estimates for broader employment categories does ameliorate concerns about instrument validity, since local shocks affecting overall employment are uncorrelated with the instrument. Moreover, the 2SLS point estimates are on average about 40 percent smaller than their OLS counterparts, suggesting the latter are biased upward because of other factors such as reverse causality. Results are also very similar when using state fixed effects.

To understand the extent to which second-home buying may have affected the severity of the housing boom, I combine the 2SLS estimates with the counterfactual assumptions that the share of second-home buying remained at its 2000 level instead of rising. In the baseline scenario, I find that second-home buying could explain about 30 and 10 percent of the run-up in construction employment, respectively, from 2000 to 2006. However, this estimate is subject to uncertainty about coefficient estimates, in addition to assumptions about both the extent to which the increase in second-home origination shares during the boom was an endogenous response to other changes in the economy, as well as the magnitude of the general equilibrium effects of second-home buying not captured in the county-level models. Reflecting uncertainty in the model estimates, I find that second-home buying could have

explained between 10 to 44 percent of the runup in construction employment, and between 6 and 23 percent of the increase in house prices over from 2000 to 2006.

This paper adds to the growing literature showing that second-home buyers were an important driver of the boom and bust. Bhutta (2015) documents that second-home buyers contributed significantly to the rise in aggregate mortgage debt during the housing boom. Second home buyers had higher than average default rates during the recession (Haughwout et al. 2011) though they were typically higher income and prime prior to it (Albanesi et al. 2017; Albanesi 2018). Quantitative work, such as Piazzesi and Schneider (2009); Burnside et al. (2016); DeFusco et al. (2017); Nieuwerburgh and Favilukis (2017), highlights how second-home buyers can influence other buyers and drive boom-bust episodes. Chinco and Mayer (2016) find that second-home buying led to higher house prices (and mispricing) in a panel of 21 U.S. cities using a high frequency panel VAR identification approach. Gao et al. (2018) also find that second-home buying contributed to the boom-bust in activity, though they use data from the Home Mortgage Disclosure Act, which is known to under-report second-home buying (Elul and Tilson (2015)). Overall, the results in this paper are complementary to this literature; the main contribution is using new data combining the strength of datasets previously used in isolation (credit bureau data and mortgage servicing records), a novel identification strategy, and results that include a broad set of outcome variables including employment.

More broadly, this paper fits in the extensive body of work studying the determinants of the housing boom. The housing boom had many often interrelated causes involving households up and down the income and credit score distributions (Adelino et al. 2016; Foote et al. 2016; Albanesi et al. 2017). One of the main contributions of this paper is isolating the effect of second-home buying (as instrumented via the vacation share of housing) on changes in construction employment and house prices during the 2000s. I do so by showing that the vacation share of housing is uncorrelated with major determinants of the housing boom identified in the literature, including: the interaction of changes in housing demand with supply constraints (Saiz 2010; Aladangady 2017); the use of alternative mortgages such as interest-only or balloon mortgages (Barlevy and Fisher 2012; Foote et al. 2008); the expansion in subprime credit (Mian and Sufi 2009; Demyanyk and Hemert 2011; Gerardi

et al. 2008); and the boom-bust in private-label securitization (Keys et al. 2010; Nadauld and Sherlund 2009; Mian and Sufi 2018; Garcia 2018).

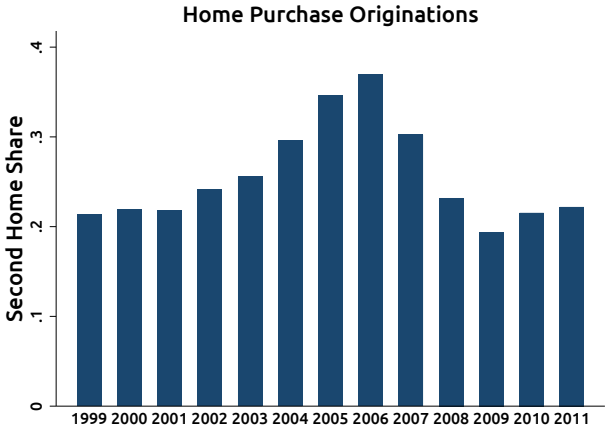
2 Data

The FRBNY Consumer Credit Panel/Equifax contains credit reporting data for a nationally representative 5 percent sample of all adults with a social security number and credit report beginning in 1999. The data contain information on the number of open first-lien mortgages per borrower. Second home purchase originations are measured as new purchase loans for borrowers with 2 or more properties. For each origination, I use the borrower's number of first mortgage accounts four quarters ahead of the origination, to avoid counting false positives, for example, a refinancing or change in residency that temporarily shows the borrower as having two properties due to reporting lags. Figure 1 shows the aggregate second-home origination share, which rose from 21 percent in 2000 to its peak of 36 percent in 2006, subsequently falling back to near 20 percent over 2009-2011. These patterns are similar to those reported in Haughwout et al. (2011) (using the same dataset) and Albanesi (2018) (using Experian), with both identifying second-home buyers using a similar approach. While credit bureau data are useful in analyzing aggregate trends in second-home buying, these data generally do not contain the address of nonprimary residences acquired.

On the other hand, Black Knight McDash (formerly known as LPS) contains additional loan level characteristics, including property location. The Black Knight McDash dataset is comprised of the servicing portfolios of the largest residential mortgage servicers in the United States, covering about 60 percent of the mortgage market. The main dataset I use in this paper, CRISM, contains credit bureau data from Equifax, matched to the mortgage-level McDash servicing data. CRISM covers about 60 percent of the mortgage market (from McDash). The merge is key since McDash does not contain data on the number of first-lien mortgages by borrower.[2] As before, a second-home origination is identified as an origination

[2]McDash and also HMDA do contain primary residence identifiers, though these are self-reported and evidence in Haughwout et al. (2011) and Elul and Tilson (2015) finds that these data severely underreport second-home buying.

Figure 1: The Aggregate Second Home Origination Share



Note: The figure plots the aggregate second-home origination (new loans for nonprimary residences) share by year. Source: FRBNY Consumer Credit Panel/Equifax and author's calculations.

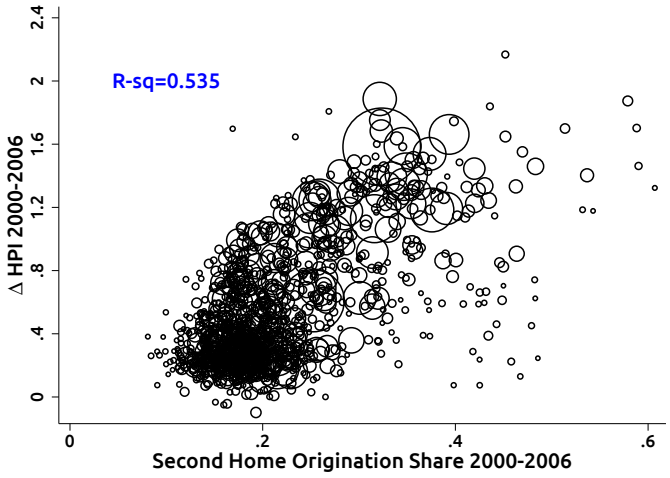
for which the borrower has two or more properties one year after the origination.[3]

Using CRISM, I measure county-level second-home origination shares as the ratio of second-home originations to total originations. Figure 2 plots the county-level percent change in the CoreLogic house price index against the second-home origination shares, both measured over 2000-2006. There is a strong positive association: areas with higher second-home origination shares experienced stronger growth in house prices from 2000 to 2006. The second-home origination share explains almost 55 percent of the variation in house price changes. This association could be driven by a number of factors. One possibility, the hypothesis assessed in this paper, is that historically elevated second-home buying during the housing boom contributed to increases in house prices and residential activity. On the other hand, high shares of second-home buying could instead reflect other factors, such as expectations about house price appreciation, or easy credit conditions due to high local prevalence of alternative rate or privately securitized mortgages.

