2015 V43 2: pp. 334–374
DOI: 10.1111/1540-6229.12075
REAL ESTATE ECONOMICS

The Boom, the Bust and the Future of Homeownership

Stuart A. Gabriel* and Stuart S. Rosenthal**

This article investigates the boom and bust in U.S. homeownership rates over the 2000–2010 period. Using individual-level census data, we first estimate 204 homeownership regressions stratified by household age (21, 22, . . . , 89) and survey year (2000, 2005 and 2009). Shift-share methods confirm that changes in the model coefficients that reflect household attitudes, lending standards and other market conditions—but not population socioeconomics—were the primary driver of the boom and bust in homeownership over the decade. This pattern holds for nearly all age groups and is more pronounced for recent movers. Results also suggest that homeownership rates may have come close to bottoming out in early 2013 at 65% after falling roughly four percentage points from their peak in 2006. This suggests little lasting effect of the grand homeownership policy experiment of recent decades.

It is widely appreciated that the boom and bust in U.S. house prices of the last decade served as a catalyst for the 2007 meltdown in mortgage and capital markets and the downturn in the global economy. Less well known is that the decade from 2000 to 2010 also experienced a dramatic boom and bust in homeownership. As seen in Figure 1, from 1970 through the mid-1990s U.S. homeownership rates varied between 64% and 65% and were essentially flat at 64% between 1985 and 1995. Homeownership rates then rose sharply to an historic high of just over 69% in late 2006. In the wake of the housing and financial crisis in 2007, homeownership rates imploded, falling all the way back to 65% in early 2013.[1]

*Anderson School of Management, University of California, Los Angeles, Los Angeles, CA 90024 or stuart.gabriel@anderson.ucla.edu.
**Department of Economics and Center for Policy Research, Syracuse University, Syracuse, NY 13244 or ssrosent@maxwell.syr.edu.

[1]For additional detail on historical homeownership rates for the entire U.S. and by region, see the chart at the U.S. Census Bureau website: http://www.census.gov/hhes/www/housing/hvs/charts/files/fig05.pdf.

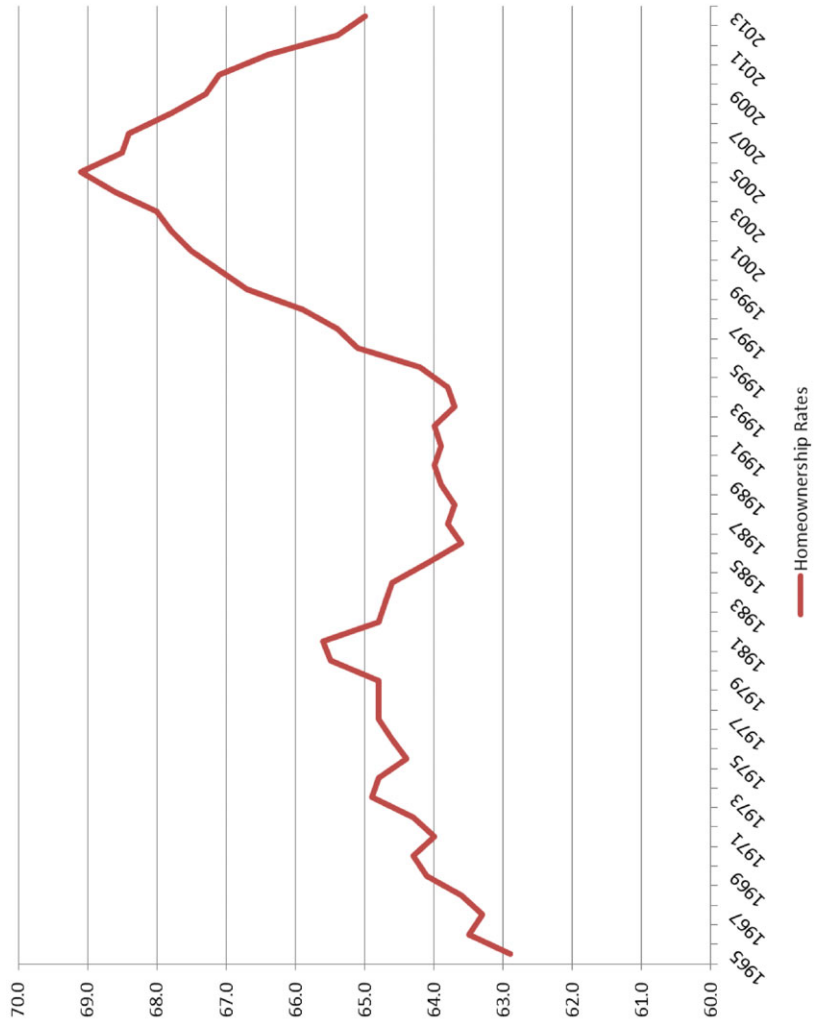

Figure 1 ■ U.S. homeownership rates in the first quarter by year. (Current Population Survey/Housing Vacancy Survey, Series H-111 Reports, Bureau of the Census)

Homeownership is deeply embedded in American culture and is viewed as a symbol of economic achievement.[2] Partly for that reason, homeownership is encouraged through numerous federal and state policies. At the household level, homeownership traditionally has been viewed as an important mechanism for wealth accumulation. Homeownership also contributes directly to the economic health of communities. Homeowners are invested in their communities and have incentives to enhance their neighborhoods. Studies by DiPasquale and Glaeser (1999), Rosenthal (2008), Coulson and Li (2013) and Harding and Rosenthal (2013) find evidence of such behavior.[3]

There is also a tight link between homeownership and the macro economy. Previous studies have emphasized the propensity of homeowners to consume out of housing capital gains (Canner, Dynan and Passmore 2002, Case, Quigley and Shiller 2005, Bostic, Gabriel and Painter 2009). Federal Reserve Chairman Alan Greenspan argued that home equity spending helped to bolster economic activity during the 2001 recession, softening the downturn at that time.[4] The great recession that began in 2007 was exacerbated by massive reductions in housing wealth that contributed to declines in spending out of home equity. Homeownership is also often associated with new home construction because homeowners are typically of higher income and tend to favor new as opposed to older homes.[5] For all of these reasons, federal and state governments have long promoted homeownership through a range of policy mechanisms.[6]

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[2]This is implicit in the title of the federal "American Dream Act," which provided incentives to promote homeownership in the early 2000s.

[3]DiPasquale and Glaeser (1999) show that homeowners are more likely to behave in ways that enhance the local community. Rosenthal (2008) offers evidence that the presence of homeowners sets in motion a dynamic effect that elevates a neighborhood's future economic status as measured by the income of local residents. Coulson and Li (2013) use neighborhood clusters in the American Housing Survey in conjunction with panel and other econometric methods. They estimate that converting a rental unit to owner-occupied housing would increase nearby property values. Harding and Rosenthal (2013) show that housing capital gains encourages homeowners to establish new businesses. See also Coulson and Fisher (2009), Engelhardt *et al.* (2010) and Holupka and Newman (2012), for related discussion and evidence.

[4]In testimony to the Joint Economic Committee of Congress (November 13, 2002), Chairman Greenspan stated "... the extraction of equity from homes has been a significant support to consumption during a period when other asset prices were declining sharply. Were it not for this phenomenon, economic activity would have been notably weaker in the wake of the decline in the value of household financial assets."

[5]See Baer (1986), Bruckner and Rosenthal (2009), Rosenthal (2008, 2014) and Case, Cotter and Gabriel (2011).

[6]Such policies include post-World War II Federal Housing Administration (FHA) creation of the fully amortizing, long-term fixed-rate mortgage, longstanding federal tax policies that subsidize homeownership (*e.g.*, Rosen 1979, Rosenthal 1988) and mortgage

With the above as backdrop, this article seeks to address a set of interrelated questions about the drivers of homeownership in the United States, the experience of the 2000–2010 decade and what may lie ahead. We begin by revisiting the theoretical model of Henderson and Ioannides (1983) in which they argue that demand for homeownership increases with the divergence between the investment versus consumption (or "shelter") demand for housing. Details of this model will be highlighted later. For now it is sufficient to indicate that the Henderson–Ioannides model implies that any factor that contributes to a household's investment or consumption demand for housing belongs as a control variable in a regression designed to evaluate the propensity of a family to own its own home. Moreover, the coefficients on those control measures are reduced form in nature and reflect the combined influence of investment and consumption demands for housing.[7]

We conduct our analysis using household-level data from the 2000 U.S. Census and the 2005 and 2009 American Community Surveys. For each sample year, separate regressions of household homeownership status are run for 68 groups of individuals stratified by age for ages 21, 22, 23 and so on all the way up to age 89. Stratifying the sample in this manner greatly enriches the analysis as it provides a clear indication of how the drivers of homeownership vary over the lifecycle. That stratification is feasible because of the very large sample sizes in the 2000 Census and the ACS, details of which are provided later in the article.

A further feature of the analysis is motivated by the fact that homeownership rates depend on past decisions because a family's housing tenure status is determined only at the time of a move. For that reason, we estimate all of our

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lending policies that required the GSEs to make special efforts to expand the supply of mortgage credit for lower income and minority neighborhoods (*e.g.*, Gabriel and Rosenthal 2010). In some instances, these policy initiatives have also been prompted by concerns about a legacy of discrimination in housing and mortgage markets and stubbornly persistent and large disparities in homeownership rates between white and minority households (*e.g.*, Gabriel 2001, Painter, Gabriel and Myers 2001, Gabriel and Painter 2003, 2009, Haurin, Herbert and Rosenthal 2007, Haurin and Rosenthal 2009). While racial disparities in access to homeownership are important, that is not the focus of this study.

[7]Brueckner (1997) and Flavin and Yamashita (2002) both emphasize that because owning and renting are not perfect substitutes, families with a large demand for shelter relative to investment demand for housing may own their own homes and "overinvest" in housing in order to satisfy their consumption needs. The Brueckner and Flavin–Yamashita models provide valuable insights but do not change the fundamental points we derive from the Henderson–Ionannides model. Specifically, when estimating a reduced form homeownership regression, (i) any factor that contributes to investment and consumption demand for housing belongs as a control variable in the model, and (ii), the model coefficients reflect the combined influence of shelter demand and portfolio considerations.

models twice, once for all families including those who may have been in their homes for many years, and then again for a subset of households that only just recently moved into their homes. Findings from the two samples complement and enrich our assessment of the drivers of homeownership.

All of the homeownership regressions include 35 control variables designed to highlight the underlying drivers of homeownership. As suggested above, these include a broad set of household socioeconomic and local market controls. Other drivers of homeownership are more difficult to observe, including mortgage underwriting standards and household tastes for investing in housing. Mortgage underwriting standards experienced significant easing during the 2000–2006 period followed by a pronounced tightening later in the decade.[8] Tastes for investing in housing also likely changed over the 2000–2010 period. These factors are reflected in changes in the model coefficients.

To illustrate, we highlight three of our control measures here that are especially relevant for the empirical work to follow (the other controls are described later in the article). The first of these is the median owner-assessed value of owner-occupied homes in the public use micro area (PUMA) in which the individual resides, an area about 50% larger than a typical county.[9] Higher house prices require higher downpayment and/or higher mortgage carrying costs. This increases the tendency for families to bump into lender-imposed downpayment and other constraints (*e.g.*, debt-to-income ratios) that limit the extent to which households can invest in housing. In the context of the Henderson–Ioannides (1983) model, such restrictions effectively reduce the household's investment demand for housing and thereby reduce the tendency for the household to own their own home.[10]

We also control for the one-year-ahead expected percent change in quality-adjusted house prices in the metropolitan area in which a family resides.[11]

[8]The broad-based easing in credit standards in the mid-2000s was manifested in part in the widespread proliferation of subprime and Alt-A mortgages. While we do not model those terms directly in our reduced-form specification, we do anticipate that such credit easing would have improved access to homeownership, the effect of which is reflected in the model coefficients.

[9]As constructed by the U.S. Census Bureau, there are roughly 2,000 PUMAs covering the entire United States. In comparison, there are roughly 3,100 counties in the United States, so a given PUMA is about 50% larger than a typical county.

