Owned Now Rented Later?
Housing Stock Transitions and Market Dynamics

by

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Abstract

Although it is well known that the durable nature of housing amplifies downturns, an overlooked mechanism by which this occurs is through shifts in the ownership status of local housing stocks. Based on census and American Housing Survey data, I show that there is a 2 percent net shift of single family U.S. housing stock into the rental sector with each passing decade. Short term transitions following the 2007 crash were larger, exceeding 10 percent for recently built homes, and should partially reverse as markets rebound. Indeed, in recent years,18 fewer construction permits were filed for every 100 post-crash own-to-rent transitions, about the same effect as from vacant housing. These and other patterns confirm that housing stock transitions contribute to filtering of older housing down to lower income families and slow recovery following a negative shock.

I. Introduction

Although it is well known that the durable nature of housing is an important driver of housing market dynamics, sometimes amplifying downturns (e.g. Glaeser and Gyourko (2005)), this paper highlights an overlooked mechanism by which this occurs. A huge literature has examined household housing tenure decisions, to own versus rent, and related shifts in aggregate homeownership rates (see Gabriel and Rosenthal (2005, 2015) for recent examples and Haurin, Herbert and Rosenthal (2007) for a review). The rate and conditions under which housing stock shifts between the owner-occupied and rental sectors of the market, however, has been largely ignored. This paper shows that such shifts have important effects on market dynamics and local economies, slowing the rate at which construction recovers following a negative demand shock and accelerating the rate at which markets provide affordable housing as existing homes age.[1] Some recent context will help to clarify.

Between 1994 and 2016, US homeownership rates experienced an historic boom and bust, jumping from 64 percent in 1994 to 69 percent in 2006, and then crashing all the way back down to 63 percent in the second quarter of 2016, a level not seen since 1965 (see Figure 1a).[2] Although home prices have rebounded in most markets, housing construction has not. This is evident in Figure 1b which plots home price indexes and housing permit levels for the U.S. from 2000 to 2016. It is also especially true for select individual markets, as with Atlanta, Miami, Las Vegas and Phoenix for which similar plots are displayed in Figure 1b. For each of these cities, housing construction remains depressed despite sharp increases in home prices since roughly 2011. On the surface, that seems to contradict general principles that supply should increase with price. As will become apparent, modeling housing stock transitions helps to explain the pattern.

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[1] Rosenthal (2014) shows that rental homes filter down to lower income families at a sharply faster rate than owner-occupied housing (2.5 percent decline in occupant real income per year compared to just 0.5 percent). Transition of housing stock into the rental sector, therefore, accelerates the filtering process and the rate at which markets provide affordable housing. See also Brueckner and Rosenthal (2009) and Rosenthal (2008a, 2008b) for related discussion of the market provision of lower income housing and the role of age-related depreciation and filtering.

[2] Source: Current Population Survey/Housing Vacancy Survey, Series H-111, U.S. Census Bureau, Washington, DC 20233 (https://www.census.gov/housing/hvs/data/histtabs.html).

In modeling these and other relationships, the paper makes a sharp distinction between short run versus long run transitions of the housing stock. Short run transitions arise from changes in market conditions such as rising house prices that may affect anticipated returns to investment, or falling house prices that may trigger defaults. These sorts of transitions could be reversed if market conditions return to earlier states. Long run transitions, in contrast, are sensitive to age-related depreciation of the housing stock. These sorts of transitions are part of the filtering process by which markets provide affordable rental housing (e.g. Rosenthal (2014)).

To guide the empirical work, I adapt the model of Henderson and Ioannides (1983) on housing tenure choice. In the Henderson-Ioannides framework, households are increasingly likely to own their home as their investment (portfolio) demand for real estate rises above their consumption (shelter) motive for occupying a home. Assuming a higher income elasticity of housing investment demand relative to shelter demand, the model predicts that higher income families will tend to own while lower income families will tend to rent. An additional implication not previously emphasized is that higher quality homes tend to be sorted into the owner-occupied sector while lower quality homes will be concentrated in the rental segment of the market. Aging homes, therefore, shift from owner-occupied to rental status. On the other hand, demand shocks shift housing investment and shelter demand and can prompt large shifts of homes between the owner-occupied and rental sectors, as with the recent crash following 2007.

Two primary datasets are used to explore the frequency and causes of housing stock transitions. The first is the 2000 five-percent PUMS file of the decennial census along with each year of the 2005-2015 one-percent PUMS files of the American Community Survey (ACS).[3] These data are used to document trends in housing stock transitions at the national and metropolitan levels over the 2000 to 2015 period. Because the ACS files are separate cross-sections, I rely on the vintage strategy to estimate counts of housing stock transitions for specific vintages (e.g. homes built in the 1990s). For a given

[3] PUMS data for these files are available from the Census website (www.census.gov) and also in a more user-friendly form from the IPUMS website (www.ipums.org). ACS samples in 2002-2004 have more limited geographic and variable coverage than in later years and are not used for that reason.

vintage of the housing stock (e.g. homes built in the 1990s), absent demolitions or vacancies, a change in the homeownership rate implies a shift of homes from one segment of the market to the other. Especially for recent vintage homes that are unlikely to be subject to age-related demolitions, this makes it possible to use observed changes in homeownership rates along with knowledge of the size of the housing stock to estimate the number of homes that transition between sectors.

The second data source is the 1985-2013 American Housing Survey (AHS) panel which is approximately representative of urban areas in the United States. This file follows individual homes every two years over the 1985-2013 period. Because few homes remain in the panel over its entire length, overall the panel includes information on over 100,000 different homes. The AHS includes an extensive array of structural and neighborhood attributes in addition to detailed information on the current occupants of the home. Importantly, the AHS panel follows individual homes over time making it possible to observe individual tenure transitions directly. In addition, the AHS contains a richer set of structural and neighborhood attributes relative to the ACS. Together, these features enhance the ability to clarify underlying mechanisms that drive short and long run housing tenure transitions.[4]

Estimates confirm that long-term transitions of housing stock occur both from the owner-occupied to the rental sector and also in reverse direction. However, the former dominate and are sensitive to aging of the housing stock. With each passing decade, on average there is a net transition of roughly 2 percent of the housing stock into the rental sector.

Findings also indicate that short run transitions of housing stock can be much larger in magnitude and are especially sensitive to changes in housing prices, with rising prices drawing rental units into the

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[4] Although many papers have been written with the AHS, few have drawn on the panel structure of the data. This paper is the latest in a series of papers in which I have used the panel structure of the AHS, including Hoyt and Rosenthal (1997), Harding, Sirmans and Rosenthal (2003; 2007), Rosenthal (2014), Harding and Rosenthal (2016) and Mota, Patacchini, and Rosenthal (2016). Of these, Rosenthal (2014) is closest in structure and content to the analysis in this paper. In that paper the AHS panel is used to estimate a repeat income model that is modelled off of the repeat sales specification. Results confirm that homes tend to filter down to families of lower-income status in both the owner-occupied and rental sectors of the market but much faster among rental units. This implies that transitions of owner-occupied homes into the rental sector of the market accelerate downward filtering. Filtering rates are also amplified by low income elasticities of demand for housing and falling house prices.

owner-occupied sector and falling prices having the opposite effect. Between 2000 and 2014, roughly 6.5 percent of homes built prior to 2000 and 10.3 percent of homes built in the 1990s shifted from owner-occupied to rental status (see Table 1a). Owner-occupied homes for which the current household is modestly under water (with CLTV[5] between 100 and 120 percent) are also 1 to 2 percentage points more likely to transition into the rental sector, while homes that are deep under water (with CLTV greater than 120 percent) are 6 to 8 percentage points more likely to transition. Further analysis, reveals that these transitions occur primarily for housing types for which there is ample demand in the rental market. In instances where an underwater property is of high quality to a degree that limits demand in the rental sector, transitions to the rental sector largely do not occur. Moreover, these patterns are nearly identical pre- versus post-financial crisis which suggests that the mechanisms governing such transitions were similar in both periods.