To isolate the effect of second-home buying on local activity, I use as an instrument the vacation share of housing from the 2000 census. The identification strategy exploits the fact that differences in physical, predetermined local amenity values help explain variation in the second-home origination shares. In particular, the vacation share of housing from the

[3]For originations before 2005, second-home origination status is derived based on the borrower's number of first-lien mortgages in 2005, when the Equifax portion of CRISM is first available.

Figure 2: Δ HPI and Second Home Origination Shares 2000-2006



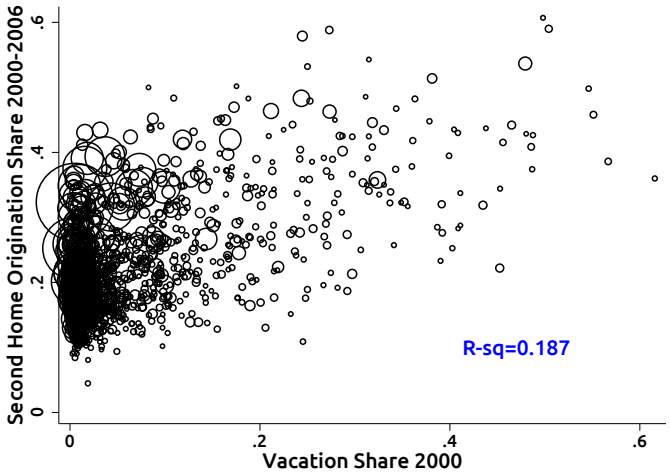
Note: The figure plots county-level changes in house prices (y-axis) against second-home origination shares (x-axis) over 2000-2006. Observations are weighted by housing units in 2000 census. Source: CoreLogic HPI, CRISM, and author's calculations.

2000 decennial Census is positively correlated with the second-home origination shares. The vacation share of housing is defined as the ratio of the stock of vacation units to the total stock of housing units in a locality. Vacation units are those classified by the Census as vacant for seasonal, recreational, or occasional use. Figure 3 plots second-home origination shares over the 2000-2006 period against the vacation share of housing from the 2000 census; the vacation share explains about 19 percent of the variation in the second-home origination shares.

2.1 Vacation Localities

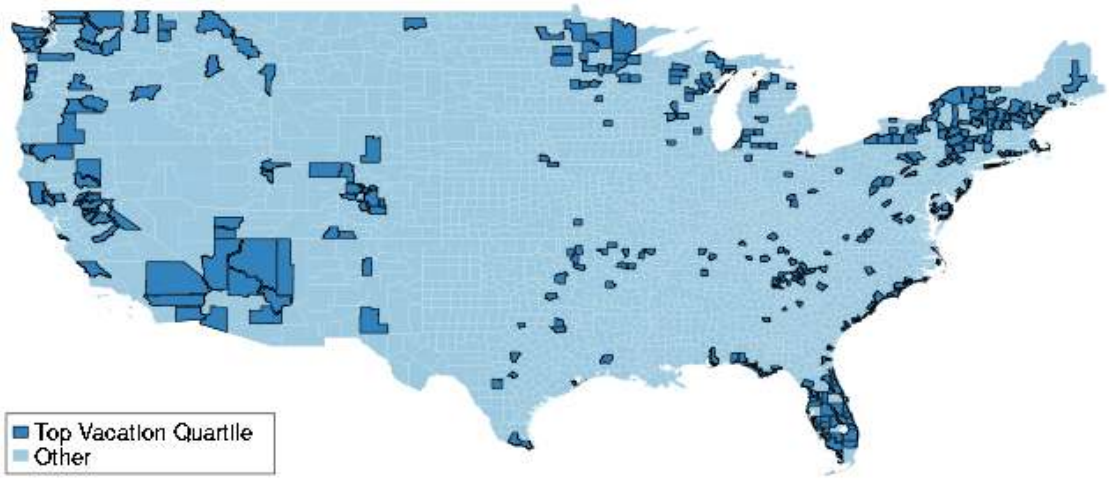
Figure 4 maps the top quartile of vacation localities. Vacation areas have appealing physical characteristics: Many are located near a body of water, such as along the Eastern Seaboard or near the Great Lakes. They tend to have warm winters or are located along mountain ranges such as the Ozarks. The vacation share of housing is nearly collinear when measured in different decennial census years, reflecting the persistent nature of the underlying physical qualities of the localities. For example, the correlation coefficient is 0.97 between the vacation shares in the 2000 and 2010 decennial census years.

Figure 3: Second Home Origination Shares and Vacation Share of Housing



Note: The figure plots county-level second-home origination shares over 2000-2006 (y-axis) against the vacation share of housing from the 2000 census. Observations are weighted by housing units in 2000. Source: CRISM, 2000 census, and author's calculations.

Figure 4: The Geography of Vacation Localities



Note: The map shows the geographic distribution of the top quartile of the vacation share of housing from the 2000 census versus other locations. The top quartile of vacation localities is shaded in dark blue, while the other localities are in lighter blue. Source: 2000 census, and author's calculations.

There is a strong positive association between second-home origination shares during the boom years and the vacation share of housing, but not all areas with high second-home origination shares were vacation localities in particular, some populous urban areas with booming real estate markets in the 2000s, such as Los Angeles, Phoenix, and Miami. While

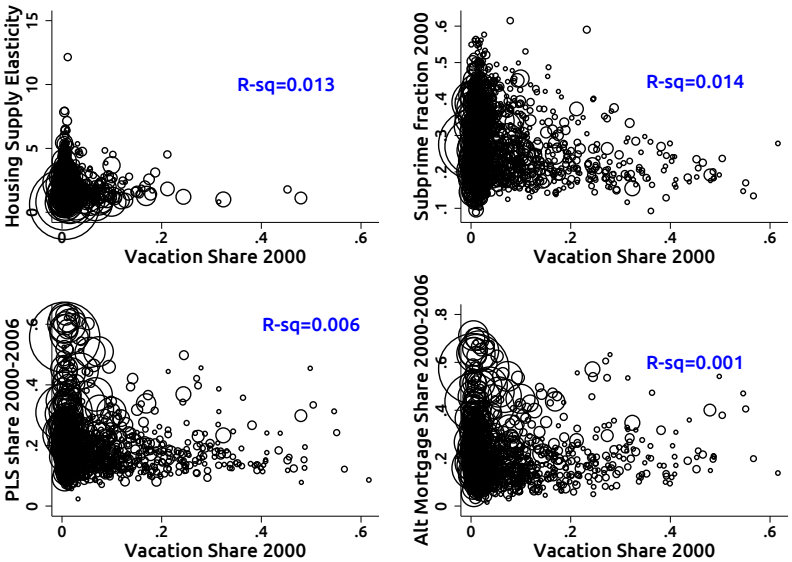
important observations, identifying what drove the housing boom from these localities alone is challenging because they experienced not only high second-home buying rates, but also high shares of alternative mortgages and private-label securitization. Each of the home counties of Las Vegas, Phoenix, and Miami is in the 90th percentile or higher for shares of second-home originations, alternative mortgages, and private-label securitization. All these factors are likely important and intertwined. Mian and Sufi (2018) show that areas with higher private-label securitization experienced larger increases in house prices and construction. Barlevy and Fisher (2012) show that areas with higher use of alternative mortgages during the boom years also experienced stronger house price appreciation.