[10]Note that there is no easy analogue to express the influence of borrowing constraints on user cost measures of owner-occupied housing (*e.g.*, Rosen 1979) which in part is why we focus on the Henderson–Ioannides model.

[11]To do this, we first generate a metro-level one-year-ahead house price forecast by regressing the four-quarter change in the Federal Housing Finance Agency (FHFA) MSA index on five four-quarter lags of the dependent variable.

In the Henderson–Ioannides model, expected housing capital gains should increase the investment demand for housing. In the context of user cost measures that appear in many studies of homeownership (*e.g.*, Rosen 1979), housing capital gains lowers the relative cost of owning to renting. In both instances expectations of rising housing prices should encourage homeownership.

A third control of special note is the tendency for a given metro area to experience periods of significant house price volatility. Conditional on the other model controls, it seems unlikely that the consumption demand for housing, as driven by the need for shelter, is particularly sensitive to anticipated house price volatility. Investment demand for housing, however, surely is sensitive to house price volatility because that would expose housing investors to a greater degree of risk.[12] Although volatility is not typically taken into account in standard user cost measures of the relative cost of owning to renting, it has a natural role in the investment–consumption model of Henderson and Ioannides (1983). With risk-averse households, house price volatility should reduce the investment demand for housing and discourage homeownership.

It is worth emphasizing that our modeling strategy yields a panel of coefficients that characterize reduced-form drivers of homeownership over the decade and across the life cycle. Drawing on that panel of estimates, we conduct a shift-share analysis that decomposes changes in aggregate homeownership rates over time into the contributions from changes in model controls (*e.g.*, household sociodemographic and house price terms) versus changes in the model coefficients.[13] We first perform this analysis based on the entire sample of

[12]Inclusion of the volatility variable is motivated in part by recent work by Case, Cotter and Gabriel (2011) and Davidoff (2005). Davidoff (2005) demonstrates that house price volatility affects family housing decisions, and more so if their labor income is correlated with movements in housing values. Case, Cotter and Gabriel (2011) show that localized house price volatility is often priced into metropolitan house price returns.

[13]Our shift-share analysis is similar in design to Gabriel and Rosenthal (2005) and Haurin and Rosenthal (2007). In Gabriel and Rosenthal (2005), our focus was on the 1990s, the role of borrowing constraints and racial gaps in homeownership. In Haurin and Rosenthal (2007), the time horizon spanned 1970–2000 with a primary focus on the influence of headship decisions on homeownership rates. Relative to these studies, the innovation in this paper is to focus on the dramatic boom and bust in homeownership over the 2000–2010 period as highlighted above. Although large racial gaps in homeownership still persist, they will not be our focus even though race and ethnicity are included as controls in the homeownership regressions. Similarly, Haurin and Rosenthal (2007) show that headship and homeownership decisions are not independent, and that rising headship rates in the 1990s contributed to an increase in homeownership rates among younger households. Lee and Painter (2013) and Paciorek (2013) also document that headship rates increase during a boom and decrease markedly during a recession. Nevertheless, we do not directly address the role of headship in this study. This simplifies our analysis considerably. We will comment on possible biases arising from not having directly modeled headship rates later in the paper.

households and then again using just those households that moved in the last 12 months. Although inertia associated with nonmovers affects the full-sample shift-share results, that influence is largely absent in the recent mover sample. Together, findings from the two samples provide a more complete picture than if only one of the samples was used.

Bearing the above points in mind, the deterrent effect of house price volatility on homeownership diminished between 2000 and 2005 and then increased following the crash. We argue that this yields suggestive evidence that households may have become more risk loving during the boom and more risk averse during the subsequent market downturn.[14] Shifts in primary and secondary mortgage market lending standards in response to house price volatility also likely contributed to these patterns. Consistent with these interpretations, findings from the shift-share analysis indicate that the boom and bust in homeownership between 2000 and 2010 was largely driven by changes in the model coefficients that reflect shifts in preferences for homeownership, changes in lending standards and other market conditions that are not directly modeled (*e.g.*, loan rates). This stands in marked contrast to findings for the 1990s. Using data from different years of the Survey of Consumer Finances, in earlier work (Gabriel and Rosenthal 2005) we show that changes in population socioeconomic characteristics—not market conditions—account for most of the roughly four-percentage-point increase in homeownership between 1989 and 2001 (see Figure 1). Using census data, Haurin and Rosenthal (2007) further demonstrate that shifts in the age distribution of the population drive most of the change in aggregate homeownership rates in the 1990s.

Looking ahead, the shift-share analysis also suggests that homeownership rates may have come close to bottoming out in early 2013 at roughly 65%, similar to rates that prevailed throughout much of the 1970–1995 period. This suggests little lasting effect of the grand homeownership policy experiment of recent decades.

To clarify these findings, the following section defines the demand for homeownership based on the divergence between consumption and investment motives for owning real estate. The third section describes the data, the fourth section discusses our regression results, and the fifth section presents results of the shift-share analysis. We conclude in the final section.

[14]Equivalently, household *perceptions* of exposure to risk may have diminished during the boom and then increased during the bust. In the present context, shifts in risk aversion versus perception are observationally equivalent and both point to reduced household sensitivity to house price risk.

The Demand for Homeownership

It is not uncommon to see references to the demand for homeownership in the popular press, academic articles and policy discussions. Nevertheless, the sense in which there is a demand for homeownership is ambiguous because households consume housing services, not homeownership. This section offers an explicit definition of the demand for homeownership that helps to specify and interpret the empirical models to follow. The discussion draws closely on previous work by Henderson and Ioannides (1983) and Ioannides and Rosenthal (1994).

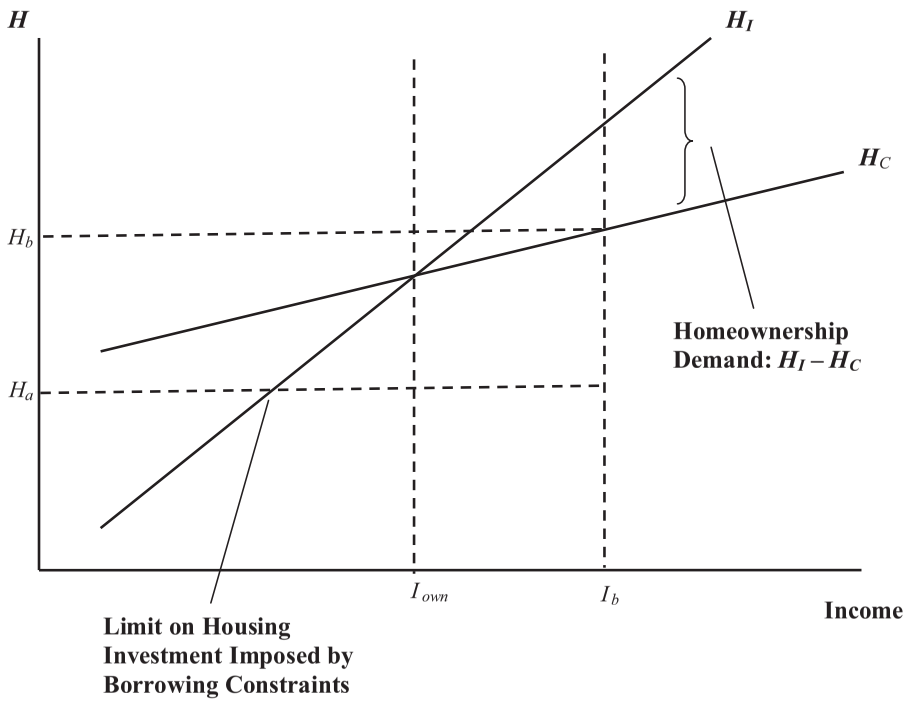
Henderson and Ioannides (1983) emphasize that if a family's consumption (shelter) demand for housing exceeds its investment demand then the family is likely to rent. That is because if the family purchased a home that met its consumption demand it would be overinvested in real estate from a portfolio perspective. As investment demand rises up above consumption demand, the family becomes increasingly likely to own their primary home. That is because the family could purchase a level of housing equal to investment demand and then occupy more housing than needed for consumption purposes or rent out the extra space.

To illustrate, in Figure 2, H_C and H_I are the consumption and investment demands for housing and increase along the vertical axis. Household income is on the horizontal axis and is assumed to have a more positive impact on H_I than on H_C with the slope of H_I exceeding that of H_C. This causes the two lines to cross at an income level of I_{own}, beyond which families choose to own. As drawn, the demand for homeownership increases with income and is measured by the divergence between investment and consumption demand for housing, $H_I - H_C$.

Consider now the role of lending standards. To simplify, these are expressed as a constraint on the maximum amount of housing a family can purchase. In the figure, this is represented by the lower horizontal dashed line and limits housing investment to H_a. If income equals $I_b > I_{own}$, the household would want to own but as drawn the downpayment constraint would be binding. In this instance, the family would be better able to accommodate its consumption demand of $H_b > H_a$ by choosing to rent.

An implication of the model is that the coefficients in the homeownership regressions to follow are reduced form in nature and reflect the combined influence of three factors: consumption demand for housing, investment demand for housing and the presence of possibly binding borrowing constraints. This makes it difficult to use changes in the homeownership coefficients across

Figure 2 ■ Demand for homeownership.



sample years to identify the role of borrowing constraints or infer shifts in attitudes about investing in housing. We return to this issue at various points later in the article.

Data

The primary data for the study include individual-level records from the public use micro samples (PUMS) of the 2000 Census and the 2005 and 2009 American Community Surveys (ACS).[15] It is worth noting that the 2000 data are based on a 5% sample of the U.S. population while the ACS is a 1% sample. Each of the surveys provides an extensive array of variables that are common across sample years. Each of the surveys are also cross-sections of the population in a given sample year and do not follow households over time.[16] The samples were limited to noninstitutional, civilian household heads not living in group quarters.[17] In all cases, there is one observation per family in the survey, and socioeconomic attributes are those of the household head.

The data contain information on the family's housing tenure status, the primary variable of interest. Also reported in the surveys is the number of years the family has been in the home; this variable is used to identify families that moved into their homes in the previous year for the recent mover sample. Control variables include a wide range of information and are of four broad types: (1) demographic control variables: marital status (single female, currently married, married at one time, other), race (black, Asian, Hispanic, other), income (in year-2009 dollars), educational attainment (less than high school, high school degree, other), various types of disability status (restricted to a wheel chair, unable to care for self, impaired hearing or sight), years in the United States (0–10 years, 11–20 years, other including natural born citizen) and veteran status; (2) labor-related control variables: occupation type (professionals, managers and others), current employment status, self-employment status and hours worked; and (3) geographic control variables: central city,

[15]Geographical location of the individual person records in the 2000 Census and the ACS PUMS data are identified down to the PUMA (public use micro area) level. By definition, a PUMA contains at least 100,000 people in residence.

[16]PUMS data from both data sets are available from the Census website (www.census.gov) and also in a more user-friendly form from the IPUMS website (www.ipums.org).

[17]Further excluded were observations where the unit was unoccupied, of individuals for which ownership status was nonapplicable and of renters for which there was no cash rent.

suburban, non-MSA and region of the country (dummies for the nine census regions).

The fourth group of controls includes the three local housing market attributes highlighted in the introduction and requires further comment. The first of these is the median value of owner-occupied homes in the family's PUMA of residence. As with income, this measure is expressed in year-2009 dollars.

The second housing market variable is the one-year-ahead forecast of the percent change in quality-adjusted house price in the household's metropolitan area. This was obtained based on an AR(5) specification using 1980–2009 MSA-level house price indexes from the Federal Housing Finance Agency (FHFA).[18] The dependent variable in the model was the nominal four-quarter change in the FHFA house price index. Control variables included five annual lags of the dependent variable. The model was estimated separately for each MSA and the estimated coefficients used to forecast one-year-ahead changes in the FHFA index.