Returning to Figure 1b, a natural question in the post-2007 context is whether recent own-to-rent transitions act as a buffer stock of *potential* future owner-occupied housing and delay recovery of new construction for that reason? To address this question, an MSA level housing permits model is also estimated in which controls include the number of owner-occupied homes from 2006 that have since transitioned into the rental market. Estimates indicate that for every 100 post-2006 own-to-rent single family housing stock transitions, 18 fewer single family construction permits are filed, about the same effect as arises from the presence of vacant housing. The depressive effect of recent own-to-rent transitions is also notably larger for recently built homes, a pattern that is consistent with the view that transitions are most common when there is a viable market for the housing type in the alternate market sector.

To elaborate on these results, the next section of the paper outlines the conceptual framework described above. Section III describes key features of the data. Section IV documents shifts in housing

[5] CLTV stands for the current loan to value ratio for a home. CLTV values above 1 indicate that the homeowner owes the lender more than the home is worth, a condition typically referred to as being under water. Under such conditions households are at risk of defaulting on their mortgage (e.g. Foote, Gerardi, and Willen, 2008).

stock between the owner-occupied and rental sectors of the market using the vintage strategy. Section V evaluates the drivers of housing stock transitions in the long and short run. Section VI presents the housing permits model and Section VII concludes.

II. Model: Sorting of housing stock by quality

Figure 2 reproduces the housing tenure choice model from Henderson and Ioannides (1983). As described earlier, each household has an investment demand for real estate and also a consumption demand. Both sources of demand are sensitive to a variety of household attributes including income. In Figure 2, income is plotted along the horizontal axis. All other household attributes are implicitly held constant. Housing level (which is treated synonymously as housing quality) is plotted on the vertical axis. As drawn in the figure, both sources of housing demand increase with income but consumption demand rises at a slower rate. That is because of the anticipated effect of diminishing marginal returns from housing consumption. On the other hand, at very low levels of income investment demand is assumed to fall to zero while consumption demand remains positive reflecting the need for a minimum level of shelter. Together, these assumptions suggest that the investment demand function crosses the consumption demand function from below at income level I*.

Consider now a household with income above I* so that investment demand exceeds consumption demand. Such families can optimize their portfolio by purchasing housing equal to investment demand. In principle, any additional housing above the preferred level of consumption can then be rented out. For families with income below I* consumption demand exceeds investment demand. In this case, owning a level of housing that would meet the family's shelter demand would require overinvesting in real estate from a portfolio perspective. As that disparity grows the family will eventually choose to rent. Families with income sufficiently below I* are therefore expected to rent.

The model above implies that high income families will own while lower income households will rent. This stratification of households has been emphasized in the past (e.g. Henderson and Ioannides (1983), Ioannides and Rosenthal (1994)). The model in Figure 2 also points to a further pattern that has not received attention: high quality homes (those for which $h > h^*$) will tend to be in the owner-occupied sector while homes with quality below h^* will tend to be rented out. Although intuitive, this structure provides considerable guidance when modeling long and short run transitions of housing stock between the owner-occupied and rental sectors of the market.

To clarify, note again that housing quality depends on the structural attributes of the home and also the attributes of the neighborhood in which the home is located. Changes in these attributes affect perceptions of quality and shift a home up or down along the vertical axis. Holding the housing demand functions constant, sufficient change in quality will cause a home to transition between market sectors. As an example, age-related depreciation of the home will reduce quality and push owner-occupied units towards the rental sector (e.g. Rosenthal, 2014) but falling neighborhood crime rates that improve neighborhood appeal will work in the opposite direction.

Suppose, instead that quality of the housing stock remains fixed but metropolitan house price levels increase. In this case, housing consumption demand in Figure 2 will shift down since households will consume less housing for a given level of income. The impact of rising house prices on investment demand is more complicated but may well go in the reverse direction. That is because a given percentage change in home prices produces larger capital gains when house price levels are high. That should encourage investment in real estate. On the other hand, higher house price levels may also increase investor exposure to house price risk which could discourage investment. Weighing these possibilities, it seems very likely that rising house prices will cause consumption demand to fall further than investment demand (which may in fact increase). In Figure 2, this implies that rising house prices would cause higher end rental homes to transition into the owner-occupied sector of the market. It should also be emphasized that these sorts of shifts could be quickly reversed if house prices revert back to previous levels. For that reason, housing stock transitions prompted by changes in market conditions that shift the housing demand functions are characterized as short run in nature.

Summarizing, an implication of the model in Figure 2 is that shifts in housing quality may prompt long run transitions of housing stock between the owner-occupied and rental sectors of the market.

Changes in market conditions that shift the housing demand functions may prompt short run transitions of housing stock that could be reversed should market conditions revert back to previous states.

III. Data and measurement

The first major data source used in this paper draws on the individual PUMS files for the 5 percent 2000 decennial census and each year of the 1 percent 2005-2015 American Community Survey (ACS). These files are all cross-sections and provide millions of records on individual households. Although the surveys are mostly representative of the US population, sampling weights are also provided to improve the representativeness of the data. In the empirical work to follow, I used household weights in all instances where the census/ACS data were used to summarize patterns in the US and individual metropolitan areas.

The ACS data provide extensive information on individuals and households. These data also report core features of the homes in which individuals reside, including structure type (e.g. single family versus multi-family), number of bedrooms, number of rooms, decade the home was built, and metropolitan location. Each survey is therefore not only a sample of the population of households in the United States but also of the stock of homes in which families live.

In the work to follow, I distinguish between three housing types, including single family detached, single family attached, and multi-family. Mobile homes are omitted. In addition, I create separate measures for each type of home for 9 different vintages. This includes homes built prior to 1940, homes built in the 1940s, 1950s, 1960s, 1970s, 1980s, and 1990s, as well as homes built 2000 to 2004 and homes built after 2004. In all, there are 27 different type-by-vintage homes identified in each survey year. Moreover, for each survey year separate counts are calculated for each type-vintage home for 290 metropolitan statistical areas (MSAs) that can be followed on a coherent geographic basis and which can be reliably merged with repeat sales house price indexes from the Federal Housing and Finance Association (FHFA). This produces a vast amount of detail and is possible because of the huge size of the census/ACS files.

A multi-step procedure is used to estimate the number of housing stock transitions between the owner-occupied and rental sectors for each type and vintage home and for each survey year. In the first step, for each type and vintage home (e.g. single family detached homes built in the 1990s), I calculate the average number of housing units reported across all survey years after the vintage in question pooling owner-occupied and rental observations together. As an example, for single family detached homes built in the 1990s data from the 2000 and the annual 2005-2015 ACS files would be used. For homes built 2000-2004, only the 2005-2015 surveys would be used. Combining samples in this fashion greatly increases sample size and reduces the potential for sampling variation when estimating the number of a given type and vintage home. This produces a more reliable estimate than comparable measures based on a single survey such as the 2015 ACS. The cross-sample average number of type-*k*, vintage-*v* homes is denoted $N_{k,v}$ for all combinations of *k* and *v*.

In the second step, for each survey year *t*, I calculate the homeownership rate for type-*k* homes of vintage *v*, denoted as $R_{k,v,t}$. This is done by forming the ratio of type-*kv* homes in survey *t* that are owner-occupied divided by the sum of such homes in *t* from the owner-occupied and rental sectors. Under the assumption that sampling variation has a similar percentage effect on the number of type-*kv* owner-occupied homes as for rental units, errors from sampling variation will tend to difference away. This helps to ensure that measures of $R_{k,v,t}$ are robust.