The identification strategy exploits the fact that while the vacation share of housing is on average strongly informative of second-home origination shares during the boom years, the vacation share is also uncorrelated with other drivers of the housing boom and bust. I focus in particular on: the housing supply elasticity of Saiz (2010); the fraction of subprime borrowers measured in 2000; the share of alternative mortgages measured over the 2000-2006 period; and the share of privately securitized mortgages also measured over the 2000-2006 period. The fraction of subprime borrowers is defined as the ratio of borrowers with an Equifax Risk Score 3.0 below 620 and is obtained from the FRBNY Consumer Credit Panel/Equifax. The local shares of alternative and privately securitized mortgages are obtained from Black Knight McDash, which identifies for each purchase loan both the interest type at origination, as well as the investor type (the institution type owning the mortgage in the secondary market). I define alternative mortgages as those without a fixed principal or interest rate, and privately securitized mortgages as those owned by private securitizers in December 2006.

Figure 5 plots these boom drivers – the subprime fraction, housing supply elasticity, and shares of PLS and alternative mortgages – against the vacation share of housing. The main conclusion from the plots in figure 5 is that the vacation share is largely uncorrelated with the different measures. The associations are either not significant or only weakly significant, with the R-squared below 0.015 in each case. The highest R-squared (0.014) is between the subprime fraction and the vacation share, though in this case the correlation is negative: the higher the vacation share of housing, the lower the fraction of subprime borrowers.[4]

[4] In the plots, observations are weighted by population, though the results are very similar without weights.

Figure 5: Other Boom Drivers and the Vacation Share of Housing



Note: The figure plots other drivers of the housing boom (y-axis) against the vacation share of housing in 2000 (x-axis). The y-axis variables are: the housing supply elasticity of Saiz (2010) (top left); the fraction of subprime borrowers in 2000 (top right); the share of privately securitized mortgages over 2000-2006 (bottom left); and the share of alternative mortgages over 2000-2006 (bottom right). See text for details. Source: FRBNY Consumer Credit Panel / Equifax, Black Knight McDash, 2000 census, and author's calculations.

Therefore, the explanatory power of the vacation share on the second-home origination share is largely independent from any of the other major drivers of the boom-bust identified in the literature.

It is possible, though, that unobservables asssociated with the boom are correlated with the vacation share of housing, for example, expected house price appreciation may partly explain why vacation shares have high second-home origination shares. Local housing expectations are generally not observed, but we can measure changes in household debt balances, which are likely correlated with housing expectations. All else equal, stronger expected appreciation in vacation localities would predict stronger increases in debt balances, through looser credit constraints and spending wealth effects (Carroll et al. 2011; Mian and Sufi 2011; Kaplan et al. 2017; Aladangady 2017). I measure county-level median debt balances for first mortgages and home equity loans for the 2000-2006 period from the FRBNY Consumer Credit Panel/Equifax. These data are based on the primary residence of the borrower, for

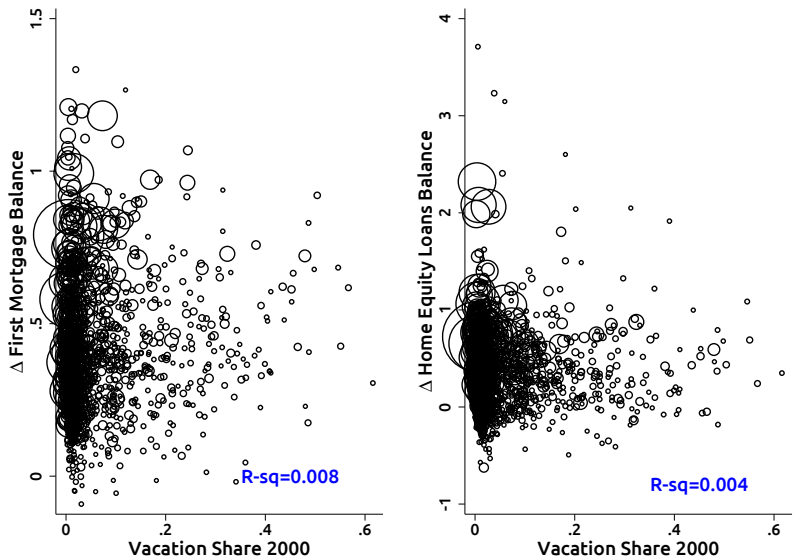
example, if New York City residents buy properties in Phoenix, those purchases are registered in New York City. Figure 6 plots changes in median household debt balances by debt category against the vacation share of housing. Neither changes in mortgage nor home equity loan debt balances are significantly associated with the vacation share of housing, with the R-squared in each case below 0.010.

Thus, judging by the debt behavior of locals, it does not appear that local expectations of house price appreciation were stronger on average in vacation localities. Therefore, it is unlikely that expectations of house price appreciation originating from vacation localities explain why they had higher second-home origination shares.[5] The second-home origination share when measured at borrower (rather than property) location provides additional evidence. If locals expected strong appreciation on their primary residence, they may have purchased more nonprimary residences in the same locality or elsewhere. Using the FRBNY Consumer Credit Panel / Equifax, I measure second-home origination shares at borrower location, for example, if a New York City resident buys a second-home in Phoenix, that purchase is registered in Phoenix at the borrower location. Figure 7 plots the second-home origination share over the peak boom years of 2004-2006 against the vacation share of housing: the two are uncorrelated, with the R-squared rounding out to 0.00.

In sum, the evidence does not suggest that vacation localities were particularly bubbly during the housing boom years, for any reason other than having high second-home shares by virtue of their appealing physical localities. The lack of an association between the various boom drivers considered and the vacation share of housing is not likely explained by measurement issues; changes in median debt balances and the other housing characteristics considered are strongly associated with house price changes during the boom years. Figure 8 plots county-level changes in house prices over 2000-2006 against changes in mortgage debt balances, housing supply elasticity, and the shares of alternative and PLS mortgages. All the series are highly correlated. For example, PLS shares during the boom years explain about 45 percent of the variation in house price changes, while changes in mortgage balances

[5] While locals of vacation localities do not appear to have had stronger than average expectations of house price growth than residents elsewhere, that does not imply that out-of-town buyers held consistent beliefs. Chinco and Mayer (2016) find that out-of-town buyers appear generally less informed and experienced worse loan losses than locals.