The third housing market variable is house price volatility for the MSA in which the household resides. This was also calculated using the nominal house price indexes obtained from the FHFA. A multistep procedure was used to create the volatility measures. In the first step, we calculated the nominal percentage change in the house price index over the previous 20 quarters for the MSA in question. This was done for each quarter from 1985 to 2007. In the second step, for each location we calculate the variance of the five-year percentage change in the price index across 13 years of quarterly values or 52 quarters.[19] For the 2000 Census data, variance is calculated over the 1985–1998 period; for the 2005 ACS data, variance is calculated over the 1990–2003 period; for the 2009 ACS data, variance is calculated over the 1994–2007 period. This ensures that our measure of local house price volatility is based on historical levels of volatility up to two years prior to the Census/ACS sample year. Given the important role of house price volatility in the discussion to follow as a proxy for risk, Appendix A reports summary measures for the variable across MSAs.

[18]The Census and ACS data report household location at the MSA level while FHFA reports house price indexes at the CBSA level. In most instances we were able to match the FHFA indexes to the MSA in which a household resides. In other instances, we matched the household's state of residence to the state-level FHFA index.

[19]This is the longest history that will still allow us to retain all MSAs in the United States in the sample.

Regression Results

Homeownership Regressions

Our empirical analysis begins with 68 age-stratified regressions for individuals age 21–89 for sample years 2000, 2005 and 2009. The regressions are of the following form:

$$Own_{i,a,y} = x_i b_{a,y} + e_i, \tag{1}$$

where i indexes the individual observation for a given age group a (21, 22, . . . , 89) in a given sample year y (2000, 2005 and 2009). *Own* equals 1 if family i owns their home and zero otherwise. x is a vector of model controls as described earlier, while b are the corresponding coefficients. To facilitate estimation and presentation, the model is estimated by ordinary least squares (OLS). Accordingly, the model coefficients should be interpreted as follows: for a one-unit change in the value of a given control variable (*e.g.*, income), the corresponding coefficient indicates the percentage point change in the probability of homeownership holding all other control variables in the model constant.[20]

As discussed above, (1) is estimated twice for each age group and sample year, first using the full sample and then using only those households that moved into their homes in the previous 12 months. With 35 control variables in x, this procedure results in 14,280 regression coefficients: 35 coefficients per regression for 68 age groups for three survey years for both the full sample and the sample of recent movers.

Coefficient Plots

To present this vast amount of information, we plotted the coefficients by age of the household head for each variable for each survey year, and for both the full sample and the sample of recent movers. In earlier versions of the article, over 30 different figures were reported for the full-sample estimates and then repeated for the recent mover sample estimates. Each figure corresponded to a single control variable (*e.g.*, family income, employment, *etc.*) and each contained plots from all three survey years (2000, 2005 and 2009). Organizing the coefficients in this fashion facilitated comparisons across the survey years but still produced too many figures to be discussed in detail or presented in a parsimonious manner. For that reason, we present coefficient plots for just four variables that are especially instructive of what may have driven the boom and bust in homeownership over the 2000s: family income, the median value

[20]Estimating by probit did not change the results after adjusting for the nonlinearity of the probit function.

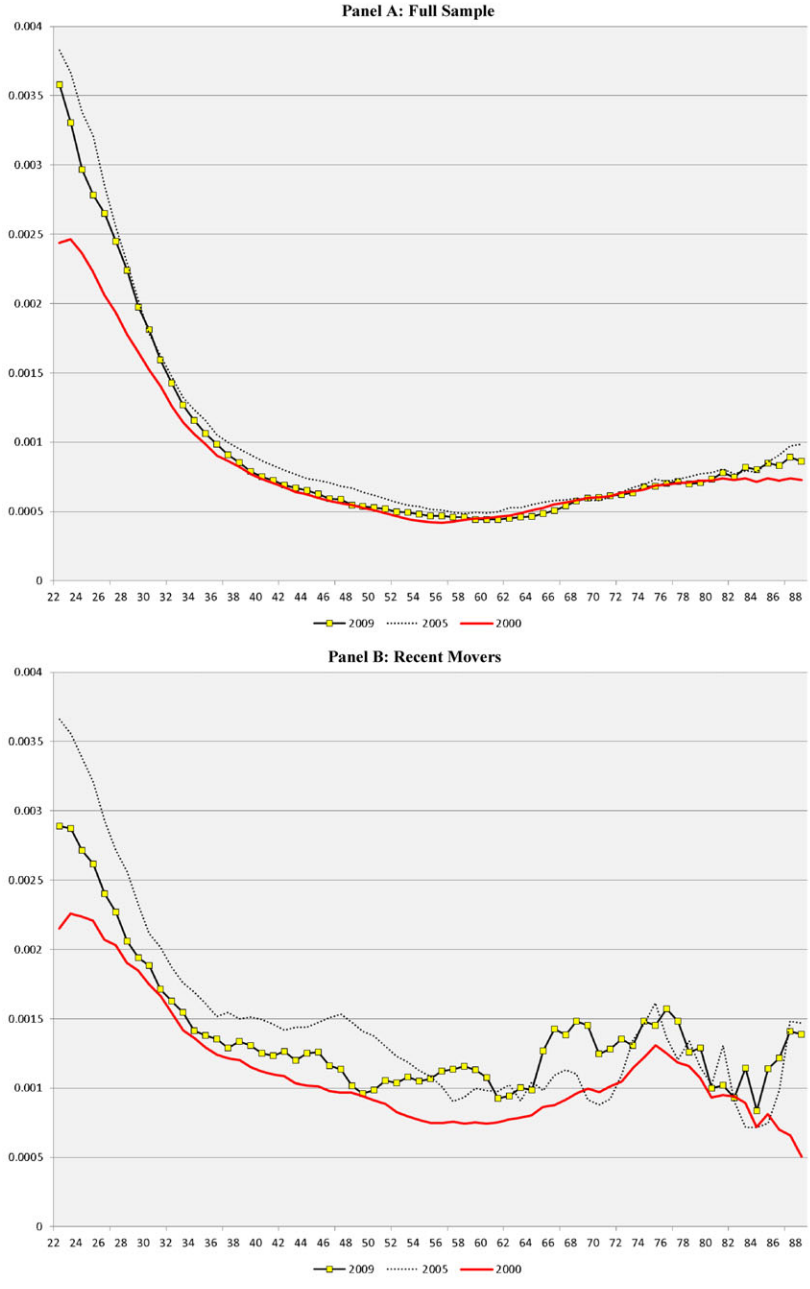
of owner-occupied homes in the family's PUMA of residence, the one-year-ahead forecast of the percent change in the family's MSA house price and the historical level of house price volatility in the family's MSA. To increase precision, the plots report three-year moving averages of the coefficient in question based on coefficient estimates that correspond to three adjacent age groups (*e.g.*, ages 21–23).[21] In all cases, age of the sampled individuals is plotted along the horizontal axis, while the three-year moving average of the estimated coefficients is on the vertical axis.

Consider first the influence of family income as plotted in Figure 3, Panels A and B, for the full sample and recent mover sample, respectively. Income is measured in $1,000 units (in year-2009 dollars). Focusing on the full sample estimates in Panel A and using the coefficient on income in the age-26 regression for the 2005 sample as an example, notice that the coefficient is roughly 0.003. This indicates that for each $10,000 of additional income (in year-2009 dollars), the typical 26-year-old household head would be three percentage points more likely to own a home holding the other model controls constant. From our model in Figure 2, this suggests that housing investment demand rises more rapidly with income in comparison to consumption demand, and, for that reason, higher income families are more likely to own. This is true for all age groups and sample years given the positive coefficients throughout the figure. On the other hand, the influence of income declines sharply with age until leveling off once individuals reach their mid-40s. For individuals beyond that age, $10,000 additional income increases the propensity for homeownership by just one-half percentage point. The much larger influence of income among younger individuals is consistent with widely appreciated stylized facts that younger families are often wealth constrained when purchasing a home and take on higher loan-to-value ratios for that reason. That increases the mortgage-debt-burden-to-income ratio for younger families making it more difficult to purchase a home. Additional income alleviates this situation but is not as influential for older families who tend to be less wealth constrained relative to their preferred housing purchase.[22]

[21] We do not report the standard errors on any of our estimates since to do so would become unwieldy given the extensive number of model coefficients. Instead, we note here that sample sizes for the age-specific regressions ranged from about 15,000 observations for some of the younger and older age cohorts to approximately 200,000 observations for middle-aged cohorts. These sample sizes are large enough to ensure quite precise estimates of most of the model coefficients. Plotting three-year moving averages of the estimated coefficients as noted above also has the effect of effectively tripling sample size and further enhances precision.

[22] In the context of the model in Figure 2, this suggests that income has a relatively larger impact on investment demand for housing relative to consumption demand among younger versus older households.

Figure 3 ■ Homeownership model coefficients: Family income (2009 constant dollar $1,000 units).



It is also instructive to compare the income coefficients across the survey years. For most individuals beyond their mid-30s there is little difference in the income coefficients between 2000, 2005 and 2009. However, for households in their 20s, the coefficients increased in magnitude from 2000 to 2005, and then fell back somewhat between 2005 and 2009. This pattern is reinforced in Panel B, which presents plots of the income coefficients for the recent mover sample. In that figure, the influence of income increased from 2000 to 2005 for individuals up to age 55, and it then dropped back most of the way to the year-2000 pattern in 2009. The elevated plot for 2005 is consistent with the issuance during that period of many nonconforming, low-downpayment loans that required higher income, all else equal. The shifting back towards a pattern more similar to that of 2000 may reflect in part the disappearance of such low-downpayment loans following the implosion of credit markets.[23]

Figure 4 presents plots of the impact of PUMA median house value on the propensity to own a home (with house values measured in year-2009, $100,000 units). As before, Panel A corresponds to the full sample while Panel B is based on the sample of recent movers. Focusing on Panel A, notice that the coefficient for individuals in their late 20s in 2009 is roughly -0.05. This suggests that a late-20s household would be roughly five percentage points less likely to own a home for every $100,000 increase in local house prices, all else equal. More generally, it is clear that higher house prices deter homeownership for all age groups but most for individuals in their early 30s. For individuals beyond their early 30s, the deterrent effect of higher house prices diminishes (becoming less negative) until reaching a plateau for individuals in their early 40s. While this pattern is remarkably robust across survey years, there is an obvious upward shift in the age-specific coefficients from 2000 to 2005 all across the age spectrum. This indicates that the deterrent effect of higher house prices diminished between 2000 and 2005, coinciding with the easing of credit standards that allowed for higher levels of nominal mortgage debt qualification. The pattern reverses as one shifts from 2005 to 2009, consistent with the tightening of credit standards following the crash. These patterns are especially pronounced among recent movers (Panel B) and younger households.

Figure 5, Panels A and B, display plots for the coefficients on the one-year-ahead forecast of the percent change in MSA-level house prices for the full sample and recent movers, respectively. The year-2000 estimated coefficients are largely positive, consistent with the expectation that higher expected housing capital gains increase the investment demand for housing and encourage

[23]To the extent that FHA lending remains a viable source of low-downpayment loans, the post-2005 downward shift in the income coefficient plots noted above could also reflect a decline in household taste for investing in real estate.

Figure 4 ■ Homeownership model coefficients: PUMA median house value (2009 constant dollar $100,000 units).