In step three, estimates of the number of owner-occupied type-*k* homes of vintage-*v* in a given survey year *t* are obtained by multiplying $N_{k,v}$ and $R_{k,v,t}$ forming $N_{own,k,v,t} = N_{k,v} \times R_{k,v,t}$. Finally, the number of housing stock transitions between survey years is determined by differencing $N_{own,k,v,t}$ across surveys.

The second major data source used in this study are the national core files of the 1985-2013 American Housing Survey (AHS) panel.[6] Each survey contains an extensive array of questions about the house, neighborhood, and occupants. The survey is designed to be approximately representative of the United States and yields a panel that is unique among major surveys in that it follows homes not people

[6] Few papers have taken advantage of the panel feature of the AHS, possibly because of the extensive coding efforts required. Recent exceptions include Harding et al. (2003, 2007, 2016) and Ferreira et al (2010).

over time. The survey is conducted every odd year (e.g. 1985, 1987 ...) and collects data from occupants of roughly 55,000 homes. The exact number of units surveyed varies across years because of budgetary and other considerations (see the Codebook for the AHS, April 2011 for details). As would be expected, few homes are present throughout the entire panel. Instead, individual homes enter and leave the survey at different times but not in manner that is likely to bias estimates.[7]

The AHS data also identify whether a home is currently renter-occupied or owner-occupied and also whether a home changes tenure from rent to own or own to rent in a successive survey.[8] These features make it feasible to directly measure the tendency for individual homes to transition between sectors of the market.

IV. The frequency of housing stock transitions

This section documents the frequency of housing stock tenure transitions between the owner-occupied and rental sector using the vintage approach outlined above. Except where noted, all estimates are based on the 2000 decennial census and the 2005-2015 ACS data.

As a starting point, Figures 3-5 plot homeownership rates by structure type (SFD, SFA and MF) and for all three types combined for each of the 12 surveys years, 2000 and 2005-2015. In considering these plots it is worth noting that from among the three structure types (i.e. omitting mobile homes), SFD homes account for roughly 72 percent of the stock across the 2000-2015 samples, SFA homes account for roughly 5 percent of the stock, and MF homes account for about 23 percent of the stock.

[7] The AHS is designed and implemented by the Department for Housing and Urban Development (HUD). Conversations with HUD officials confirmed that the composition of the AHS sample is adjusted over time to help ensure that it remains roughly representative of the U.S. For a succinct comparison of the sample design and coverage of the American Housing Survey (AHS), the American Community Survey (ACS), and the Current Population Survey (CPS) see http://www.census.gov/housing/homeownershipfactsheet.html. Additional details of the AHS sample design are provided in the codebook manuals listed in the reference section of this paper.

[8] The AHS reports whether the current occupant owns or rents the home. In addition, house rent is only reported for rental units while purchase price, maintenance, and mortgage variables are only reported for owner-occupied units. These variables ensure a reliable classification of housing tenure.

Consider now Figure 3 which plots homeownership rates for all vintage homes pooled together. Confirming well-known patterns, homeownership rates are highest for single family detached homes, with rates close to 85 percent in each year. Single family attached homeownership rates are lower, typically between 55 and 60 percent, while multi-family homeownership rates are just below 10 percent.

Figure 4 expands on these patterns, plotting homeownership rates for each structure type on a separate vertical scale and in a separate panel. In this figure it is clear that all three structure types experienced declining homeownership rates following 2007. SFD homeownership rates appear to have bottomed out by 2014 with homeownership rates rising in 2015. SFA homeownership rates were still at their low point in 2015 while multi-family homeownership rates bottomed out in 2012.

Figure 5 plots the change in homeownership rates since 2000 for each of the structure types. In this figure it is evident that multi-family homeownership rates only declined slightly following the crash in 2007, dropping just 1 percentage point by 2012. Single family attached homes displayed far more volatility, with homeownership rates jumping up 4 percentage points between 2000 and 2007, and then falling 7 percentage points to the low point in 2013-2015. Single family detached homeownership rates were flat 2000 to 2005 and then fell by roughly 4 percentage points 2007 to 2014 before beginning to edge up in 2015.

The patterns in Figures 3-5 hint at a general principle that will be explored in more detail later in the paper. The low homeownership rate for multi-family housing stock confirms conventional wisdom that demand for these types of homes is much more robust in the rental sector. The reverse is true for single family detached with its persistently high homeownership rates. Single family attached homes are more of a hybrid. Together, these patterns and the especially volatile history for SFA homeownership rates are suggestive that the potential for housing stock tenure transitions is amplified when there is viable demand for a housing type in the alternate sector. This will become clearer later in the paper.

Consider now the extent to which the changes in homeownership rates documented above translate into housing stock transitions between the owner-occupied and rental sectors of the market. We begin with Table 1a which reports MSA-level panel regressions of the log number of owner-occupied units present across survey years pooling all structure types together. The control measures include survey year dummy variables with year-2000 as the omitted category. MSA fixed effects are also included in all of the models. Column 1 reports estimates based on homes built prior to 2000. Column 2 restricts the sample to homes built prior to 1940, and column 3 limits the sample to homes built in the 1990s.

The coefficients in Table 1a approximate the percentage difference in the number of owner-occupied homes of a given vintage relative to 2000. Focus first on the third column for homes built in the 1990s. These homes would not have been subject to demolitions in the 2000-2015 period and for that reason the estimated change in the number of owner-occupied homes should be an accurate measure of housing stock tenure transitions. Notice that the number of such homes was roughly 2.1 percent lower by 2005 relative to 2000, indicating that some of the 1990s vintage stock shifted into the rental sector between 2000 and 2005. A much sharper shift in housing stock towards the rental sector began in 2008, with the corresponding coefficient in column 3 increasing in magnitude to over 10 percent by 2013. As of 2015, roughly 12 percent of the 1990s vintage housing stock that was owner-occupied in 2000 had shifted into the rental sector. Similar but less dramatic patterns are present for older vintage homes, as with pre-1940s homes in the second column.

Table 1b repeats these models but stratifies the housing stock by structure type for SFD, SFA and MF units. Among 1990s vintage SFA units (column 6), between 2000 and 2007 a net transition of stock from the rental to the owner-occupied sector is clearly evident: the relevant coefficient is 8.47 percent with a t-ratio of 2.69. An even more dramatic shift is present in the multi-family segment of the market, with a year-2006 coefficient in column 9 of 19.19 percent (and a t-ratio of 3.73). These estimates indicate that when home prices were booming between 2000 and 2006, an important fraction of recently built SFA and multi-family stock shifted from the rental to the owner-occupied sector. On the other hand, among SFD homes, vintage 1990s housing stock transitioned out of the owner-occupied sector in each survey year from 2000 to 2015. That shift was quite modest prior to 2005 (less than 1 percent) but grew to 5.8 percent by 2015 (see the column 3, year-2015 coefficient).

The estimates in Tables 1a and 1b confirm that a large share of existing housing stock transitioned from the owner-occupied to the rental sector of the market in the years following the 2007 crash. Those estimates, however, do not do justice to the tremendous degree of variation across MSAs in the extent to which housing stock transitions occurred. Figures 6a through 6d address this point by plotting the distribution of the change in the number of owner-occupied units since 2006 across all MSAs in the sample. In each figure, all plots are based on 1990s vintage homes and separate plots are provided for each survey year from 2007 to 2014. Figure 6a combines all three structure types while Figures 6b-d provide plots for SFD, SFA and MF housing stock, respectively.

All plots in Figures 6a-6d use a box and whisker design to describe the distribution of transitions across MSAs. In each case, the top and bottom of the box represents the interquartile range (IQR), or the 75th and 25th percentiles, respectively. The horizontal line dividing the box into two vertical segments is the median of the distribution. The stems extend to include all data points that are within 1.5 times the IQR of the nearer quartile.[9] In each of the figures to follow, Panel A plots dots for outlier MSAs whose values lie outside of the stems while Panel B omits the outliers to facilitate viewing of the main part of the distribution. The vertical axis measures the change in 1990s vintage owner-occupied units since 2006 in 1,000 units.