Figure 6: Δ Housing Debt Balances and the Vacation Share of Housing

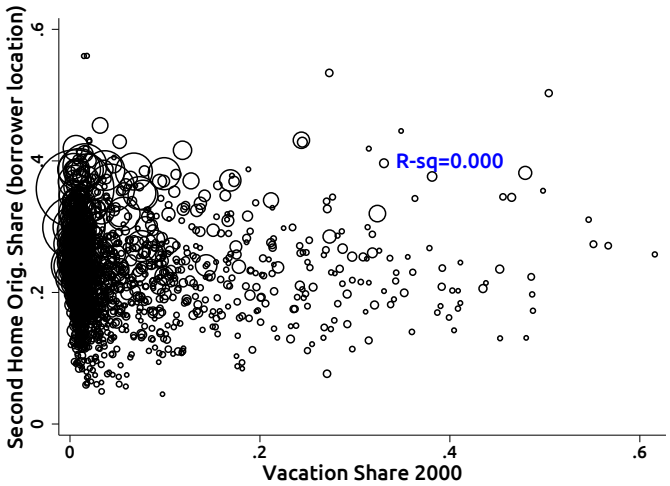


Note: The figure plots county-level percent changes in median household debt balances over 2000-2006 (y-axis) against the vacation share of housing (x-axis). The left panel plots changes in first-lien mortgage balances, and the right panel plots changes in home equity loan balances. Source: NYFRB Consumer Credit Panel / Equifax, 2000 census, author's calculations.

explain slightly over 60 percent of the variation in house prices.

Another concern is that economic activity in vacation localities may tend to be proyclical, reflecting for example, differences in industry composition. If so, we may expect that activity in vacation localities tends to rise more during expansions, and contract more during recessions, for reasons unrelated to second-home buying. To check for this, I aggregate house prices for the top quartile of vacation localities as well as for the remaining counties. Figure 9 plots house prices for the two groups of vacation localities, both indexed to equal 100 in the year 2000. Figure 9 shows that house prices trended nearly identically between 1975 and 2000 in vacation localities as in other locations. Significant differences in patterns only emerge after 2000. To delve deeper into the question of cyclicality, I regress yearly changes in the house price index on the vacation share of housing. Figure 10 provides a time plot of the coefficient estimates along with 95 percent confidence intervals. Positive and significant yearly estimates indicate that house price growth was stronger on average that year in vacation localities, and viceversa. Figure 10 shows that changes in house prices in vacation

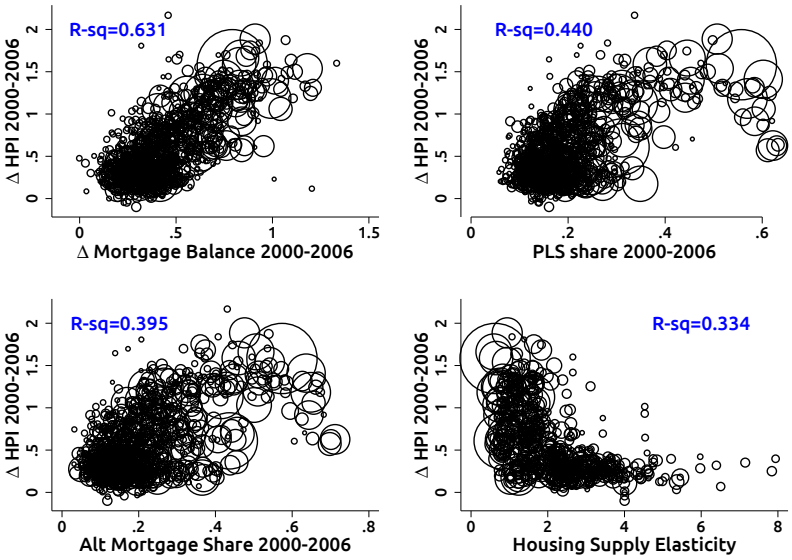
Figure 7: Second Home Origination Shares (Borrower Location) and Vacation Share of Housing



Note: The figure plots second-home origination shares over 2004-2006 (y-axis) against the vacation share of housing (x-axis). The second-home origination shares are measured based on borrower (rather than property) location, for example, New York City residents buying out-of-town second-homes are counted in New York City. Source: NYFRB Consumer Credit Panel / Equifax, 2000 census, author's calculations.

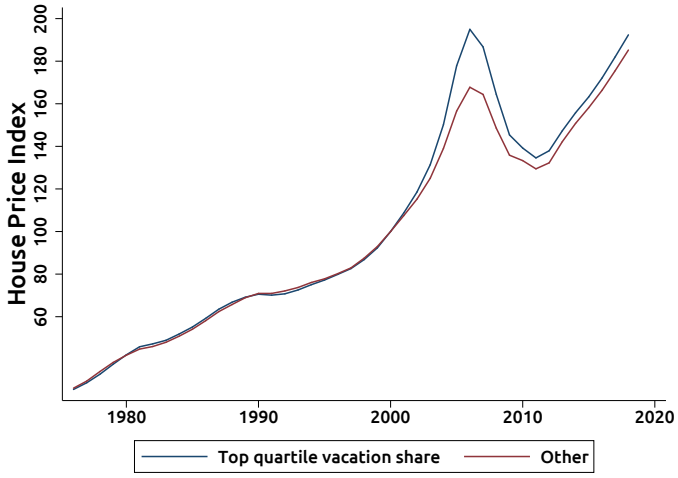
localities were not statistically different for almost all years between 1977 and 2000. The only exceptions are during the 1980-1982 recession when house price changes in vacation localities were countercyclical rather than procyclical. After 2000, however, the coefficient estimates are significantly larger and significant. House price growth in vacation localities was faster than elsehwere from 2000 to 2006, and slower than elsewhere from 2006 to 2010, coinciding with the aggregate trends in second-home buying.

Figure 8: Δ HPI and Other Boom Drivers



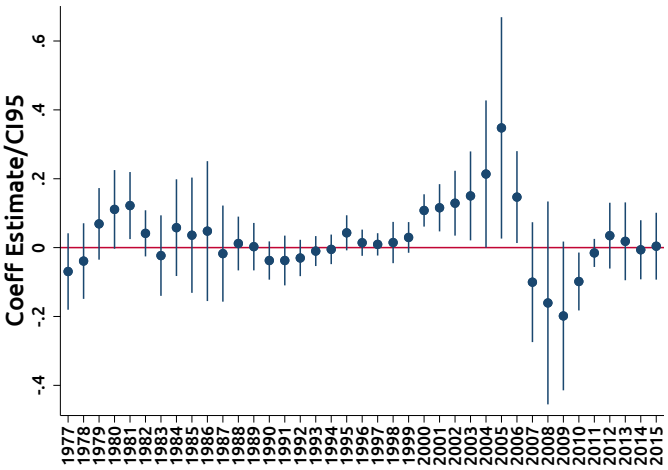
Note: The figure plots changes in house prices over 2000-2006 (y-axis) against various housing characteristics (x-axis). On the x-axis the figure plots changes in median first-lien mortgage balances over 2000-2006 (top-left panel); the share of privately securitized mortgages over 2000-2006 (top-right panel); the share of alternative mortgages (bottom-left panel); and the housing supply elasticity of Saiz (2010) (bottom-right panel). Source: NYFRB Consumer Credit Panel / Equifax, Black Knight McDash, Corelogic HPI, and author's calculations.

Figure 9: HPI in Vacation and Other Localities



Note: The figure plots house prices against time for two groups: the top quartile of vacation shares in the 2000 census, and the other counties. House prices are indexed to equal 100 in the year 2000. Source: CoreLogic HPI, 2000 census, and author's calculations.

Figure 10: Yearly ΔHPI for Vacation Localities



Note: The figure plots yearly coefficient estimates α_t with associated 95 percent confidence intervals from estimating the following equation each year: $\Delta HPI_{i,t} = \alpha_t Vacation\ Share_i + \upsilon_{i,t}$. Observations weighted by housing units in 2000 and standard errors clustered by state. Source: CoreLogic HPI, 2000 census, and author's calculations.