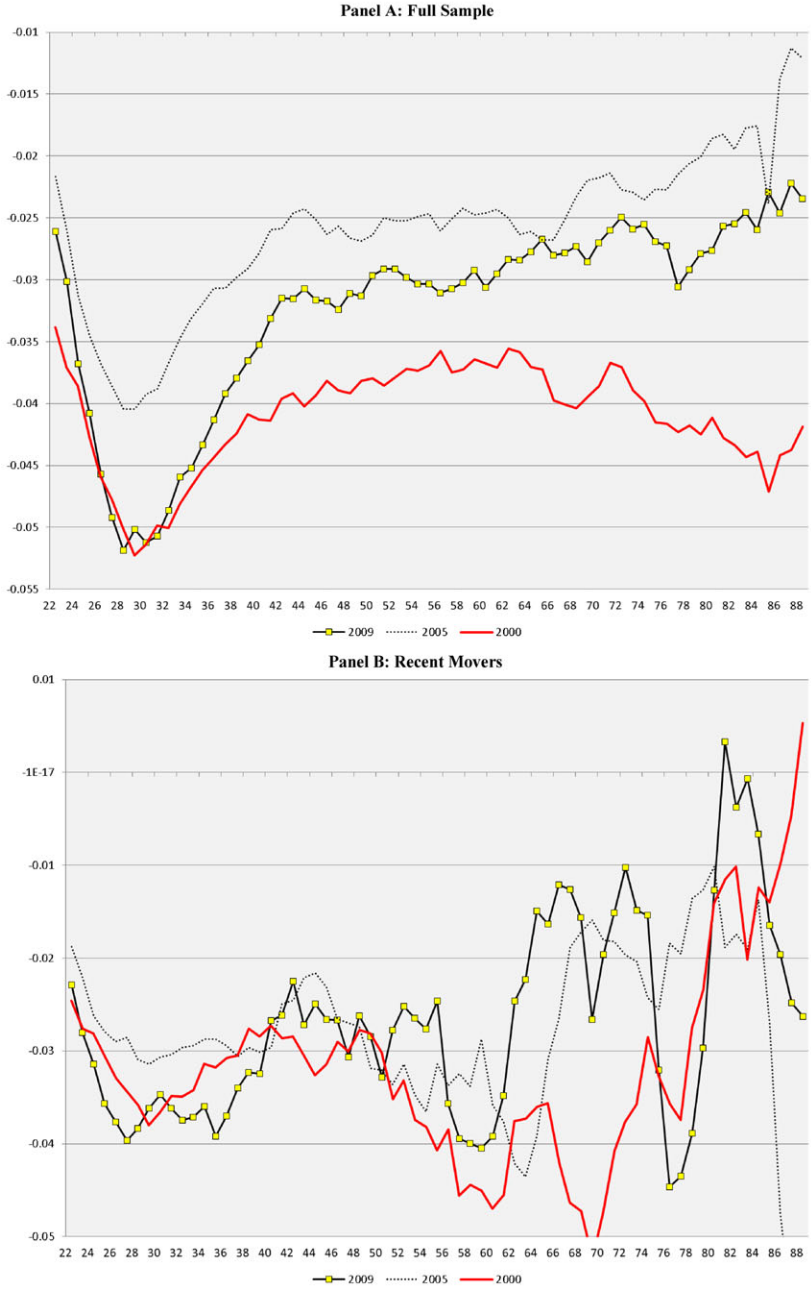
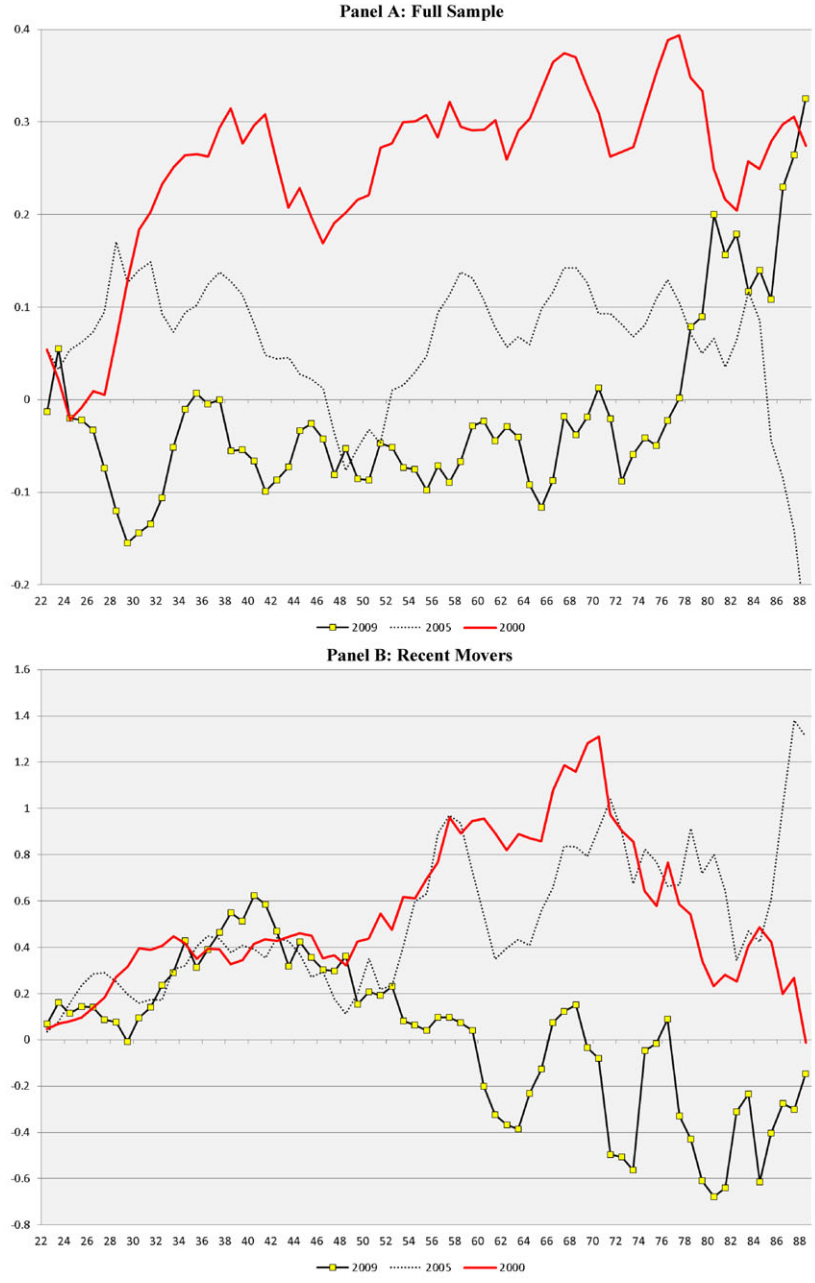


Figure 5 ■ Homeownership model coefficients: One-year-ahead forecast of the percent change in house price.



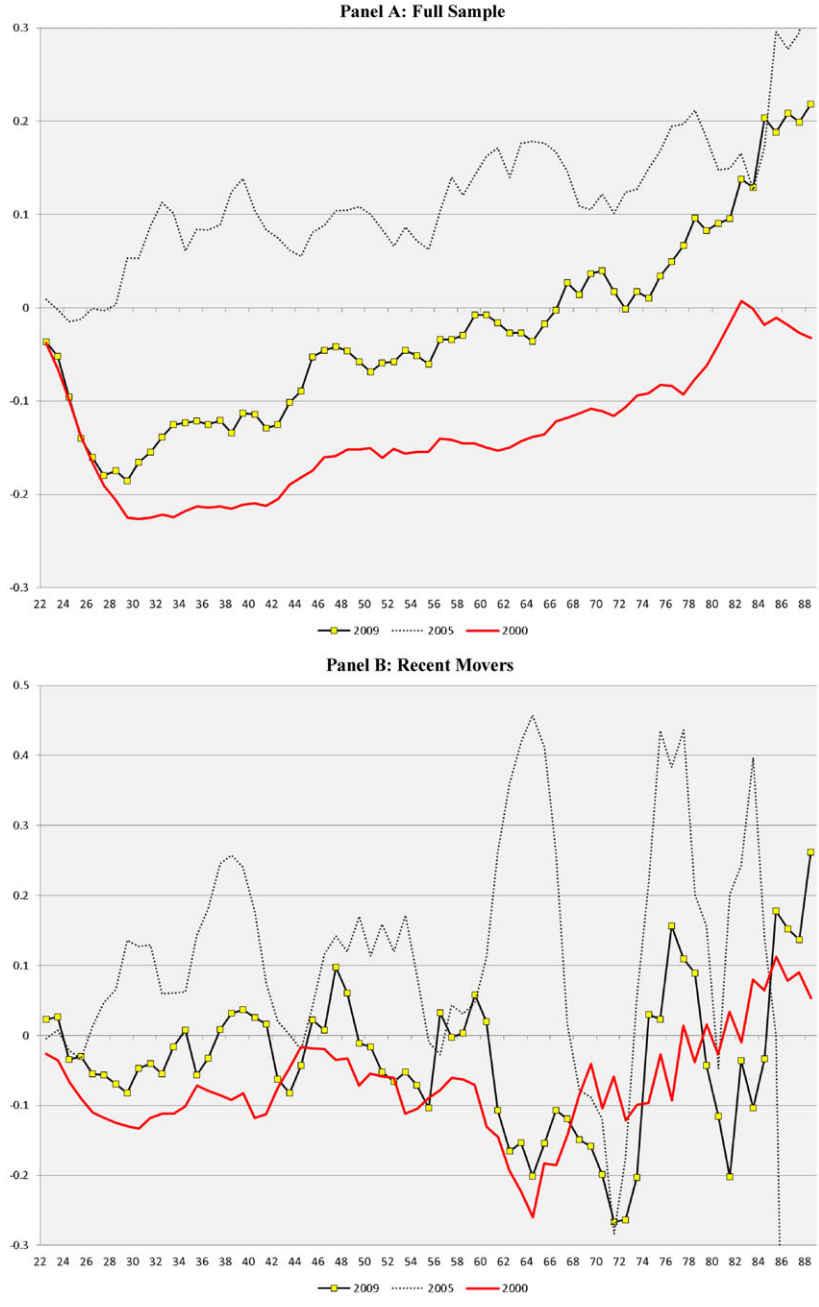
homeownership. Further, coefficient values trend higher among households in their 30s and remain at those elevated levels over the remainder of the age spectrum. The patterns for 2005 and 2009 are different: for both sample years, the coefficient plots are downward shifted and, for 2009, slightly negative for most age groups.

The coefficient plots for recent movers in Panel B of Figure 5 hint at a possible explanation for these patterns. For individuals under age 50, the coefficients are similar across sample years and display a pronounced upward trend from roughly 0 to a plateau at 0.45 for individuals in their 40s. For a typical 45-year-old that is moving to a new home, this suggests that a 10% anticipated increase in house prices over the coming year would increase the likelihood of purchasing a home by roughly 4.5 percentage points. The patterns for individuals over age 50 are dramatically different. Notice that the positive influence of expected house price appreciation on homeownership becomes even more pronounced for older individuals in 2000 and 2005. For older individuals in 2009, however, the positive influence of expected capital gains on homeownership largely disappears. This pattern is suggestive that in the aftermath of the financial crisis older individuals adopted a more conservative posture with respect to investing in real estate.

Figure 6, Panels A and B, display analogous plots of the coefficients on historical patterns of local (MSA- or state-level) house price volatility. As expected, higher local rates of house price volatility typically discourage homeownership; this is evident from the largely negative coefficients in both panels for 2000 and 2009. Also, the deterrent effect of volatility is most pronounced for relatively young families, as seen by the largely rising pattern of coefficients in Panel A beyond the youngest households. Finally, the deterrent effect of local house price volatility diminished between 2000 and 2005. Indeed, that shift was so pronounced that for many age groups, the volatility coefficients were actually positive in 2005, and especially among recent movers (Panel B). With the financial crash, the volatility plots shifted back towards year-2000 levels.

A number of factors likely contributed to the changing influence of house price volatility over the decade. As discussed earlier, lenders relaxed underwriting standards between 2000 and 2005. To the extent that the easing of credit standards was indicative of reduced lender concerns about default risk, this would have contributed to an upward shift in the volatility coefficient plots. Further, households may have adopted a more risk-loving attitude towards housing investment and homeownership during the mid-decade bubble period. That too would have contributed to an upward shift in the volatility coefficient

Figure 6 ■ Homeownership model coefficients: Historical house price volatility.



plots, reducing the deterrent effect of house price volatility on the propensity for homeownership.[24]

Homeownership Rates

Overview

We turn now to the primary question of this study: to what extent did changes in market conditions and attitudes as embodied in the estimated coefficient vectors versus changes in population socioeconomic and demographic attributes drive the boom and bust in homeownership over the 2000–2010 period? As noted earlier, we use a shift-share analysis to address this question. Specifically, we combine coefficient estimates from a given sample year Y_1 (2000, 2005 or 2009) with data from another sample year Y_2 (also 2000, 2005 or 2009). Results predict homeownership rates that would have prevailed in year two if individuals had faced year-one market conditions as embodied in the year-one coefficients. Those conditions include household preferences for investing in real estate, lending standards and other broader macroeconomic conditions (*e.g.*, loan rates). This is the same approach we used in prior work (Gabriel and Rosenthal 2005) to evaluate what drove the roughly three-percentage-point increase in homeownership rates in the 1990s (see Figure 1).[25] Findings from that study indicated that changes in population socioeconomic and demographic attributes drove nearly all of the increase in homeownership in the 1990s with changes in market conditions having little effect. As noted in the introduction and will become apparent, market conditions play a much larger role as a driver of the boom and bust in homeownership between 2000 and 2010.