Consider now Figure 6a which groups all structure types together. In both Panels A and B, moving from 2007 to 2015, the entire distribution associated with the number of owner-occupied homes that moved into the rental sector shifts down indicating more transitions. This is evident both from the growing number of MSAs that experienced large numbers of housing stock transitions and also from the magnitude of the transitions themselves. For the median MSA, by 2015, roughly 1,000 of the 1990s vintage units had moved from the owner-occupied sector to the rental segment of the market. In panel A, it is also clear that the number of outlier MSAs for which large numbers of transitions had occurred had

[9] More precisely, the upper whisker extends from the 75th percentile up to a value 1.5 times the IQR within the upper quartile. The lower whisker is formed analogously and extends downward from the 25th percentile. Values outside of these stems are clearly outliers. For additional discussion on box and whisker plots see the stata journal at: http://www.stata-journal.com/sjpdf.html?articlenum=gr0039.

increased considerably by 2015.[10] Analogous values are evident for the separate structure types in Figures 6b-6d with much larger numbers of transitions among SFD units.

Figure 7 takes a more aggregate view by pooling housing stock transitions since 2006 across all MSAs in the sample. As above, the focus here is limited to homes built in the 1990s. Grouping structure types together, roughly 550,000 owner-occupied units from 2006 had transitioned into the rental sector by 2014 with a small reversal appearing in 2015 (driven by shifts in the SFD segment of the market). Single family detached homes account for roughly 375,000 of the 2006 to 2014 transitions while SFA and multi-family stock each contribute just under 100,000 transitions. These values highlight the large magnitude of own-to-rent housing stock transitions between 2007 and 2014 and especially when one considers that these numbers only pertain to homes built in the 1990s. The figure also makes clear that large numbers of housing stock transitions were generated in the SFA and MF sectors despite the small overall share of SFA housing noted above (5.2 percent) and the lower homeownership rate among MF units. This is because SFA housing experienced a very large change in homeownership rates between 2006 and 2014 as discussed earlier while MF housing accounts for a large share of the overall housing stock (22.9 percent as noted above) so that even modest changes in homeownership rates translate into large numbers of transitions.

Table 2 provides complementary evidence based on the AHS panel. In this instance, individual homes are first sorted based on their current housing tenure, own versus rent. Each unit is then followed over time across up to eight surveys or 2 to 16 years into the future. The table then reports future homeownership rates for homes that were initially owner-occupied and homes that were initially renter-occupied. In the first two columns, structure types are grouped together (omitting mobile homes). Columns 3 and 4 report values for single family homes including both SFD and SFA given the smaller sample size in the AHS, and columns 5 and 6 report values for multi-family homes.

[10] Prominent among these areas are locations well-known for their dramatic boom-bust experiences between 2003 and 2013, including MSAs in California, Florida, Las Vegas, and Phoenix (e.g. Liu, Nowak and Rosenthal, 2016). These and other outliers are discussed further later in the paper.

In column 1, observe that the 16-year ahead homeownership rate for homes currently owner-occupied is 90.2 percent. The tendency for currently owner-occupied homes to transition to the rental sector, however, is much more pronounced among multi-family units than for single family homes: the 16-year ahead homeownership rate for single family dwellings is 92.3 percent (column 3) compared to 68.6 percent for multi-family (column 5). Analogous estimates based on currently renter-occupied homes are also informative. Among all structure types combined (column 2), the 16-year ahead homeownership rate is 20.1 percent. Among single family homes (column 4) the corresponding number is 56.1 percent but among multi-family units (column 6) the corresponding rate is just 9.1 percent.

Summarizing, the patterns above confirm that there is considerable tendency for homes to transition from the owner-occupied to the rental sector of the market as well as from rental status to owner-occupied. However, the patterns discussed thus far do not address what may be driving such transitions. We turn to that issue next.

V. Mechanisms

The previous section documented the number of housing stock transitions between the owner-occupied and rental sectors of the market. Two stylized facts that emerged are (i) housing stock transitions are extensive and (ii) the number of transitions differs considerably across MSAs and over time. This section seeks to explain that variation and the underlying drivers of what causes housing stock to move between sectors of the market. I begin by highlighting long run drivers of housing stock transitions after which short run mechanisms are considered.

5.1 Long run transitions

As suggested earlier, as homes age, they typically deteriorate, lowering quality and causing some owner-occupied homes to shift into the rental sector (e.g. Rosenthal, 2014). The pace at which such transitions occur is likely to be sensitive to structural and neighborhood attributes that affect perceptions of housing quality. Large, single family detached homes are typically perceived as higher quality, all else equal. The same is true for homes situated on a scenic site, such as a lake shore (e.g. Lee and Lin (2015)). Such attributes may help to shield a home from age-related depreciation by attracting higher income residents who may choose to invest more in home maintenance. I begin here by considering the effect of house age along with the effect of structure type based on a home's status as SFD, SFA or multi-family. Assessment of the influence of other structural and neighborhood attributes will follow.

5.1.1 Aging housing stock for single family and multi-family dwellings

Figure 8 summarizes MSA-level SFD homeownership rates across survey years using the census/ACS data. Panel A displays separate plots for eight vintages of homes built prior to 2000 while Panel B highlights homes built in the 1990s along with those built 2000-2004. Three patterns are especially evident. All of the plots trend down over time and homeownership rates in a given survey year are almost always lower for older vintage homes. In Panel A, notice also that homeownership rates in 2000 are 2 to 3 percentage points lower for each one decade older vintage: 94 percent for homes built in the 1990s, 91 percent for homes built in the 1980s, 88 percent for homes built in the 1970s, 86 percent for homes built in the 1960s, 84 percent for homes built in the 1950s, and 81 percent for homes built in the 1940s. In Panel B, observe that for the youngest vintage homes, those built between 2000 and 2004, homeownership rates have begun to increase in 2015, consistent with evidence in earlier plots.

Tables 3a and 3b begin to take a closer look at the drivers of housing stock tenure transitions by presenting individual-level house regressions using the census/ACS data. The samples in these tables include millions of households ensuring that all of the estimates are very precisely measured. In both tables the dependent variable classifies whether a home is currently owned or rented (1 if owned; 0 if rented). Table 3a pools data across structure types (SFD, SFA, and MF) while stratifying the sample into eight vintages for homes built from pre-1940 to 2004. Dummy variables for SFD and SFA are included in these models (with MF as the omitted category) along with controls for the number of rooms, number of bedrooms, and MSA fixed effects. Table 3b presents analogous models but stratifies the sample by structure type (SFD, SFA, and MF) while pooling data across vintages. Models in this table also include vintage fixed effects in all of the specifications. Finally, all of the models control for the percent change in house price at the MSA level since 2000 based on the MSA-level FHFA repeat sales house price indexes. Discussion of this variable is deferred to Section 5.2 so as to focus here on the influence of the structural attributes.

The controls for structural attributes have compelling effects in all of the models. SFD and SFA homes are always far more likely than MF to be owner-occupied as are larger homes. In column 1 of Table 3b, for example, the coefficients on SFD and SFA homes are 49.10 percent 35.15 percent, respectively with MF as the omitted category. In that same regression, the coefficients on number of rooms and number of bedrooms are 2.9 percent per room and 4.35 percent per bedroom, respectively. These results are consistent with the model in Figure 2 which predicts that higher quality homes such as large, SFD dwellings will tend to be found in the owner-occupied sector. These estimates also imply that major durable features of a home that affect perceptions of quality will tend to reduce the potential for housing tenure transitions.