3 Empirical Framework and Results

To estimate the effects of high second-home origination shares on local outcomes during the boom, I isolate the variation in the second-home origination shares explained solely by the instrument, the vacation share of housing, conditional on various other characteristics of localities. Vacation localities do differ along some observables, for example, they tend to have older, whiter, more rural populations, as well as a higher share of employment in services. To account for these differences, I control for a detailed set of county covariates including demographics, such as education, income, and age profiles in 2000; household financial characteristics, such as the fraction of subprime borrowers and median credit scores in 2000; industry composition, including manufacturing, construction, and services employment shares in 2000; and pretrends, such as changes in house prices and employment from 1997-2000 and second-home origination shares in 2000. A full list of county covariates and data sources is provided in table 1. Table 2 provides summary statistics.

I now discuss results based on the following 2SLS specification:

$$\Delta Y_i^j = \theta X_i + \beta \Delta \widehat{Second\ Home\ Origination\ Shares}_{i,2000-2006} + \epsilon_i \quad (1)$$

$$\Delta Second\ Home\ Origination\ Shares_{i,2000-2006} = \delta X_i + \rho Vacation\ Share_{i,2000} + v_i \quad (2)$$

where observations are at the county i level; changes are taken from 2000 to 2006, 2006 to 2010, and 2000 to 2010 for different outcome variables Y^j (for example, house prices, construction employment, total private employment) each estimated separately; and X_i are other county characteristics, described in table 1 with summary statistics in table 2.

I use data on counties with over 10,000 housing units in the 2000 census, which yield slightly over 1,200 counties with house price data, accounting for about 92 percent of aggregate employment. Observations are weighted by the number of households in the 2000 decennial Census, though results are similar without weighting and are also reported in the Results section. Extreme observations (1 percent from each tail) are dropped from each dependent variable. Standard errors are clustered at the state level. The baseline specifications include region fixed effects and additional results with state fixed effects are also reported.

Table 1: Data Definitions

Variable	*Definition*	*Source*
Dependent Variables		
Δ House prices	Percent change in house prices from 2000-2006, 2006-2010, and 2000-2010	CoreLogic HPI
Δ Emp^j	Percent change in employment category j from 2000-2006, 2006-2010, and 2000-2010	QCEW, CBP
Δ Delinquency rates	Percentage point change in fraction of 90+ delinquent properties from 2006 to 2010	CoreLogic MarketTrends
Δ Second-home orig. share	Change in the ratio of home purchase originations for nonprimary residences to total originations, 2000-2006.	Credit Risk Insight Servicing McDash
Preboom Characteristics		
Δ House Prices	Percent change in house prices 1997-2000	CoreLogic HPI
Δ Employment	Percent change in total private employment 1997-2000	QCEW
Δ Construction	Percent change in construction private employment 1997-2000	QCEW
House prices	Log level median house price	2000 census
Household income	Log of median	2000 census
White population	Fraction of population identified as white	2000 census
Poverty rate	Fraction of families below poverty line	2000 census
Age profile	Fraction of population 55 years or older	2000 census
College population	Fraction of population with a college degree or more	2000 census
Urban rate	Fraction of population in urban areas	2000 census
Mortgage use	Fraction of housing stock that had been mortgage-financed	2000 census
Risk Score 3.0	Median	2000 FRBNY Consumer Credit Panel/Equifax
Subprime	Fraction of households in a county with Risk Score less than 620	2000 FRBNY Consumer Credit Panel/Equifax
Second Home Orig. Share	Ratio of home purchase originations for nonprimary residences to total originations, 1999-2001	Credit Risk Insight Servicing McDash
Nontradable share	Nontradable share of employment, as defined in Mian and Sufi (2014)	2000 CBP
Construction share	Share of employment	2000 QCEW
Manufacturing share	Share of employment	2000 QCEW
Services share	Share of employment	2000 QCEW
Health and education share	Share of employment	2000 QCEW

Note: This table provides definitions and sources for the data used throughout the paper. CBP is County Business Patterns; QCEW is Quarterly Census of Employment and Wages.

Table 2: County Summary Statistics

	Mean	SD	p10	Median	p90	N
Dependent Variables						
Δ House Prices 2000-2006	0.52	0.37	0.18	0.40	1.13	1217
Δ Construction Emp 2000-2006	0.18	0.38	-0.14	0.13	0.57	1217
Δ Other Emp 2000-2006	0.05	0.15	-0.09	0.04	0.22	1217
Δ Nontradable Emp 2000-2006	0.11	0.18	-0.07	0.09	0.31	1217
Δ House Prices 2006-2010	-0.12	0.15	-0.34	-0.10	0.03	1217
Δ Delinquency Rate 2006-2010	0.04	0.03	0.02	0.03	0.08	1217
Δ Construction Emp 2000-2006	-0.23	0.33	-0.46	-0.26	-0.01	1212
Δ Other Emp 2006-2010	-0.04	0.08	-0.13	-0.04	0.05	1217
Δ Nontradable Emp 2006-2010	-0.03	0.13	-0.14	-0.04	0.09	1217
Δ House Prices 2000-2010	0.30	0.24	0.03	0.28	0.61	1217
Δ Construction Emp 2000-2010	-0.12	0.32	-0.40	-0.15	0.20	1217
Δ Other Emp 2000-2010	0.02	0.19	-0.17	-0.01	0.22	1217
Δ Nontradable Emp 2000-2010	0.08	0.24	-0.13	0.04	0.31	1217
Second Home Origination Share 2000-2006	0.21	0.08	0.14	0.19	0.32	1217
County Characteristics						
# Housing units (thousands), 2000	79.13	164.95	11.35	32.95	183.15	1217
Second Home Origination Share, 1999-2001	0.18	0.09	0.10	0.16	0.29	1217
% Educ $\geq$ College, 2000	0.21	0.09	0.11	0.18	0.33	1217
Home Value ($thousands), 2000	104.15	46.87	63.40	92.50	155.90	1217
% Equifax Risk Score 3.0 $\leq$ 620, 2000	0.26	0.08	0.17	0.25	0.38	1217
Median Equifax Risk Score 3.0, 2000	703.91	29.73	661.00	711.00	738.00	1217
% White Pop, 2000	0.87	0.12	0.72	0.91	0.98	1217
% Families below poverty line, 2000	0.08	0.04	0.04	0.08	0.13	1217
Δ Emp 1997-2000	0.07	0.08	-0.01	0.06	0.15	1217
Δ Construction Emp 1997-2000	0.15	0.19	-0.05	0.13	0.37	1217
Δ House Prices 1997-2000	0.18	0.10	0.08	0.16	0.31	1217
Δ Other Emp 1997-2000	0.06	0.08	-0.01	0.06	0.15	1217
% Urban population	0.61	0.25	0.26	0.64	0.94	1217
HH Median Income ($thousands), 2000	40.75	9.32	30.95	38.83	53.38	1217
Construction Share of Emp, 2000	0.07	0.03	0.04	0.06	0.11	1217
Manufacturing Share of Emp, 2000	0.20	0.12	0.06	0.18	0.38	1217
Nontradable Share of Emp, 2000	0.21	0.05	0.16	0.21	0.28	1217
Services Share of Emp, 2000	0.70	0.12	0.54	0.72	0.84	1217
Health & Edu Share of Emp, 2000	0.13	0.05	0.07	0.13	0.19	1217
% Age $\geq$ 50, 2000	0.29	0.05	0.22	0.29	0.35	1217

Note: The table provides summary statistics for localities with over 10,000 households in the 2000 decennial Census and with house price data. Changes for delinquency rates are in percentage point, all other are percent changes.