Our analysis is divided into three parts. We first compute homeownership rates for each age group for each of our sample years. Next, we decompose changes in age-specific homeownership rates across survey years using the shift-share approach described above. In the third portion of the analysis, we pool estimates across age groups and decompose changes in aggregate U.S. homeownership rates across years into contributions from population attributes versus market conditions.

[24]Findings by Sinai and Souleles (2005) are suggestive of an alternate possible interpretation, that risk-averse households might seek to protect themselves from possible future rent increases by becoming homeowners.

[25]In Gabriel and Rosenthal (2005), we drew upon six years of the Survey of Consumer Finances (SCF) from 1983 to 2001.

Age-Specific Homeownership Rates

This section describes the computation of age-specific homeownership rates for each survey year, both for the full population and for recent movers. We do this by first forming the predicted probability of homeownership for each individual in the sample using the estimated coefficients corresponding to that individual's age, sample and survey year. Homeownership probabilities are then averaged across individuals applying household sampling weights in the Census and ACS to ensure that the results are representative of the United States.[26] Plots of the full sample age-specific homeownership rates are provided in Figure 7, while plots for the recent mover sample are in Figure 8. In both cases, homeownership rate levels are plotted in Panel A, while differences in ownership rates between survey years are plotted in Panel B.

For the full sample (Figure 7), the estimated age-specific homeownership rates in Panel A rise for households under age 50, plateau at a level between 80% and 85% for households in their 50s to mid-70s and decline thereafter. This pattern is similar to findings in Haurin and Rosenthal (2007) for earlier decades. Also notable, for all age groups and especially individuals under 35, homeownership rates were higher in 2005 than in 2000 (see Panel B). Homeownership rates fell between 2005 and 2009 and especially so for younger families. As a result, among individuals under age 60, homeownership rates in 2009 were notably lower than in 2000, while the reverse is true for individuals over age 60; this is evident from the solid line in Panel B.

Among recent movers (see Figure 8), there is relatively little difference in age-adjusted homeownership rates between 2000 and 2005; this is clear from the dotted line in Panel B of Figure 8, which varies between -0.02 and 0.02 across age groups. In contrast, there is a pronounced decline in the propensity of recent movers to purchase a home between 2005 and 2009. As shown by the dotted line in Panel B, that decline increases sharply with age of the household until leveling off for individuals in their 40s at roughly 13 percentage points below that of homeownership rates for comparably aged individuals in 2005. The following sections help to explain these patterns.

Decomposition of Age-Specific Homeownership Rates

This section decomposes changes in the age-specific homeownership rates between 2000 and 2009 into contributions arising from shifts in the value of the control variables versus shifts in the estimated model coefficients. Full sample results are reported in Figure 9, while recent mover results are in Figure 10. In

[26]Unweighted data are used when estimating the regressions given the assumption that the controls are exogenous.

Figure 7 ■ Full sample homeownership rates by year.

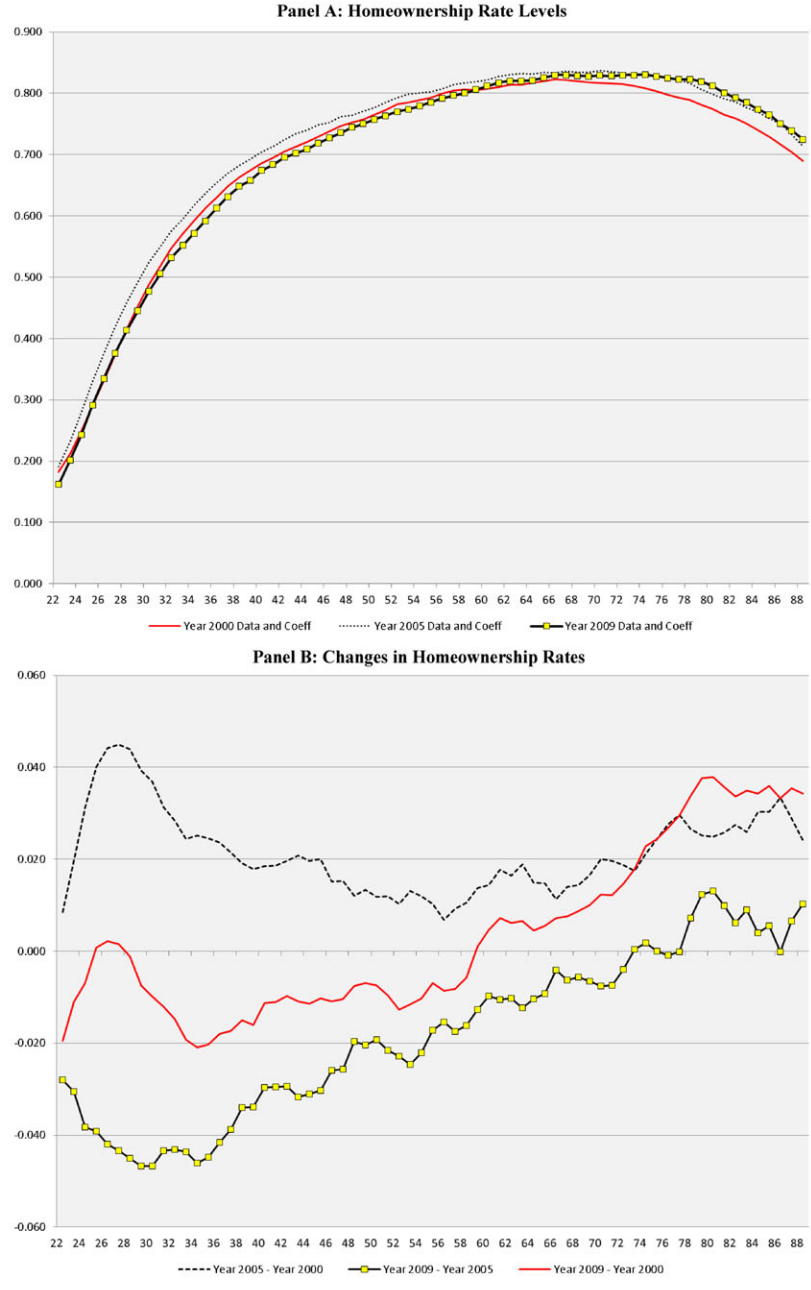


Figure 8 ■ Recent mover sample homeownership rates by year.

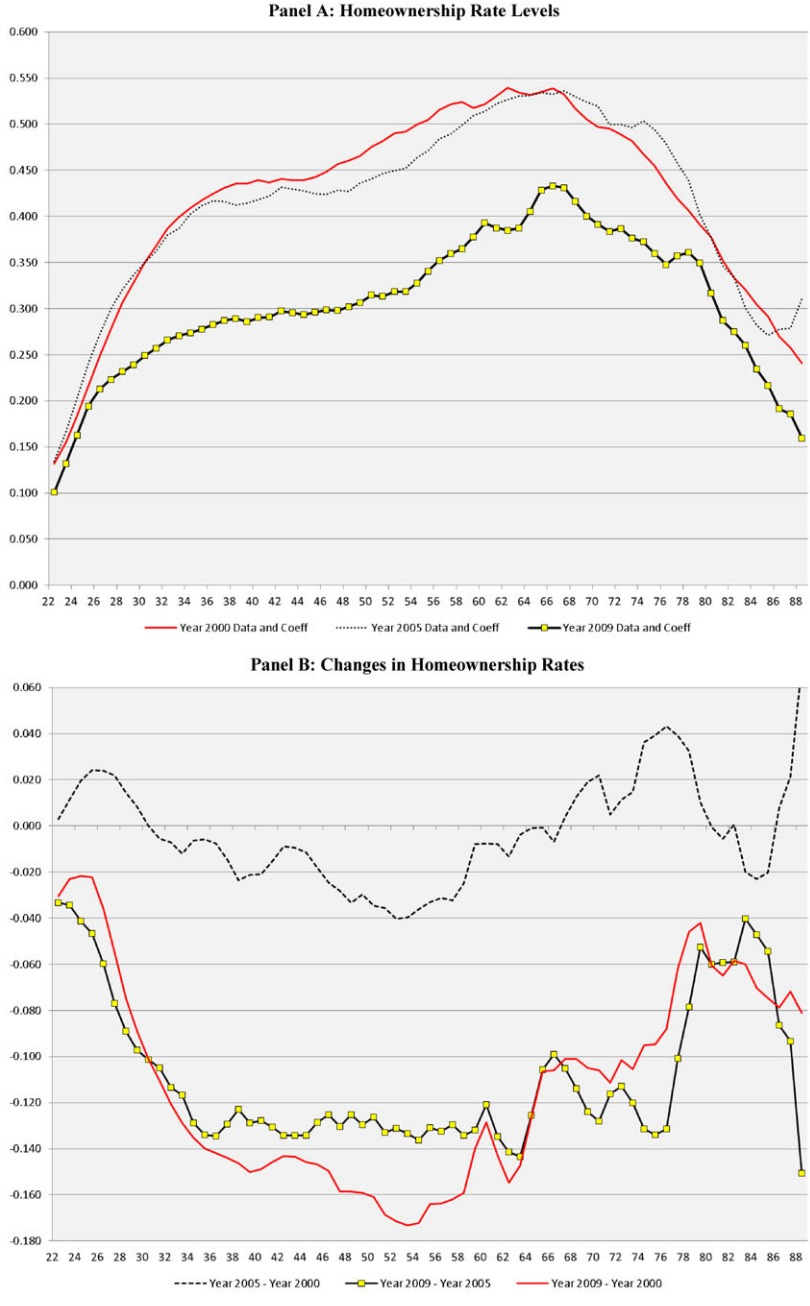


Figure 9a ■ Homeownership rate 2009–2000 decomposition using different model-year coefficients and data.

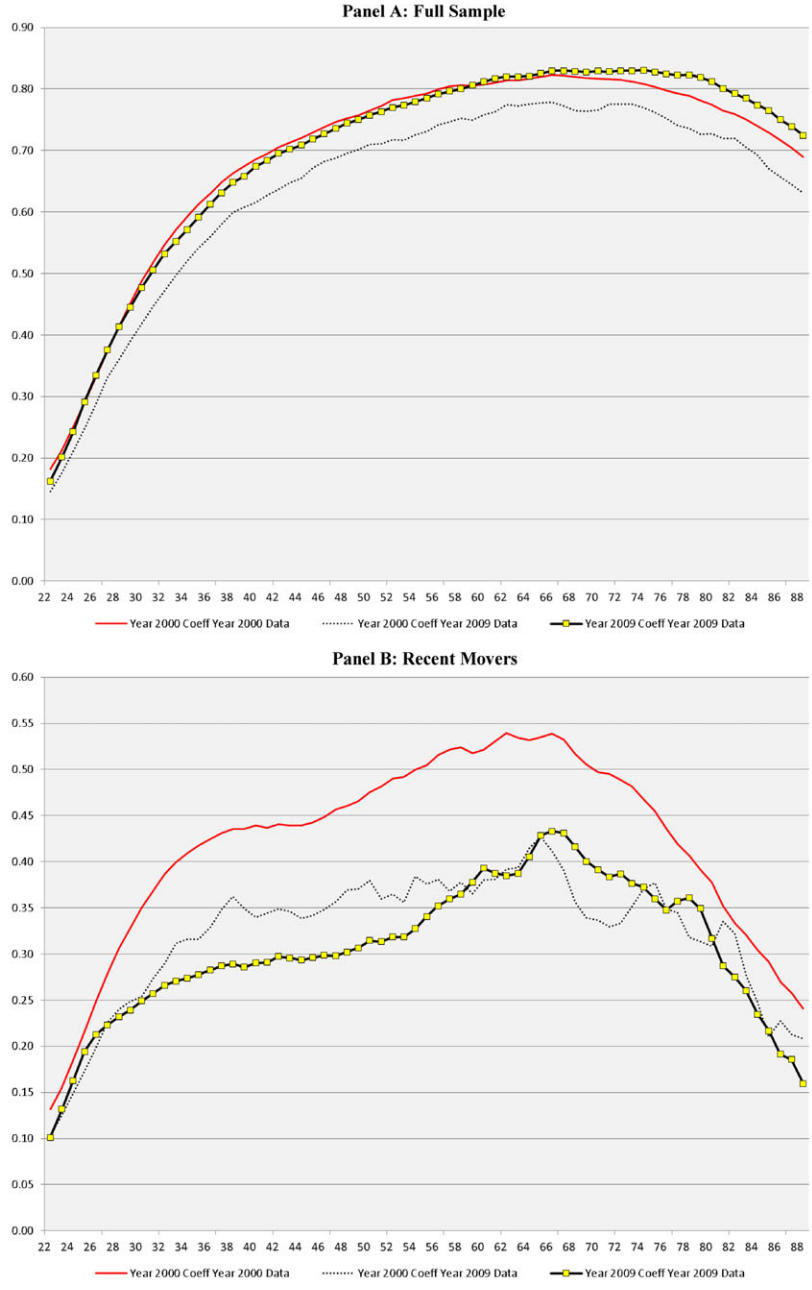


Figure 9b ■ Full sample homeownership rate decomposition using different model-year coefficients and data.