Table 3c presents analogous models to those in Table 3b using individual homes in the 1985-2013 AHS files and treating each successive survey as a separate cross-section. In this case, however, two sets of models are presented. The first in columns 1-4 omit controls for home size (rooms and bedrooms) while the models in columns 5-8 include those controls and match the specifications in Table 4b more closely. In addition, all of the models in Table 3c include MSA by year fixed effects which capture the effect of MSA level house price appreciation and cause that variable to drop out. Most important, in place of vintage controls, age of the home in years is included in all of the models.

In column 1 all structure types are pooled together and controls for home size are omitted. Notice that the coefficient on house age implies that with each year that a home ages the tendency for it to be in the rental segment of the market increases by 0.117 percentage points, or 1.17 percentage points with each passing decade. For single family detached homes in column 2 the estimate is 1.66 percentage points over a decade. This estimate is close in magnitude to 2 percentage point value in the ACS data as inferred from the year-2000 patterns in Figure 8. It is also nearly identical in magnitude to the corresponding estimate for SFA homes in the AHS data in column 3 of Table 3c. For MF homes in the AHS data (column 4 of Table 3c), the comparison estimate is roughly ten times smaller.

In column 5, estimates of the coefficients on structure type and house size (based on rooms and bathrooms) are similar to those from the ACS data in Table 3b. The same is mostly true when stratifying the sample by structure type although bedrooms has a negative coefficient for SFA and MF units after conditioning on number of rooms and the MSA by year fixed effects.

Several points can be learned from the patterns in Figure 8 and Tables 3a-3c. First, owner-occupied homes tend to shift towards the rental sector of the market as they age. This feature of housing markets clearly provides a long run source of future rental housing and at a rate of roughly 2 percent of the overall housing stock per decade (based on the SFD summary measures in Figure 8). This amplifies the rate at which homes filter down to lower income families given evidence in Rosenthal (2014) that filtering rates are much faster among rental units compared to owner-occupied stock.[11] The results above also make clear that the tendency for housing tenure transitions differs sharply across structure types. Transition rates are much larger among single family housing units as compared to multi-family housing. These patterns hint once again that for tenure transitions to occur there must be sufficient demand for the housing type in question in the alternate segment of the market.

5.1.2 Structure and neighborhood attributes

Table 4 extends the analysis above using the AHS panel. Motivated in part by the sample design in Table 2, eight regressions are presented that explore the tendency for owner-occupied homes to transition to rental status. In each case the sample is restricted to homes that are currently owner-occupied. The dependent variable in column 1 is set to 1 if the home is still owner-occupied 2 years in

[11] An alternate approach to estimating the influence of age-related depreciation on tenure transitions is reported in the appendix. The approach draws on the AHS panel and adapts the repeat sales model to follow changes in housing tenure status across turnover dates for individual homes. Estimates from that model also confirm the tendency for owner-occupied units to transition towards the rental stock as they age, with age-related patterns plateauing off at about age 50. Analogous patterns are also evident for rental homes transitioning towards owner-occupied status but at a lesser rate.

the future and 0 if rented. In column 2 the dependent variable is 1 if the home is owner-occupied 4 years in the future and 0 otherwise, and similarly for the other columns for 6 to 16 years into the future.

Each of the models includes five sets of controls that serve different functions. The first two groups of controls are conventional and include a wide range of observable structural and neighborhood attributes of the home. These controls are used to assess the extent to which indicators of housing quality shift homes between sectors of the market.

A third group of controls are a set of dummy variables for whether the current mortgage loan-to-value ratio (CLTV) for the current occupant in the home is 80 to 90 percent, 90 to 100 percent, 100 to 120 percent, and over 100 percent, with CLTV less than 80 percent as the omitted category. Discussion of these variables is deferred to the following section (Section 5.2) where the house price measures in Tables 3a and 3b will also be discussed. For now, it is sufficient to emphasize that the CLTV dummy variables are expected to trace out a step function, with no effect of CLTV on tenure transitions for homes with CLTV below 1, but a negative influence on future homeownership for underwater homes for which CLTV is above 1.

The remaining two groups of controls in Table 4 are intended to control for unobserved quality attributes of the home and other market conditions that may affect tenure transitions. This includes a vector of MSA-by-year fixed effects that address shifts in MSA-specific market conditions over time. In addition, all of the models in Table 4 include controls for current occupant characteristics such as income and the owner's assessment of house value. These latter controls are motivated by the model in Figure 2. Recall that higher quality homes should be sorted into the owner-occupied sector. House occupant controls are undoubtedly correlated with unobserved quality features of the structure and neighborhood. Their inclusion in Table 4, therefore, helps to ensure that the estimates of the coefficients on the structure, neighborhood and CLTV measures are not affected by unobserved quality. A partial check on whether that is the case can be gleaned by considering the influence of current house age. Current house age is primarily a proxy for *unobserved* age-related depreciation of the structure. To the extent that occupant attributes and other controls soak up unobserved quality, the coefficient on current house age should be reduced relative to estimates reported in earlier tables. Evidence in Table 4 supports this expectation. In column 5, notice for example that the 10-year ahead coefficient on current house age is just -0.00022. This implies that aging an owner-occupied home ten years increases the likelihood that it will transition to rental status by just 0.22 percentage points, much smaller than corresponding estimates discussed above for Figure 8 (for the ACS data) and Table 3c (for the AHS data). We will revisit this point in the following section when discussing the influence of the CLTV variables.

Consider now the overall pattern of coefficients in Table 4 that control directly or indirectly for house quality. Looking down the rows in the table it is evident that the estimates are consistent with the findings from the earlier tables and other priors. As a rule, indicators of housing quality such as SFD status, house size (based on rooms and bathrooms), and the absence of neighborhood disamenities (e.g. indicators of crime, abandoned buildings, and junk on the street) have positive effects on the tendency for the home to remain owner-occupied. Moreover, those effects tend to amplify over time and especially so when the feature in question is durable in nature. This is as anticipated since it takes time for a home to transition across sectors, both because it takes time for quality features to evolve and also because current occupants must move out of the dwelling. Because there are too many controls in Table 4 to discuss each in detail, three key controls are highlighted in Figure 9 to illustrate. These include house age, bars on the windows of neighboring homes, and owner's assessment of house value.

Panel A of Figure 9 plots the Table 4 coefficients on house age and their 95 percent confidence bands across each of the eight regressions. Observe that house age has nearly zero effect on the tendency for an owner-occupied home to transition to rental status two years into the future. However, further out into the future, the age coefficient has an increasingly negative and highly significant effect on homeownership status (although still small in magnitude as noted above).

Panel B of Figure 9 plots the coefficients on a dummy variable that indicates whether there are homes on the block that have bars on their windows. The presence of such bars is indicative of security concerns and is likely correlated with higher local crime rates. Two years ahead, the presence of bars on the windows of neighboring homes increases the likelihood that the home in question transitions to the rental sector by roughly 0.75 percentage points. That effect grows to 1.89 percentage points 14 years in the future and then moderates slightly in the following two years.

Panel C of Figure 9 plots the coefficients on log of house value in the current year. This variable is among those intended to capture the effect of unobserved quality attributes of home. As expected, higher house value has little effect on tenure transitions in the near term but an increasingly positive and highly significant effect on the likelihood that the home remains owner-occupied further out in the future. For the 16-year ahead estimate, doubling house value increases the likelihood that the home will still be owner-occupied by 1.35 percent.

These and other estimates in Table 5 confirm that structural and neighborhood that enhance quality have long term effects on the tendency for a home to remain owner-occupied.