3.1 Results

Areas with larger increases in second-home origination shares (instrumented with the vacation share of housing) experienced a more pronounced boom and bust in activity. Higher second-home shares led to higher construction employment and house prices from 2000 to 2006. However, those gains during the boom years were reversed over the next years: declines in house prices and construction employment, and increases in delinquency rates, were more severe in areas where second-home originaton shares increased more during the boom years. Overall, when looking at differences in activity for the whole decade of 2000 to 2010, the effects are roughly offsetting for changes in house prices and construction employment.

Table 3 shows 2SLS coefficient estimates for the 2000-06 changes in house prices and employment (for construction, nontradable, and total private employment) models.[6] In table 3, columns 1 and 2 show that a 10 percentage point increase in second-home originations shares led to 17 and 12 percentage point faster growth in house prices and construction employment, respectively. Despite faster growth in house prices and construction employment, those gains in real estate do not appear to have led to gains in overall employment. Columns 3 and 4 show results for nontradable employment and other employment (total private employment excluding construction).[7] The coefficient estimates are not significant and small, especially in the nontradable employment model (Column 3).

Over the next years, the increase in activity associated with the increase in second-home origination shares during the boom is largely reversed. Second homes borrowers were more levered during the boom and had higher default rates during the recession (Haughwout et al. 2011; Albanesi 2018). Table 4 shows 2SLS coefficient estimates for the 2006-2010 period. Counties where second-home origination shares increased by 10 percentage points over 2000-2006, experienced steeper declines in activiy. House price and construction employment declines were 10 percentage points and 11 percentage points stronger on average (columns 1 and 3, respectively), while changes in delinquency rates were on average about 2 percentage

[6]The instrument is strong, with the Kleibergen-Paap first stage F statistic slightly over 100, considerably higher than the rule of thumb F statistic value of 10 that is commonly used in the literature to indicate weak instrument problems.

[7]Nontradable employment is a category of local employment accounting for about 20 percent of total private employment, comprised mostly of local retail and food; see Mian and Sufi (2014).

points higher (column 2). The overall employment effects are mostly restricted to construction, with changes in nontradable employment and other employment not significant.

Looking at changes in activity for the whole decade, estimated effects are small and not significant. Table 5 shows results for the 2000-2010 period. For localities with a 10 percentage point increase in second-home origination shares from 2000 to 2006, changes in house prices from 2000 to 2010 were on average 6 percentage points higher though not statistically different from zero (column 1), and construction employment changes were on average 3 percentage points lower though not significantly different from zero (column 2).[8] Similarly, for broader employment categories, the effects on employment losses are not significant. When looking at changes in activity over a longer horizon, such as from 2000 to 2014, the results are similar.

In sum, areas with plausibly exogenous higher second-home origination shares experienced a sharper boom-and-bust in housing markets: Construction employment and house prices grew more during the boom years, but those gains were reversed in the recession. The effects appear limited to housing markets. A limitation of the county-level empirical strategy is that spillover effects across localities may not be captured. For example, high default rates for second-home buyers likely contributed to the poor health of the financial system during the recession, and so likely affected overall credit supply. In turn, lower credit supply during the recession likely contributed to the job losses (Duygan-Bump et al. 2015; Chodorow-Reich 2014; Garcia 2018). Nonetheless, the lack of significance in the nontradable and other employment models does ameliorate concerns about instrument validity, since the instrument is not correlated with local shocks affecting overall employment, that is, it is unlikely that vacation localities had higher shares of second-home originations because those localities experienced a positive shock during the boom that increased overall employment.

[8]The net negative effect in construction is consistent with Rognlie et al. (2018), which predicts that the recovery from housing boom-bust episodes is asymmetric, with the overbuilt sector left behind. That said, the net negative effect in construction appears small and is not estimated to be significantly different from zero.

3.2 Delving Deeper

The 2SLS coefficient estimates contrast with their OLS counterparts, with the former on average about 40 percent as large as the OLS estimates. Tables 6 and 7 report OLS coefficient estimates for the 2000-06 and 2006-10 periods, respectively. The OLS coefficient estimates are larger, suggesting that the OLS estimates are biased upward because of other factors such as reverse causality. For example, the coefficient on second-home origination shares in the 2000-2006 2SLS house price model (Table 3 Column 1) is 1.682, while the OLS analog is 3.653 in table 6 column 1, with the difference statistically significant. The difference between 2SLS and OLS estimates is particularly large for the nontradable and other employment models. For example, the coefficient on second-home origination shares in the 2000-2006 2SLS nontradable employment model (table 3 column 3) is -0.006 and not significant, while the OLS analog is 0.481 and is highly significant (Table 6 Column 3).

The results are also robust to using state fixed effects. Because the results are similar, I use specifications with region fixed effects in the baseline to exploit all variation within regions, rather than restricting the data to using only within state variation. Table 8 provides results for the 2000-2006 models with state fixed effects. The second-home origination shares coefficient is similar to the baseline estimates in Table 3 – the coefficient on the house price model is slightly larger (column 1), while the coefficient in the construction employment models is slightly smaller (column 2), with neither difference being statistically significant. Table 9 provides results for the 2006-10 models with state fixed effects. Again, the results are very similar with coefficient estimates not statistically different.

The results reported are weighted by the number of housing units in 2000, though they are robust to alternatives. Table 10 reports unweighted results for the 2000-2006 2SLS models. The results are qualitatively the same: Areas with larger increases in second-home origination shares during the boom experienced significantly higher growth in house prices and construction employment, though not in broader employment categories. The instrument is stronger (the Kleibergen-Paap first stage F statistic is larger) than in the baseline model, reflecting that localities with high second-home origination shares during the boom that are not vacation localities tend to be larger, for example, the home counties

of Miami, Phoenix, and Los Angeles. The coefficient estimates are not statistically different from their counterparts in the baseline (table 3), though they are a touch smaller.[9]

The results are also robust to controlling for differences across localities in housing supply elasticities. The baseline results do not control for differences in elasticities, because these are available only for the smaller sample of counties located within metropolitan statistical areas (MSAs). Table 11 report results for the counties for which the housing supply elasticity of Saiz (2010) is available. Since coefficient estimates may change because of the sample change (counties in MSAs only), or the inclusion of the housing supply elasticity control, I report results for the MSA sample with and without the housing supply elasticity on the right-hand side. columns 1 and 2 report coefficient estimates for the house price and construction employment models without the elasticity control, while columns 3 and 4 add the control. The coefficient estimates for the MSA subsample tend to be larger than the full sample, though they are not statistically different. Adding the housing supply elasticity as a control (columns 3 and 4) slightly lowers the second-home origination share coefficients, reflecting the negative correlation between supply elasticities and the vacation share of housing, though the correlation is only very weak (see the top left panel of figure 5). However, the coefficient estimates are very similar and well within one standard error.

Overall, the qualitative conclusions are the same and quantitative results not statistically different, when using alternative specifications, such as the inclusion of state fixed effects, alternative weighting schemes, and sample restrictions (for example, counties in MSAs only) and controlling for differences in supply constraints.

[9]The comparison for the 2006-2010 models is not reported to economize on space, but the discussion is very similar to that of the 2000-2006 period. Results available upon request.