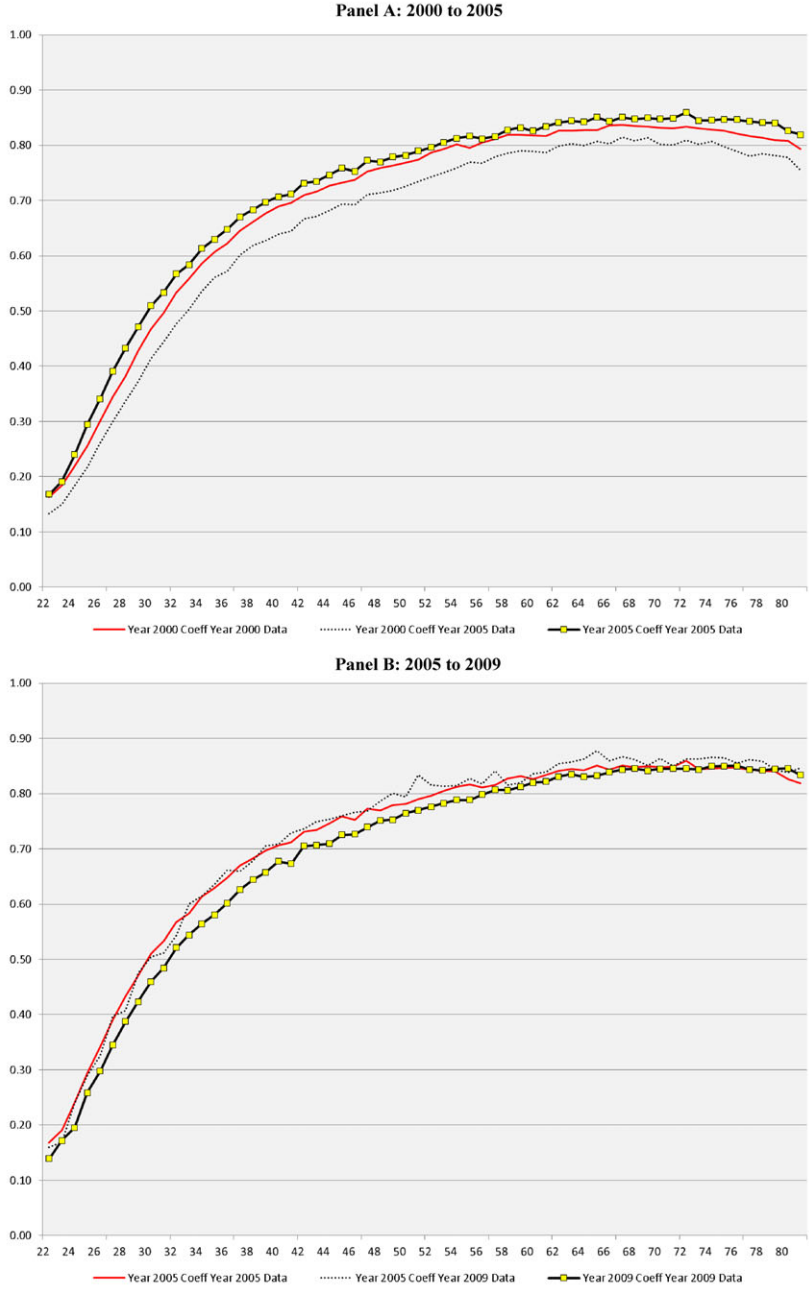
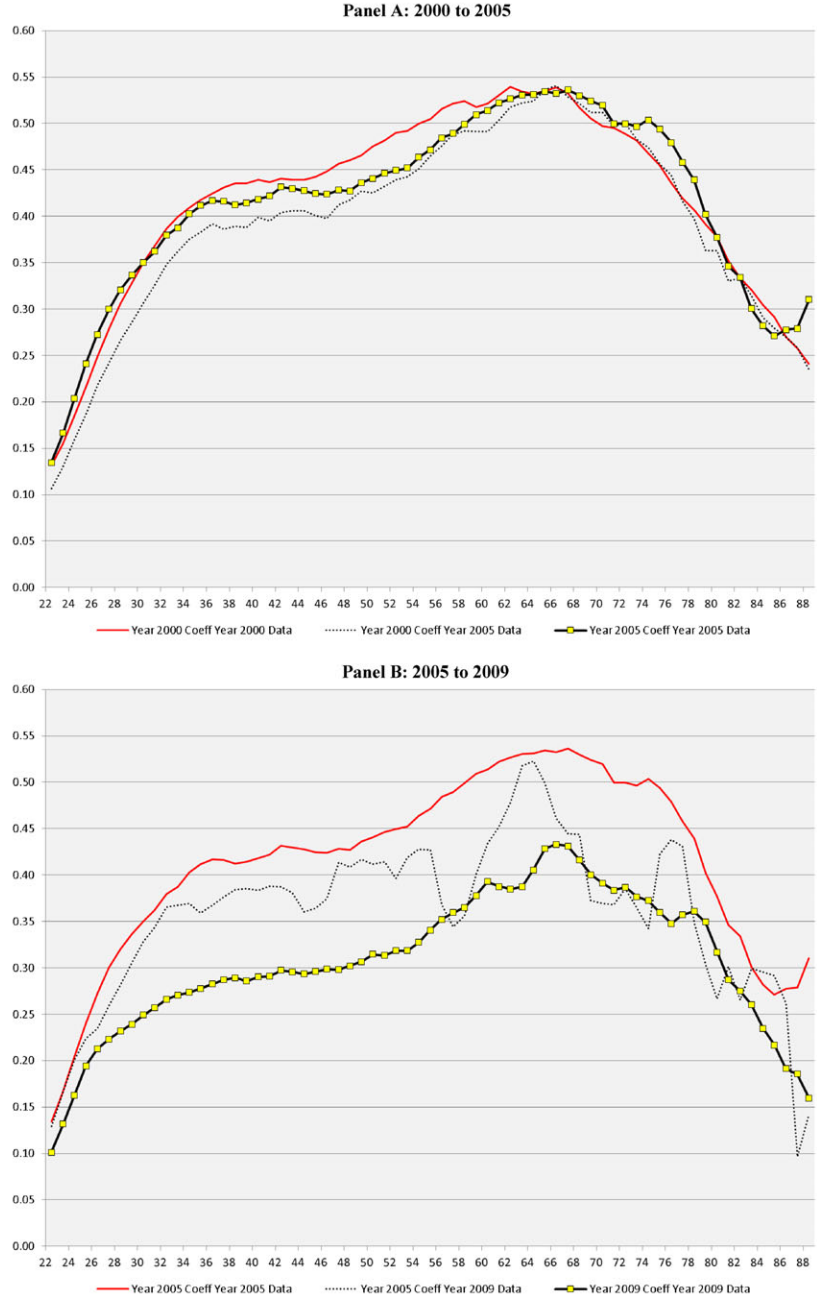


Figure 10 ■ Recent movers homeownership rate decomposition using different model-year coefficients and data.



each case, Panel A compares 2000 to 2005 while Panel B compares 2005 to 2009.

In Panel A of Figure 9, notice that combining year-2000 coefficients with year-2005 data lowers homeownership rates for all age groups relative to year-2000 rates (based on year-2000 coefficients combined with year-2000 data). This is evident from the downward-shifted position of the dotted line and indicates that socioeconomic and demographic changes over this portion of the decade worked in the direction of reducing homeownership. On the other hand, replacing the year-2000 coefficients with year-2005 coefficients increases homeownership rates for all age groups. This confirms that market conditions pushed homeownership rates higher between 2000 and 2005. A different set of patterns emerges when comparing 2005 to 2009 in Panel B. For the second half of the decade, population socioeconomic traits have little further influence on changes in homeownership rates while changes in market conditions, as embodied in changes in the model coefficients, reduce homeownership for all age groups.

Figure 10 repeats this shift-share analysis using recent movers. Although the qualitative patterns are mostly similar to those for the full sample, the magnitude of the effect of changes in the model coefficients is much larger. This is especially easy to see in Panel B where it is evident that adverse post-crash market conditions dramatically reduced the tendency of recent movers to purchase their homes and especially so for individuals under age 50.

Summarizing, the patterns in Figures 9 and 10 indicate that changes in population socioeconomic attributes tended to lower homeownership rates between 2000 and 2005 but had little influence on changes in homeownership rates thereafter. As such, shifts in population attributes over the decade cannot explain the boom and bust in homeownership. In contrast, changes in market conditions as embodied in estimated coefficient vectors pushed homeownership rates higher between 2000 and 2005 and reduced homeownership rates thereafter. This confirms that shifts in market conditions were the primary driver of the boom and bust in homeownership over the decade. Moreover, this was the case for most age groups.

Decomposition of Aggregate U.S. Homeownership Rates

This section repeats the shift-share analysis, but this time it pools individuals across age groups in order to assess the influence of population attributes and market conditions on aggregate U.S. homeownership rates. We begin with Table 1, which displays results for the full sample. Notice that the table is organized as a three-by-three matrix corresponding to the different combinations

Table 1 ■ Estimated homeownership rates from shift-share analysis: All individuals age 21–89.

	Survey Year from Which Sample Characteristics are Drawn		
Regression model-year coefficients[a]	2000	2005	2009
Year 2000 coefficients	0.681	0.645	0.634
Year 2005 coefficients	0.737	0.703	0.715
Year 2009 coefficients	0.703	0.665	0.688

[a]Regression coefficients were taken from the estimated models discussed in the text and were estimated using unweighted data under the assumption that the control variables are exogenous. The homeownership rates reported above were then constructed using household sampling weights to ensure that results are representative of the target population of households in the United States.

of survey year data and model coefficients for 2000, 2005 and 2009. As such, the main diagonal terms are estimates of the actual homeownership rates for the different survey years while the off diagonal terms combine data and coefficients from different years.[27]

As is evident from the main diagonal entries in the table, between 2000 and 2005, the estimated aggregate homeownership rate increased from 68.1% to 70.3%. Between 2005 and 2009, the homeownership rate then declined to 68.8%. Suppose now that the model covariate values (*e.g.*, income, employment, volatility, *etc*.) remained constant at year-2000 values. Applying year-2005 coefficients the homeownership rate would have been 5.6 percentage points higher than in 2000 or 73.7%. This confirms that the change in market conditions between 2000 and 2005 greatly contributed to the jump in homeownership rates over that period. Applying the year-2009 coefficients pushes the simulated homeownership rate back down to 70.3%, indicative of deteriorating market conditions including increased risk aversion among both households and lenders. The incomplete adjustment back to year-2000 homeownership

[27]It is worth noting that the estimated homeownership rate for 2000 (seen in the upper-left corner of the table) differs somewhat from values often noted in the media for U.S. aggregate homeownership rates as reported in Figure 1. In part this is because our sample is comprised only of households with heads age 21–89 as opposed to the entire U.S. population. In addition, homeownership rates in Figure 1 and as typically reported in the media are derived from the current population survey (CPS). Conversations with analysts at the U.S. Census Bureau confirmed that the CPS sample is known to yield slightly different values for U.S. homeownership rates as compared to values obtained from 2000 Census. Our homeownership values for 2005 and 2009 are obtained from the ACS data and are nearly identical to those reported by HUD.