5.2 Short run transitions

5.2.1 House price movements and mortgage default risk

Consider now the estimates on house price inflation in Tables 3a and 3b and recall that all of the models in these tables condition on house size (number of rooms and bedrooms) along with fixed effects for MSA and survey year. Conditional on these controls, in Table 3a house price inflation has little effect on the tendency for owner-occupancy among older vintage homes but positive and highly significant effects for newer vintage homes. Notice also that in Table 3b, the percent change in house price since 2000 has a positive and highly significant effect on the tendency for SFD homes to be owner-occupied. On the other hand, house price inflation has a negative and marginally significant effect on owner-occupancy among SFA homes (with a t-ratio of -0.0112) and an insignificant but positive effect on owner-occupancy among multi-family units.[12] Summarizing, conditional on the other model controls,

[12] The limited effect of MSA-level house price inflation on SFA homes in Table 3b is seemingly at odds with the considerable volatility in SFA homeownership rates in the raw data displayed in Figure 5. That difference suggests that the other model controls in Table 3b are important drivers of the pattern in Figure 5.

rising house prices encourage transitions into the owner-occupied sector for SFD housing. For SFA and MF housing the estimates are sufficiently noisy it is difficulty to make a definitive statement.

The model in Figure 2 provides one explanation for the mixed pattern of these results. It is possible that for some types and vintage homes rising house prices depress investment demand by an amount sufficient to limit any change in the spread between investment demand and consumption demand (recall that rising price levels lower consumption demand). In Figure 2, this would reduce any tendency for a shift towards owner-occupancy. For other housing types and vintages, it is possible that rising house prices may instead cause investment demand to increase which would unambiguously push homes into the owner-occupied sector.[13]

The CLTV variables in Table 4 address the possibility that financing and the mortgage market may contribute to housing stock tenure transitions in the face of changing house prices. When a homeowner defaults on a mortgage the lender takes over ownership of the home. This by itself does not necessarily mean that the home will transition into the rental sector since the lender has an incentive to sell the home for the greatest net return. That could entail selling the home through a real estate agency or by auction to a prospective owner-occupier although in other instances lenders may market their inventories of distressed properties to investors. A different explanation is therefore needed.

One such possibility is that homeowners who anticipate defaulting on their loan have little incentive to conduct further maintenance. Indeed, this has been recently documented by Lambie-Hanson (2015), Gerardi et al (2015) and Haughout et al (2013).[14] In the worst case scenario homeowners at risk of default may even sell off valuable appliances and other recoverable items in the home before vacating the dwelling. If this sort of pre-default behavior sufficiently lowers house quality the home could transition into the rental sector. Note, however, that this only applies to homes for which the occupants

[13] Although this explanation is plausible, it is also important to recognize that changes in house price levels could also have complicated effects not captured by the model in Figure 2. It is worth noting, for example, that the model in Figure 2 does not take financing into account.

[14] Each of these studies provides evidence that homes at risk of mortgage default tend to be under-maintained.

are at risk of default which does not apply in instances where the current occupant has a low CLTV. More precisely, an extensive literature has confirmed that for a homeowner to default on their mortgage, they must have a need or desire to move since default requires that the household vacate their property. In addition, the family must owe the lender more than the home is worth (see Foote, Gerardi and Willen, 2008, for example). For these reasons, for homes with CLTV above 1, the possibility exists that the occupant of the dwelling may anticipate a future default, would stop maintaining the home, and that this along with a possible eventual default could prompt a transition to the rental sector. On the other hand, for families with CLTV sufficiently below 1, the risk of future default is low and the occupant retains an incentive to maintain the home. In this instance, even moderate differences in the level of CLTV should not affect transitions of owner-occupied housing stock into the rental sector. This motivates the anticipated step function for the CLTV coefficients mentioned earlier that should be present provided the other model controls adequately control for unobserved quality.

Figure 10 plots the CLTV estimates from Table 4. The omitted category includes homes with CLTV below 80 percent and is the reference point when interpreting the CLTV coefficients. Notice that the coefficients on the CLTV dummies for 80 to 90 percent and 90 to 100 percent are close to zero for each regression, from 2 to 16 years out into the future. On the other hand, homes with modestly underwater occupants, with CLTV between 100 to 120 percent, experience transitions into the rental sector at a rate roughly 1 to 2 percentage points above low CLTV homes for most of the period from 4 to 16 years in the future. For homes with occupants who are deep under water, with CLTV above 120 percent, the pattern is more dramatic. Two years into the future, such homes are roughly 1 percentage point more likely to transition to rental status. That effect grows to roughly 5 percentage points over most of the period from 6 to 16 years in the future. For these coefficients, the 95 percent confidence band is also plotted in Figure 10. Although the estimates are much less precise further into the future because of small sample size, there is clear evidence of a growing and substantial tendency for high CLTV homes to transition into the rental sector.

Two extensions of the model in Table 4 provide further insight into the CLTV results. The first considers whether underwater owner-occupied homes are more likely to transition if they are of lower quality and are in relatively high demand in the rental sector for that reason. The second examines whether the tendency for underwater owner-occupied homes to transition to rental status is similar or different pre-2000 as compared to the boom-bust period from 2003 to 2013.

5.2.2 The effect of rental demand on transitions of underwater owner-occupied homes

This section considers the extent to which rental demand for a home presently in the owner-occupied sector affects its potential to transition into the rental sector of the market. This is done using a two-step procedure. The first step establishes whether demand for the home is likely to be present in the rental sector. The second step stratifies the sample on the basis of inferred rental demand and then re-estimates the models in Table 4. This yields a richer set of coefficients on the CLTV measures making it possible to assess whether underwater homes are more likely to transition to rental status when demand for those homes is present in the rental sector is comparatively high.

To implement the first step, owner-occupied and rental homes are pooled together across all survey years treating each survey as a separate cross-section. Using this sample, a linear probability model is estimated for which the dependent variable is 1 if the home is currently owner-occupied and 0 if rented. Estimates from this model are then used to predict the probability of homeownership for each individual home in the sample. For homes for which the predicted probability of homeownership is high (e.g. above 90 percent), demand in the rental sector is inferred to be low. For homes for which the predicted probability of homeownership is low the reverse is true. Bearing this in mind, Table 5 presents estimates from two specifications of the linear probability model. The first of these includes all of the structure and neighborhood controls from Table 4 in addition to the MSA-by-year fixed effects. The second specification includes all of these controls and also adds in controls for occupant attributes from Table 4 such as household income and age of the household head. Attributes that are tenure-specific such as house value are omitted from both specifications.

In Table 5, notice that the coefficient on house age in column 1 is positive (the wrong sign) and highly significant. However, in column 2 where controls for occupant attributes are included in the model the coefficient on house age is nearly zero (0.00004) and not significant. This is appealing and suggests that the occupant controls are effective in helping to soak up unobserved quality for reasons discussed above. For that reason, estimates from the model in column 2 are used to form the predicted likelihood that a home is owner-occupied for each home in the sample, P_i.

To execute the second step, the sample of owner-occupied units used for Table 4 is split into two groups based on homes above and below a critical value for P. That value is set so that homes with P_i below the critical value are expected to face comparatively high levels of demand in the rental sector while homes with P_i above the critical value are expected to face limited demand in the rental sector. Models analogous to those in Table 4 are then estimated for the separate samples.

An important part of this strategy is to pick a sensible value for the critical level of P. Table 6 provides summary measures to guide that selection while additional supporting evidence is discussed in the appendix. In Table 6, Panel A summarizes the distribution of P for homes stratified by their current owner-occupancy status. In this panel, values in a given column sum to one. Notice that among currently rented units, only 2.31 percent of homes have values for P above 0.9 (1.9 plus 0.41 in the last two rows). Among currently owner-occupied units 49.15 percent of homes have values for P above 0.9 (26.99 plus 22.16 in the last two rows). Panel B of Table 6 provides a complementary perspective that summarizes the rental and owner-occupancy rates for different values of P. In this instance, entries in each row sum to one. Observe that the predicted owner-occupancy rate is over 96 percent when P exceeds 0.9, roughly 91 percent for P between 0.8 and 0.9, and much lower when P is below 0.8. On the other hand, among rental units, the predicted homeownership rate is less than 4 percent for values of P above 0.9.