Table 3: 2000–2006 2SLS Estimates of the Effects of Second Home Buying

	Dependent variables 2000-2006:			
	Δ HPI Coef./SE	Δ Construction Emp Coef./SE	Δ NonTradable Emp Coef./SE	Δ Other Emp Coef./SE
Δ Second Home Origination Share 2000-2006	1.682**	1.230***	-0.006	0.151
	(0.80)	(0.48)	(0.22)	(0.14)
All other controls	Yes	Yes	Yes	Yes
R-squared	0.74	0.57	0.50	0.61
Kleibergen-Paap F stat	100.14	113.49	105.18	115.05
Observations	1107	1113	1110	1110

Note: This table shows 2SLS results from regressing changes in local outcomes on the change in second-home origination shares (using the vacation share of housing in the 2000 decennial census as an instrument). The sample of counties includes localities with over 10,000 housing units in the 2000 census. All equations include the controls listed in table 1. Observations weighted by the number of housing units in the 2000 decennial census. Dependent variable outliers (1 percent of each tail) are dropped. Standard errors are clustered at the state level. *, **, and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 4: 2006–2010 2SLS Estimates of the Effects of Second Home Buying

	Dependent variables 2006-2010:				
	Δ HPI Coef./SE	Δ Delinq. Rate Coef./SE	Δ Constr. Emp Coef./SE	Δ NonTrd. Emp Coef./SE	Δ Other Emp Coef./SE
Δ Second Home Origination Share 2000-2006	-0.967***	0.173**	-1.089***	0.080	-0.057
	(0.30)	(0.08)	(0.26)	(0.09)	(0.10)
All other controls	Yes	Yes	Yes	Yes	Yes
R-squared	0.60	0.62	0.49	0.23	0.41
Kleibergen-Paap F stat	121.02	125.74	112.46	113.33	111.68
Observations	1106	1107	1114	1110	1116

Note: This table shows 2SLS results from regressing changes in local outcomes on the change in second-home origination shares (using the vacation share of housing in the 2000 decennial census as an instrument). The sample of counties includes localities with over 10,000 housing units in the 2000 census. All equations include the controls listed in table 1. Observations weighted by the number of housing units in the 2000 decennial census. Dependent variable outliers (1 percent of each tail) are dropped. Standard errors are clustered at the state level. *, **, and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 5: 2000–2010 2SLS Estimates of the Effects of Second Home Buying

	Dependent variables 2000-2010:			
	Δ HPI Coef./SE	Δ Construction Emp Coef./SE	Δ NonTradable Emp Coef./SE	Δ Other Emp Coef./SE
Δ Second Home Origination Share 2000-2006	0.584	-0.329	0.169	0.055
	(0.51)	(0.34)	(0.18)	(0.17)
All other controls	Yes	Yes	Yes	Yes
R-squared	0.54	0.33	0.48	0.59
Kleibergen-Paap F stat	122.25	116.59	112.89	114.34
Observations	1110	1117	1110	1112

Note: This table shows 2SLS results from regressing changes in local outcomes on the change in second-home origination shares (using the vacation share of housing in the 2000 decennial census as an instrument). The sample of counties includes localities with over 10,000 housing units in the 2000 census. All equations include the controls listed in table 1. Observations weighted by the number of housing units in the 2000 decennial census. Dependent variable outliers (1 percent of each tail) are dropped. Standard errors are clustered at the state level. *, **, and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 6: 2000-2006 OLS Estimates of Second Home Buying

	Dependent variables 2000-2006:			
	Δ HPI Coef./SE	Δ Construction Emp Coef./SE	Δ NonTradable Emp Coef./SE	Δ Other Emp Coef./SE
Δ Second Home Origination Share 2000-2006	3.653***	1.558***	0.481***	0.242***
	(0.52)	(0.22)	(0.11)	(0.06)
All other controls	Yes	Yes	Yes	Yes
R-squared	0.76	0.57	0.52	0.61
Observations	1107	1113	1110	1110

Note: This table shows OLS results from regressing changes in local outcomes on the change in second-home origination shares measured over 2000-2006. The sample of counties includes localities with over 10,000 housing units in the 2000 census. All equations include the controls listed in table 1. Observations weighted by the number of housing units in the 2000 decennial census. Dependent variable outliers (1 percent of each tail) are dropped. Standard errors are clustered at the state level. *, **, and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 7: 2006–2010 OLS Estimates of Second Home Buying

	Dependent variables 2006-2010:				
	Δ HPI Coef./SE	Δ Delinq. Rate Coef./SE	Δ Constr. Emp Coef./SE	Δ NonTrd. Emp Coef./SE	Δ Other Emp Coef./SE
Δ Second Home Origination Share 2000-2006	-1.740***	0.312***	-1.544***	-0.317***	-0.246***
	(0.21)	(0.05)	(0.19)	(0.10)	(0.05)
All other controls	Yes	Yes	Yes	Yes	Yes
R-squared	0.63	0.64	0.50	0.26	0.43
Observations	1106	1107	1114	1110	1116

Note: This table shows OLS results from regressing changes in local outcomes on the change in second-home origination shares measured over 2000-2006. The sample of counties includes localities with over 10,000 housing units in the 2000 census. All equations include the controls listed in table 1. Observations weighted by the number of housing units in the 2000 decennial census. Dependent variable outliers (1 percent of each tail) are dropped. Standard errors are clustered at the state level. *, **, and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 8: 2000–2006 2SLS Estimates of the Effects of Second Home Buying, with State Fixed Effects

	Dependent variables 2000-2006:			
	Δ HPI Coef./SE	Δ Construction Emp Coef./SE	Δ NonTradable Emp Coef./SE	Δ Other Emp Coef./SE
Δ Second Home Origination Share 2000-2006	2.267***	1.109***	-0.045	0.140
	(0.55)	(0.41)	(0.22)	(0.15)
All other controls	Yes	Yes	Yes	Yes
R-squared	0.90	0.67	0.59	0.67
Kleibergen-Paap F stat	187.74	182.82	162.44	194.00
Observations	1107	1113	1110	1110

Note: This table shows 2SLS results from regressing changes in local outcomes on second-home origination shares (using the vacation share of housing in the 2000 decennial census as an instrument). The sample of counties includes localities with over 10,000 housing units in the 2000 census. All equations include the controls listed in table 1. State fixed effects are included. Observations weighted by the number of housing units in the 2000 decennial census. Dependent variable outliers (1 percent of each tail) are dropped. Standard errors are clustered at the state level. *, **, and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 9: 2006–2010 2SLS Estimates of the Effects of Second Home Buying, with State Fixed Effects

	Dependent variables 2006-2010:				
	Δ HPI Coef./SE	Δ Delinq. Rate Coef./SE	Δ Constr. Emp Coef./SE	Δ NonTrd. Emp Coef./SE	Δ Other Emp Coef./SE
Δ Second Home Origination Share 2000-2006	-0.686***	0.154***	-1.019***	0.039	-0.057
	(0.16)	(0.05)	(0.25)	(0.09)	(0.07)
All other controls	Yes	Yes	Yes	Yes	Yes
R-squared	0.86	0.84	0.66	0.39	0.55
Kleibergen-Paap F stat	210.55	188.63	188.09	185.13	189.00
Observations	1106	1107	1114	1110	1116

Note: This table shows 2SLS results from regressing changes in local outcomes on second-home origination shares (using the vacation share of housing in the 2000 decennial census as an instrument). The sample of counties includes localities with over 10,000 housing units in the 2000 census. All equations include the controls listed in table 1. State fixed effects are included. Observations weighted by the number of housing units in the 2000 decennial census. Dependent variable outliers (1 percent of each tail) are dropped. Standard errors are clustered at the state level. *, **, and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 10: 2000–2006 2SLS Estimates of the Effects of Second Home Buying (Unweighted)