Table 2 ■ Estimated homeownership rates from shift-share analysis: Recent movers age 21–89.[a]

	Survey Year from Which Sample Characteristics are Drawn		
Regression model-year coefficients[b]	2000	2005	2009
Year 2000 coefficients	0.368	0.331	0.282
Year 2005 coefficients	0.399	0.361	0.324
Year 2009 coefficients	0.323	0.284	0.261

[a]The recent mover sample includes only individuals who moved into their homes in the previous 12 months.
[b]Regression coefficients were taken from the estimated models discussed in the text and were estimated using unweighted data under the assumption that the control variables are exogenous. The homeownership rates reported above were then constructed using household sampling weights to ensure that results are representative of the target population of households in the United States.

levels is also likely indicative of inertia because many of the families that chose to become homeowners in the boom years were still in their homes in 2009.

Suppose now that the year-2000 data are replaced with the year-2009 data while retaining the year-2009 coefficients. This would reduce the simulated homeownership rate by another 1.5 percentage points—from 70.3% to 68.8%—back to the actual year-2009 value. That shift confirms that changes in household attributes between 2000 and 2009 served to reduce homeownership rates. In contrast, the effect of changes in market conditions over the entire decade as embodied in the model coefficients served to elevate homeownership. On net, the two effects increased homeownership over the 2000–2009 period by 0.7 percentage points.

Table 2 revisits the aggregate shift-share analysis using the sample of recent movers and related coefficients. Notice first that only about one-third of the recent movers choose to own a home in a typical year (*e.g.*, 36.8% in 2000). That is roughly half the share of households in the population that live in owner-occupied housing and is as anticipated given previous arguments from Rosenthal (1988).[28] Also evident in Table 2 is that the aggregate homeownership rate among recent movers held steady in 2005 at about 36%. That rate fell dramatically in 2009, however, to 26.1%.

[28]Rosenthal (1988) demonstrates that this difference arises because length-of-stay in the home among owner–occupiers is substantially greater than that for renters.

Following a procedure similar to that of above, suppose now that we hold the data constant at year-2000 levels. Applying the year-2005 coefficients would increase recent mover homeownership rates from the actual year-2000 rate of 36.8% to 39.9%, a change of 3.1 percentage points. Applying the year-2009 coefficients lowers the homeownership rate to roughly 32.3%, a change from year-2005 market conditions of nearly 7.6 percentage points. The change in ownership rates resulting from the shift from year-2005 coefficients to year-2009 coefficients is much larger in the recent mover sample than in the full sample models of Table 1. That difference reflects the absence of inertia in the recent mover analysis. Further replacing the year-2000 data with year-2009 data reduces the recent mover homeownership rate from 32.3% to the actual rate for 2009 of 26.1%.

Summarizing, the share of recent movers that purchase a home was 36.8% in 2000 and 26.1% in 2009. Roughly 4.5 percentage points of that decline can be attributed to changes in attitudes and market conditions as embodied in the model coefficients. The remaining 6.2 percentage points derive from a change in the attributes of the population.

Homeownership Going Forward and Caveats

The shift-share analysis described above helps to clarify what drove the boom and bust in homeownership of the previous decade and also allows us to look ahead if one is willing to make some assumptions. It seems unlikely, for example, that market conditions and attitudes towards risk will return to year-2005 patterns as embodied in the year-2005 model coefficients. Instead, a more plausible scenario is that market conditions and attitudes toward investing in housing will settle back to something much closer to pre-boom year-2000 levels, as reflected in the year-2000 coefficients. Further, the 2009 data likely approximate near-term future values for many of the covariates in the model.

Given these two assumptions, consider Table 1 once again. Combining year-2000 coefficients and year-2009 data yields a homeownership rate of 63.4%. This is on the lower end of the range of homeownership rates observed between 1970 and 1995, which mostly varied between 64% and 65% (see Figure 1). Moreover, 63.4% is 5.4 percentage points below our estimated homeownership rate for 2009, of 68.8% (see Table 1), and roughly 1.5 percentage points below the 65% rate recorded for the first quarter of 2013 (see Figure 1).

Taken at face value, the numbers above suggest that although U.S. homeownership rates could fall somewhat further we are likely close to the nadir in homeownership. Prudence, however, requires that we acknowledge the limitations of our research design and related uncertainties associated with our

forecast. It should be emphasized, for example, that future values for the model control variables may diverge from year-2009 values. Similarly, the actual evolution of market conditions may differ from those embodied in the year-2000 coefficients. Although in principle, omitted variables from the homeownership regressions could also bias results from the shift-share analysis, the extensive parameterization of the homeownership models makes that unlikely.[29] On the other hand, the forecast above may be sensitive to future shifts in household formation as such shifts could cause the attributes of the population of household heads to differ from that of 2009 or the implicit homeownership coefficients to differ from that of year-2000.

To clarify, Haurin and Rosenthal (2007) estimate a bivariate probit model with sample selection and show that individual homeownership and headship decisions are not independent. They further demonstrate that rising headship rates contributed to rising homeownership rates in the 1990s, and that this was especially true for households in their 20s. Both Lee and Painter (2013) and Paciorek (2013) also demonstrate that headship rates rise with the economy and fall during a recession. In the context of our current analysis, rising headship rates during the 2000–2005 boom likely contributed to the dramatic increase in homeownership rates among household heads in their 20s while declines in headship rates may have contributed to the reversal during the bust. If headship rates should increase as the economy recovers further from the great recession, findings from Haurin and Rosenthal (2007) suggest that such shifts would elevate homeownership rates causing our forecast above to understate future homeownership rates.

None of these caveats should take away from the core implications of the shift-share analysis. These are that: (i) changes in population socioeconomic and demographic attributes lowered homeownership rates over the decade; (ii) shifts in market conditions—as embodied in the model coefficients—account for most of the boom-bust pattern over the decade; and (iii) if market conditions settle back to something closer to that of year-2000, homeownership rates could fall a bit further to levels as low as 64%.

[29] Recall from earlier in the article that the full-sample and recent-mover homeownership models both include 7,140 separate controls. The extensive parameterization of the homeownership regressions goes a long way toward addressing the influence of any omitted variables that might affect a family's housing tenure status. This includes transformations model controls that could be used to produce other variables as would be the case for user cost measures and marginal income tax rates. This also includes household wealth which is not observed in the data. For these reasons, we believe that our shift-share results—which are the primary contribution of our study—are robust to any concerns about omitted variables in the homeownership regressions.

Conclusions

The dramatic boom and bust in U.S. homeownership between 2000 and 2010 mirrored the broader boom and bust in housing and financial markets, and followed a decade of aggressive policy efforts to increase homeownership in the United States. This article utilizes individual-level census data to assess the role of changes in market conditions versus population socioeconomics in determination of the boom and bust in U.S. homeownership rates over the 2000–2010 period. To do so, we estimate richly specified homeownership regressions that are stratified by age of the household head and for 2000, 2005 and 2009 survey years. This is followed by shift-share analyses that decompose changes in age-specific homeownership rates over the decade into contributions from shifts in market conditions—as embodied in the model coefficients—versus changes in population socioeconomic and demographic attributes.

Model coefficients from the homeownership regressions yield evidence of dramatic shifts in the drivers of homeownership over the life cycle and over the course of the decade. Of special importance, the deterrent effect of local house price volatility on homeownership diminished between 2000 and 2005 and then increased following the crash. We argue that this is suggestive that households may have become more risk loving during the boom and more risk averse during the subsequent market downturn. The sensitivity of lender underwriting standards to local house price risk may also have contributed to this pattern. Together, these and other findings complement results from the shift-share analyses: for nearly all age groups, the shift-share simulations confirm that changes in market conditions—not population socioeconomics—were the primary driver of the boom and bust in homeownership over the decade.

Looking ahead, our results suggest that homeownership rates may have come close to bottoming out in early 2013 at 65%, down roughly four percentage points from their peak in 2006. This puts current homeownership rates at levels close to those that prevailed in most years between 1970 and the mid-1990s and implies little lasting effect of the grand homeownership policy experiment of recent decades. As suggested above, in the context of more cautionary owner attitudes toward housing risk and the re-emergence of prudent mortgage underwriting, we see little likelihood that homeownership rates will return to prior peaks observed in 2005–2006 any time soon. On the other hand, our model estimates also suggest that homeownership rates are not likely to fall much further.

Funding for this article from the Research Institute for Housing America (RIHA) is gratefully acknowledged. An earlier version of the work was disseminated

as a RIHA research paper. We thank Chip Case, Michael Fratantoni and two anonymous referees for helpful comments. Any errors are our own.

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Appendix

House Price Volatility Summary Measures

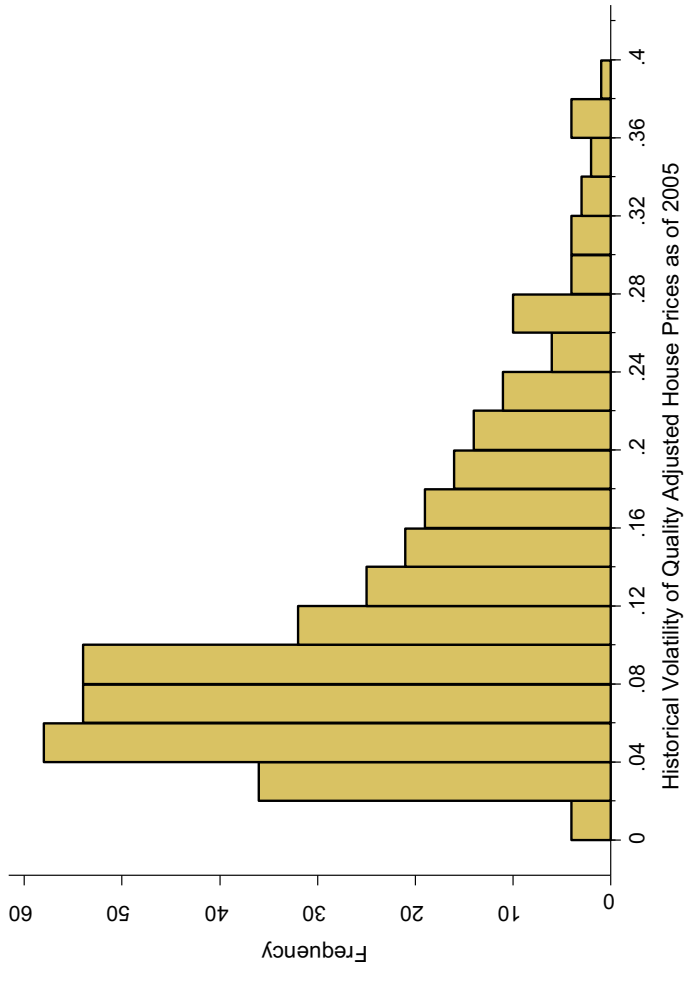

Figure A.1 ■ Distribution of house price volatility across locations (MSA or state, based on year-2005 quality-adjusted house price measure).

Table A1 ■ High house price volatility locations (based on year-2005 volatility measures described in the text).

MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005
Honolulu, HI	5.183	0.237	New Haven-Meriden, CT	3.549	0.184
Los Angeles-Long B., CA	5.652	0.222	Stockton, CA	4.031	0.180
San Luis Obispo, CA	7.199	0.214	Pensacola, FL	1.584	0.176
Manchester, NH	2.592	0.209	Boston, MA-NH	4.277	0.175
Nashua, NH	2.592	0.209	Worcester, MA	3.532	0.173
Barnstable, MA	5.183	0.208	Salinas, CA	5.183	0.171
Ventura-Oxnard, CA	7.199	0.205	Danbury, CT	4.031	0.170
San Jose, CA	7.199	0.203	Waterbury, CT	1.872	0.170
San Francisco-Oakland, CA	7.576	0.203	Brockton, MA	4.031	0.166
Santa Cruz, CA	7.199	0.200	Fitchburg, MA	4.031	0.166
Riverside, CA	4.031	0.197	New Bedford, MA	4.031	0.165
Santa Rosa, CA	7.199	0.194	Providence-Fall	3.287	0.165
Norfolk-VA Beach, VA	2.399	0.192	Newburgh, NY	3.167	0.164
Yolo, CA	5.183	0.191	Bridgeport, CT	3.476	0.157
Sacramento, CA	4.583	0.190	Stamford, CT	5.156	0.157
San Diego, CA	7.199	0.189	Springfield, MA	3.406	0.155
Santa Barbara, CA	7.199	0.188	Merced, CA	4.031	0.154
Modesto, CA	4.031	0.184	Austin, TX	1.872	0.151
Hartford-Bristol, CT	3.468	0.184			

Note: MSA names are truncated to conserve space.

Table A2 ■ Medium house price volatility locations (based on year-2005 volatility measures described in the text).

MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005
Trenton, NJ	3.697	0.146	Bakersfield, CA	2.592	0.103	Pueblo, CO	2.592	0.079	Janesville-Beloit, WI	1.584	0.063
New York, NY	5.519	0.146	Jackson, MI	1.584	0.103	Fort Myers, FL	2.592	0.078	Atlanta, GA	2.085	0.062
Portland, ME	1.584	0.144	Reading, PA	1.584	0.103	Santa Fe, NM	1.584	0.078	Flagstaff, AZ-UT	2.592	0.062
Binghamton, NY	1.296	0.143	Grand Junction, CO	2.592	0.102	Lancaster, PA	1.872	0.077	Billings, MT	1.584	0.061
Denver-Boulder, CO	2.592	0.140	Colorado Springs, CO	2.592	0.101	Albuquerque, NM	1.584	0.077	Fort Pierce, FL	2.592	0.060
Yuba City, CA	4.031	0.139	Punta Gorda, FL	2.592	0.101	Bryan-College St., TX	1.296	0.075	Sioux City, IA	0.979	0.060
Albany, NY	1.843	0.138	Wilmington, DE	2.592	0.101	Jacksonville, FL	1.718	0.075	Lubbock, TX	1.094	0.060
Monmouth, NY	4.641	0.136	Yakima, WA	1.296	0.100	Houston-Brazoria, TX	1.296	0.075	Sheboygan, WI	1.584	0.059
Redding, CA	3.167	0.133	Phoenix, AZ	2.592	0.097	Benton Harbor, MI	1.584	0.075	Savannah, GA	1.584	0.059
Glens Falls, NY	1.296	0.131	Naples, FL	2.592	0.095	Ocala, FL	1.584	0.074	Abilene, TX	0.864	0.059
Utica-Rome, NY	1.296	0.130	San Antonio, TX	1.118	0.095	Shreveport, LA	0.979	0.074	Rochester, MN	1.584	0.058
Seattle-Everett, WA	4.104	0.130	Duluth-Superior, WI	1.584	0.094	Corpus Christi, TX	0.864	0.074	Boise City, ID	1.991	0.058
Salt Lake City, UT	2.023	0.130	Lafayette, LA	1.094	0.093	Oklahoma City, OK	1.094	0.073	Chicago, IL	2.713	0.058
Greeley, CO	2.592	0.128	Visalia-Tulare, CA	2.160	0.092	Fort Lauderdale, FL	3.167	0.072	Nashville, TN	1.740	0.057

Table A2 ■ Continued.

MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005
Chico, CA	3.167	0.126	Spokane, WA	1.872	0.092	Minneapolis-St. Paul, MN	2.912	0.072	Huntsville, AL	1.094	0.057
Washington, DC	5.195	0.125	Rochester, NY	1.181	0.092	Houma-Thibodoux, LA	1.296	0.072	McAllen-Edinburg, TX	0.749	0.057
Allentown, PA	1.537	0.122	Ann Arbor, MI	2.719	0.091	Madison, WI	2.592	0.071	Laredo, TX	0.864	0.057
Bellingham, WA	3.167	0.122	Anchorage, AK	2.592	0.090	Eau Claire, WI	1.584	0.071	Milwaukee, WI	2.107	0.057
Dutchess Co., NY	5.183	0.122	Olympia, WA	2.592	0.090	Charlottesville, VA	2.592	0.071	Grand Rapids, MI	1.658	0.056
Jamestown, NY	0.864	0.122	Bremerton, WA	2.592	0.088	Monroe, LA	1.094	0.070	Asheville, NC	1.872	0.056
Portland, OR-WA	2.592	0.120	Amarillo, TX	1.094	0.087	Flint, MI	1.022	0.070	Kenosha, WI	1.872	0.055
Fort Collins, CO	2.592	0.119	Baltimore, MD	2.871	0.086	Orlando, FL	2.485	0.070	Hagerstown, MD	2.160	0.054
Eugene-Springfield, OR	2.160	0.118	El Paso, TX	0.864	0.085	Baton Rouge, LA	1.296	0.069	Longview-Marshall, TX	0.979	0.054
Odessa, TX	0.868	0.116	New Orleans, LA	1.557	0.085	Kileen-Temple, TX	1.094	0.069	Springfield, MO	1.296	0.054
Provo-Orem, UT	2.160	0.116	West Palm Beach, FL	4.031	0.085	Tulsa, OK	1.094	0.069	Davenport, IA	1.468	0.053
Atlantic City, NJ	2.592	0.116	Galveston, TX	1.584	0.084	Daytona Beach, FL	1.872	0.067	Waco, TX	1.094	0.053
Philadelphia, PA	2.619	0.115	Tacoma, WA	2.592	0.083	Tyler, TX	1.094	0.067	Sarasota, FL	2.592	0.053
Syracuse, NY	1.159	0.113	Melbourne-Titusville, FL	2.592	0.083	York, PA	1.872	0.067	Evansville, IN	1.296	0.052

Table A2 ■ Continued.

MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005
Dallas-Fort Worth, TX	1.399	0.112	Scranton, PA	1.584	0.082	Kankakee, IL	1.296	0.065	Akron, OH	1.643	0.052
Salem, OR	1.872	0.109	Charleston, SC	2.238	0.082	St. Cloud, MN	2.592	0.065	Hattiesburg, MS	0.979	0.052
Buffalo-Niagara, NY	1.120	0.108	Waterloo-Cedar Falls, IA	1.296	0.082	Dover, DE	2.160	0.065	Canton, OH	1.296	0.051
Medford, OR	2.592	0.107	Johnstown, PA	0.979	0.081	Kansas City, MO-KA	1.642	0.065	Saginaw-Bay City, MI	1.296	0.051
Detroit, MI	2.127	0.107	Sharon, PA	1.296	0.081	LaCrosse, WI	1.584	0.064	Lakeland-Winter., FL	1.296	0.051
Richland, WA	1.584	0.104	Tampa-St. Pete., FL	2.081	0.080	Alexandria, LA	1.094	0.064	Kalamazoo-Portage, WI	1.498	0.050
Fresno, CA	3.425	0.104	Vineland-Millville, NJ	1.584	0.080	Biloxi-Gulfport, MS	1.107	0.063	Las Cruces, NM	1.584	0.050

Note: MSA names are truncated to conserve space.

Table A3 ■ Low house price volatility locations (based on year-2005 volatility measures described in the text).

MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005
Panama City, FL	1.584	0.050	Gainesville, FL	1.872	0.043	Lincoln, NE	1.584	0.034	Reno, NV	3.167	0.025
Green Bay, WI	1.584	0.050	Myrtle Beach, SC	1.094	0.043	Fort Wayne, IN	1.241	0.034	Jackson, TN	1.094	0.025
Louisville, KY	1.732	0.050	Mobile, AL	1.094	0.042	Charlotte-Gaston, NC	1.584	0.034	Greensboro-Win., NC	1.468	0.025
Beaumont, TX	0.864	0.049	Miami-Hialeah, FL	2.592	0.042	Rockford, IL	1.296	0.033	Cincinnati, OH	1.507	0.025
Montgomery, AL	1.094	0.049	Columbia, MO	1.584	0.041	Des Moines, IA	1.584	0.033	Hamilton-Mid., MD	1.872	0.025
Jackson, MS	0.979	0.049	Pittsburgh, PA	1.278	0.041	Macon-Warner, GA	1.603	0.032	Dothan, AL	1.094	0.024
Richmond-Pet., VA	2.342	0.048	Cedar Rapids, IA	1.584	0.041	Sumter, SC	1.094	0.032	Appleton-Oskosh, WI	1.872	0.024
Las Vegas, NV	3.167	0.048	Sioux Falls, SD	1.094	0.040	Fargo-Morehead, ND	0.979	0.031	Clarksville-Hop., TN	1.094	0.024
Tucson, AZ	1.872	0.048	Springfield, IL	1.296	0.040	Bloomington, IL	1.584	0.031	Birmingham, AL	1.482	0.023
Wausau, WI	1.584	0.047	Fayetteville, NC	1.296	0.039	Hickory-Morg., NC	1.418	0.031	Tallahassee, FL	1.584	0.023
Omaha, NE	1.480	0.047	Albany, GA	1.872	0.039	Columbus, GA	1.872	0.030	State College, P	1.584	0.023
St. Louis, MO-IL	1.734	0.047	Cleveland, OH	1.674	0.038	Rocky Mount, NC	1.296	0.030	South Bend, IN	1.296	0.022
Wichita, KS	1.296	0.047	Wichita Falls, TX	0.979	0.038	Brownsville-Harl., NY	0.749	0.030	Lima, OH	1.296	0.021

Table A3 ■ Continued.

MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005	MSA Name	Median House Value (Year-2009 $100,000)	Historical House Price Volatility as of 2005
Lansing, MI	1.811	0.047	Iowa City, IA	1.296	0.037	Elkhart-Goshen, IN	1.296	0.030	Muncie, IN	1.094	0.021
Augusta-Aiken, GA	1.489	0.047	Decatur, AL	1.094	0.037	Gadsden, AL	1.094	0.029	Danville, VA	1.094	0.020
Lexington-Fayette, KY	1.872	0.046	Harrisburg, PA	1.701	0.037	Columbus, OH	1.775	0.029	Greenville-Spart., SC	1.435	0.019
Athens, GA	1.584	0.046	Memphis, TN	1.508	0.037	Dayton-Spring., OH	1.389	0.029	Auburn-Opelika, AL	1.094	0.018
St. Joseph, MO	1.296	0.046	Raleigh-Durham, NC	2.289	0.036	Texarkana, TX	1.296	0.029	Jacksonville, NC	1.296	0.018
Little Rock, AR	1.094	0.046	Topeka, KS	1.296	0.036	Altoona, PA	1.094	0.029	Lynchburg, VA	2.592	0.018
Kokomo, IN	1.296	0.046	Bloomington, IN	1.296	0.035	Champaign-Urb., IL	1.584	0.029	Indianapolis, IN	1.720	0.015
Williamsport, PA	1.296	0.045	Youngstown, PA	1.260	0.035	Johnson City-Kin., TN	1.296	0.028	Anniston, AL	1.094	0.014
Mansfield, OH	1.296	0.045	Fort Smith, AR	0.864	0.035	Lake Charles, LA	0.864	0.028	Roanoke, VA	2.592	0.014
Lafayette-W. Laf., IN	1.296	0.045	Fayetteville-Spr., AR	1.444	0.035	Fort Walton Beach, FL	1.584	0.028	Goldsboro, NC	1.296	0.013
Wilmington, NC	1.584	0.045	Toledo, OH	1.296	0.035	Columbia, SC	1.584	0.028	Decatur, IL	0.979	0.013
Racine, WI	2.160	0.044	Tuscaloosa, AL	1.584	0.035	Joplin, MO	0.979	0.028	Florence, AL	1.094	0.013
Erie, PA	1.144	0.044	Yuma, AZ	1.584	0.035	Chattanooga, TN	1.495	0.027	Knoxville, TN	1.296	0.010
Peoria, IL	1.296	0.043	Terre Haute, IN	1.296	0.035	Greenville, NC	1.296	0.026			

Note: MSA names are truncated to conserve space.