Based on the patterns just described, substantial potential for rental demand appears to be present for currently owner-occupied homes with values of P below 0.9. Conversely, few currently renter-occupied units have values of P above 0.9, suggestive of limited potential demand in the owner-occupied sector. Additional summary measures in the appendix also indicate that owner-occupied homes with P

below 0.9 have structural and neighborhood traits that are far more similar to current rental units as compared to owner-occupied homes with *P* above 0.9. For these reasons, the critical value for *P* used to stratify the sample in Tables 7 and 8 is set at 0.9.

Tables 7a and 7b present estimates of a modified version of the models in Table 4 for the stratified samples. Table 7a presents estimates for owner-occupied homes with *P* below 0.9 while Table 7b presents estimates for owner-occupied homes with *P* above 0.9. As before, eight models are presented in each table for homeownership status 2 to 16 years into the future. All of the models include the CLTV controls from Table 4 and MSA-by-year fixed effects. However, in place of the other variables in Table 4, the models in Tables 7a and 7b include the predicted probability that the home is owner-occupied, P_i.

The CLTV coefficients in the two tables are plotted in Figure 11. Panel A plots estimates for homes "unlikely" to be owner-occupied, with *P* below 0.9. Panel B plots estimates for homes that are "likely" to be owner-occupied, with *P* above 0.9. The patterns are dramatic. In Panel A, the pattern is quite similar to that in Figure 10. In Panel B, however, the estimates display little tendency for underwater homes to transition into the rental sector of the market. These results confirm that for underwater homes a further factor governing possible transition into the rental sector is whether a viable rental market exists for the type of home in question, including structural and neighborhood attributes.

5.2.3 Pre- versus post-financial crisis

Is it possible that the historic financial crises and great recession that began in 2007 could be driving the results in Tables 7a, 7b, and Figure 11? Or is there something more general driving these patterns? This section considers these questions. To do so, Tables 7a and 7b were re-estimated splitting the sample into two parts for survey years from 1985 through 1999, and then again for survey years from 2003 through 2013. Estimates from these samples are presented in Table 8. Because of the shortened time horizon models are presented only for 2, 4, 6 and 8 years ahead.

The estimates in Table 8 yield qualitative and quantitative patterns that are quite similar for the pre- and post-2000 periods. In both periods, among homes that are likely to be owner-occupied ($P > 0.9$), CLTV values have little impact on transitions into the rental sector even when the home is deep underwater. However, among homes that are unlikely to be owner-occupied ($P < 0.9$), homes with high CLTV values (CLTV > 1) are notably more likely to transition to rental status. These patterns suggest that despite the dramatic scale of the financial crisis and related mortgage defaults post-2007, the principles and core factors that increase the tendency for underwater homes to transition into the rental sector of the market are similar pre- and post-financial crisis.

VI. Post-2007 recovery of housing construction and own-to-rent stock transitions

The preceding sections document that housing stock tenure transitions are common and systematic, responding to both short and long run drivers. This section examines the extent to which housing stock tenure transitions affect housing construction.

A longstanding stylized fact of the U.S. economy is that new home construction takes place primarily in the owner-occupied sector.[15] This suggests that any reversal of recent own-to-rent transitions could potentially undercut demand for new home building and slow recovery in the construction market following a downturn. The extent to which this occurs will depend on the degree of reversal which in turn depends on whether homes that recently shifted into the rental sector retain viable markets in the owner-occupied sector, and also whether such dwellings are sufficiently close substitutes for newly built homes. Table 9 presents results from two regressions that provide evidence on these points.

For each regression in the table, the dependent variable is the MSA level of single family housing permits measured on an annual basis from 2006 to 2015. Controls include MSA and year fixed effects, the percent change in MSA level home prices since 2006 based on the FHFA home price index, the number (in levels) of vacant owner-occupied homes for sale, and the number of vacant rental units for rent. In column 1, the primary variable of interest is the number of own-to-rent transitions since 2006 for pre-2005 vintage homes. In column 2, that variable is replaced with a set of similarly formed measures for

[15] In the 2000 census data, for example, among homes built in the 1990s, 77 percent of all homes (excluding mobile homes) and 94 percent of SFD homes were owner-occupied (see also Figure 8).

each vintage of housing stock from pre-1940s up to 2000-2004. The premise for decomposing own-to-rent transitions in this fashion is that newly built homes likely retain a more viable market in the owner-occupied sector and are closer substitutes to new home construction. For these reasons, any depressive effect of recent own-to-rent transitions on new construction is expected to be greater for younger vintages.

Results in Table 9 support the arguments above. Notice first that in both columns, the coefficient on house price growth is positive, indicating that rising home prices encourage new construction. The coefficients on the number of vacant homes are also all roughly -0.2 (for both owner-occupied and rental units) indicating that for every 100 vacant homes there are roughly 20 fewer permits issued that year.

In column 1, the coefficient on own-to-rent transitions is -0.18. This suggest that pre-2005 vintage own-to-rent transitions have a similarly depressive effect on new construction as vacant housing. The evidence in column 2 is even more compelling. In that column, own-to-rent transitions of all vintages depress housing permits but the effect increases in a mostly monotonically fashion for younger vintage homes. For homes built between 2000 and 2004, the relevant coefficient is -0.43, indicating 43 fewer permits for every 100 transitions. For homes built in the 1980s and 1990s the corresponding coefficients are roughly -0.25. For 1970s vintage homes the coefficient is -0.16 and for pre-1960 vintages the effect is roughly -0.1. These patterns confirm that post-2006 own-to-rent housing stock transitions do act in part as a buffer stock of potential owner-occupied housing and slow the rate at which new home construction has recovered in many markets for that reason.

VII. Conclusions

Evidence abounds that different types of homes are sorted in equilibrium into the owner-occupied and rental sectors of the market, with single family dominant in the former and multi-family in the latter. Less obvious is that the ownership status of individual homes periodically shifts in response to systematic factors including demand shocks in the short run and advancing age of existing homes in the long run. Changes in these and related factors affect the nature and rate of housing stock transitions with direct effects on housing market dynamics and local economies.

Evidence presented in this paper indicates that on net, roughly 2 percent of existing single family detached housing stock transitions into the rental sector with each passing decade as existing homes age. Estimates elsewhere in the literature (e.g. Rosenthal (2014)) show that rental housing filters down to lower income families at a much faster rate than homes in the owner-occupied sector: roughly 2 percent real income per year compared to 0.5 percent per year, respectively. Together, these stylized facts indicate that own-to-rent housing stock transitions play an empirically important but previously unrecognized role in the filtering process, the market's primary mechanism by which it generates lower income housing.

In comparison to such long run trends, short run transitions of housing stock in response to demand shocks can be more volatile, both in magnitude and in potential for housing stock to shift back to previous states. As an example, over 10 percent of the 1990s vintage stock of housing shifted from owner-occupied to rental status following the 2007 crash in home prices and related jump in mortgage defaults. The conceptual model in this paper suggests that these sorts of transitions may partly reverse as local markets recover, as with boom-bust-recovery patterns in select cities over the 2000-2015 period. Partly for that reason, own-to-rent housing stock transitions following the 2007 crash appear to act in part as a buffer stock of potential owner-occupied housing and depress new home construction for that reason. In the post-2006 period, 18 fewer construction permits were filed for every 100 post-crash own-to-rent transitions, about the same effect as from vacant housing. For very recent vintage 2000-2004 housing stock own-to-rent transitions, the effect is even larger. These relationships help to explain why post-2007 construction activity has yet to recover in many cities even though home prices have largely rebounded.