	Dependent variables 2000-2006:			
	Δ HPI Coef./SE	Δ Construction Emp Coef./SE	Δ NonTradable Emp Coef./SE	Δ Other Emp Coef./SE
Δ Second Home Origination Share 2000-2006	0.839*	0.912**	0.075	-0.010
	(0.47)	(0.39)	(0.17)	(0.12)
All other controls	Yes	Yes	Yes	Yes
R-squared	0.55	0.36	0.36	0.44
Kleibergen-Paap F stat	174.99	188.16	208.20	197.41
Observations	1107	1113	1110	1110

Note: This table shows 2SLS results from regressing changes in local outcomes on second-home origination shares (using the vacation share of housing in the 2000 decennial census as an instrument). The sample of counties includes localities with over 10,000 housing units in the 2000 census. All equations include the controls listed in table 1. State fixed effects are included. Observations not weighted. Dependent variable outliers (1 percent of each tail) are dropped. Standard errors are clustered at the state level. *, **, and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

Table 11: 2000–2006 2SLS Estimates of the Effects of Second Home Buying in MSAs

	Dependent variables 2000-2006:			
	Δ HPI Coef./SE	Δ Construction Emp Coef./SE	Δ HPI Coef./SE	Δ Construction Emp Coef./SE
Δ Second Home Origination Share 2000-2006	3.063***	2.158***	2.955***	2.189***
	(0.92)	(0.58)	(0.99)	(0.62)
Elasticity			-0.021	0.005
			(0.03)	(0.01)
All other controls	Yes	Yes	Yes	Yes
R-squared	0.79	0.65	0.79	0.65
Kleibergen-Paap F stat	32.26	34.62	36.07	38.21
Observations	612	615	612	615

This table shows 2SLS results from regressing changes in local outcomes on second-home origination shares (using the vacation share of housing in the 2000 decennial census as an instrument). The sample of counties includes those located in MSAs for which housing supply elasticity data is available. All equations include the controls listed in table 1. State fixed effects are included. Observations weighted by the number of housing units in the 2000 decennial census. Dependent variable outliers (1 percent of each tail) are dropped. Standard errors are clustered at the state level. *, **, and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively.

3.3 Aggregate Implications

To gain a sense of the aggregate implications of second-home buying, I perform a partial equilibrium aggregation exercise which combines the estimated causal effects of increases in second-home origination shares during the housing boom, together with a counterfactual time path of second-home origination shares in which the shares stay fixed at their 1999–2001 levels.

To begin, define the counterfactual 2000–2006 change in construction employment in county i, $\Delta Constr.\ Emp_i^{cf}$, as the predicted construction employment change if county i second-home origination shares had stayed at their preboom level, that is, $\Delta SHOS_{i,2000-2006} = 0$:

$$\Delta Constr\ Emp_i^{cf} = \Delta \widehat{Constr.\ Emp}_i - \beta \Delta SHOS_{i,2000-2006},$$

where $\Delta \widehat{Constr.\ Emp}_i$ denotes the fitted value from the baseline construction employment 2SLS model including all covariates X_i, and β is the estimated elasticity of construction employment with respect to second-home origination shares. I then recover 2006 construction employment levels corresponding to both the counterfactual and fitted changes in employment, using the initial-period employment level: $Constr.\ Emp_{i,2006}^{cf} = Constr.\ Emp_{i,2000}(1 + \Delta Constr.\ Emp_i^{cf})$ and $\widehat{Constr.\ Emp}_{i,2006} = Constr.\ Emp_{i,2000}(1 + \Delta \widehat{Constr.\ Emp}_i)$.

The fraction in construction employment changes explained by second-home buying is given by:

$$\frac{\sum_i [Constr.\ Emp_{i,2006}^{cf} - \widehat{Constr.\ Emp}_{i,2006}]}{\sum_i [Constr.Emp_{i,2006} - Constr.Emp_{i,2000}]} \tag{3}$$

I also perform the analogous exercise for house prices.[10] I find that the increase in second-home buying could explain about 29 percent and 10 percent of the run-up in construction employment and house prices from 2000 to 2006, respectively, using the 2SLS baseline esti-

[10] Aggregate changes in house prices are computed as the average house price change weighted by housing units in 2000.

mates reported in table 3. In other words, construction employment would have increased by about 10 percent rather than 14 percent, and house prices by 59 percent rather than 66 percent, respectively, from 2000 to 2006.

The accuracy of the aggregation exercise depends on a number of factors. The counterfactual asks how different house prices and construction employment evolved had second-home origination shares remained at their 1999–2001 level rather than rising, but it is possible that at least some of that increase was an endogenous response to other changes in the economy, such as rising wealth and an aging population. From this point of view, the partial equilibrium aggregation exercise would lead to overestimates. However, the aggregation exercise does not take into account general equilibrium effects which may go in the opposite direction. For example, higher second-home origination shares led to higher house prices, which could have contributed to perceptions of a robust financial system, and therefore contributed to strong credit supply during the housing boom. Moreover, the results from the aggregation exercise also depend on the precision of the estimated elasticities of activity to second-home origination shares. When repeating the aggregation exercise using the 90 percent confidence intervals for the second-home origination shares coefficients in the construction employment and house price models, the conclusion is second-home buying could have explained between 10 percent to 44 percent of the runup in construction employment, and between 2 percent and 17 percent of the increase in house prices from 2000 to 2006.

4 Conclusion

In the peak years of the housing boom 2004-2006, about 35 percent of new home purchase mortgages were for second-homes, compared with about only 20 percent in other periods. Second-home buyers were typically over-leveraged, and despite having middle to high income and credit scores, experienced higher default rates than average during the recession (Haughwout et al. (2011); Albanesi et al. (2017); Albanesi (2018)). Studying the effects of second-home buying on activity is complicated for at least two reasons: owner-occupancy in loan level datasets (such as HMDA and Black Knight McDash) is underreported (Elul and Tilson (2015)), and localities with high second-home origination shares (for example, Las

Vegas, Miami, and Phoenix) may have boomed for other reasons, such as strong house price appreciation expectations, high shares of alternative or privately securitized mortgages, or tighter supply constraints.

The contribution of this paper is to construct a new measure of second-home origination shares at the county-level, by combining the best sources of data available – credit bureau data for the number of properties held by each borrower and mortgage servicing records for the address of each new property acquired. Second home origination shares explain about 55 percent of the variation in house prices across localities from 2000 to 2006. To isolate the effects of high second-home origination shares on activity, I use the vacation share of housing in the 2000 census as an instrument. In addition to predicting second-home shares during the boom, the vacation share is also uncorrelated with proxies for local housing expectations (such as changes in local housing debt balances) and other drivers of the boom, such as the fraction of subprime borrowers, the use of PLS mortgages, and housing supply elasticities.

I find that localities with stronger increases in second-home origination shares (explained by the vacation share instrument) experienced a more pronounced housing boom and bust. In those localities, house prices and construction employment grew faster from 2000 to 2006, and contracted more sharplyfrom 2006 to 2010, with the losses in the latter years offsetting the gains during the earlier years. A partial equilibrium aggregation exercise suggests the run-up in second-home buying could explain about 30 percent and 10 percent of the run-up in construction employment and house prices, respectively, from 2000 to 2006.

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