Finally, results confirm that housing stock transitions are most prevalent for housing types for which viable demand is present in the alternate sector. Otherwise, transitions tend not to occur. Model estimates are also similar pre- and post-2007, and in both cases conform to predictions of a simple conceptual model. The principles and evidence developed in this paper, therefore, are general and robust, and confirm that housing stock transitions have important short and long run effects on market dynamics and local economies.

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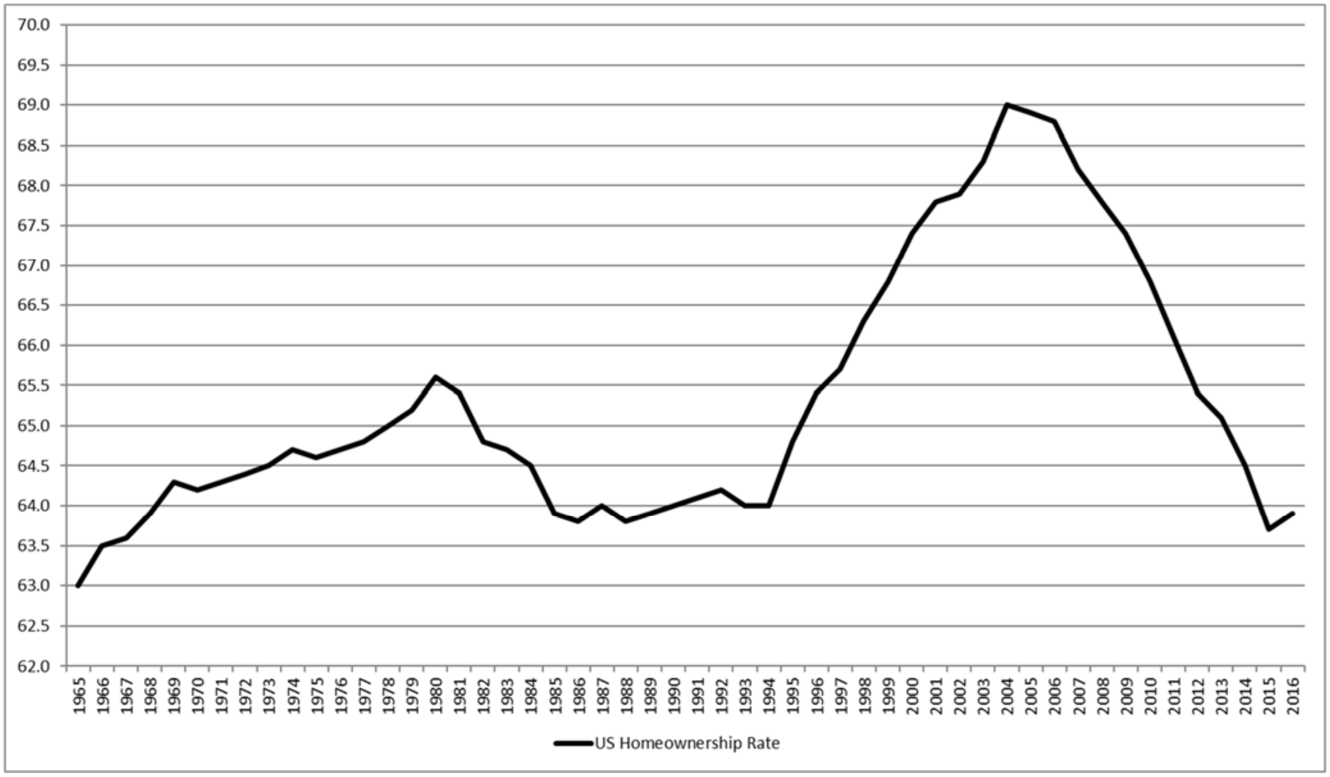
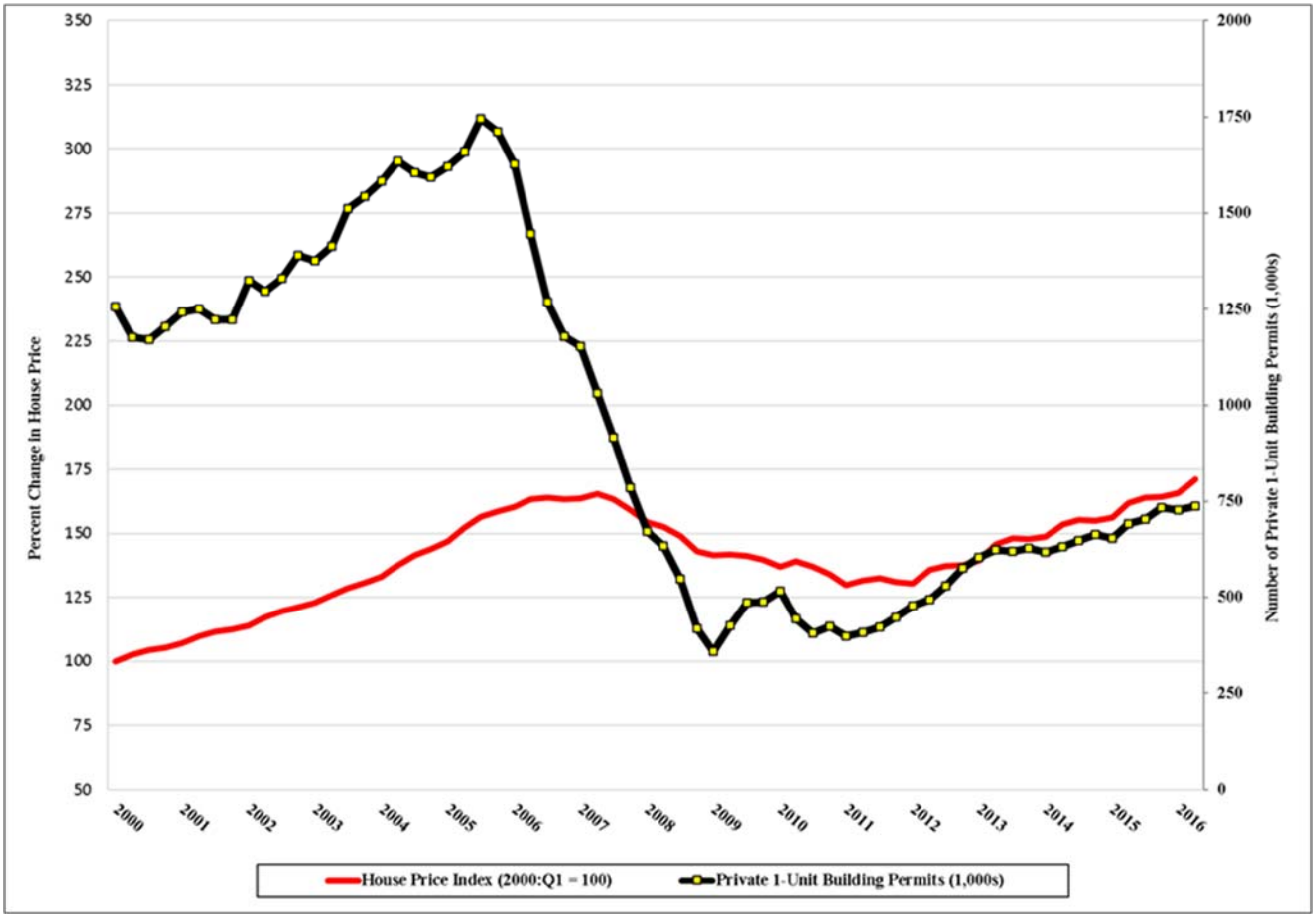
Rosenthal, Stuart S. (2014), "Are Private Markets and Filtering a Viable Source of Low-Income Housing? Estimates from a 'Repeat Income' Model," *American Economic Review*, 104(2): 687-706.

Figure 1a: US Homeownership Rate 1965-2017:Q3[a]



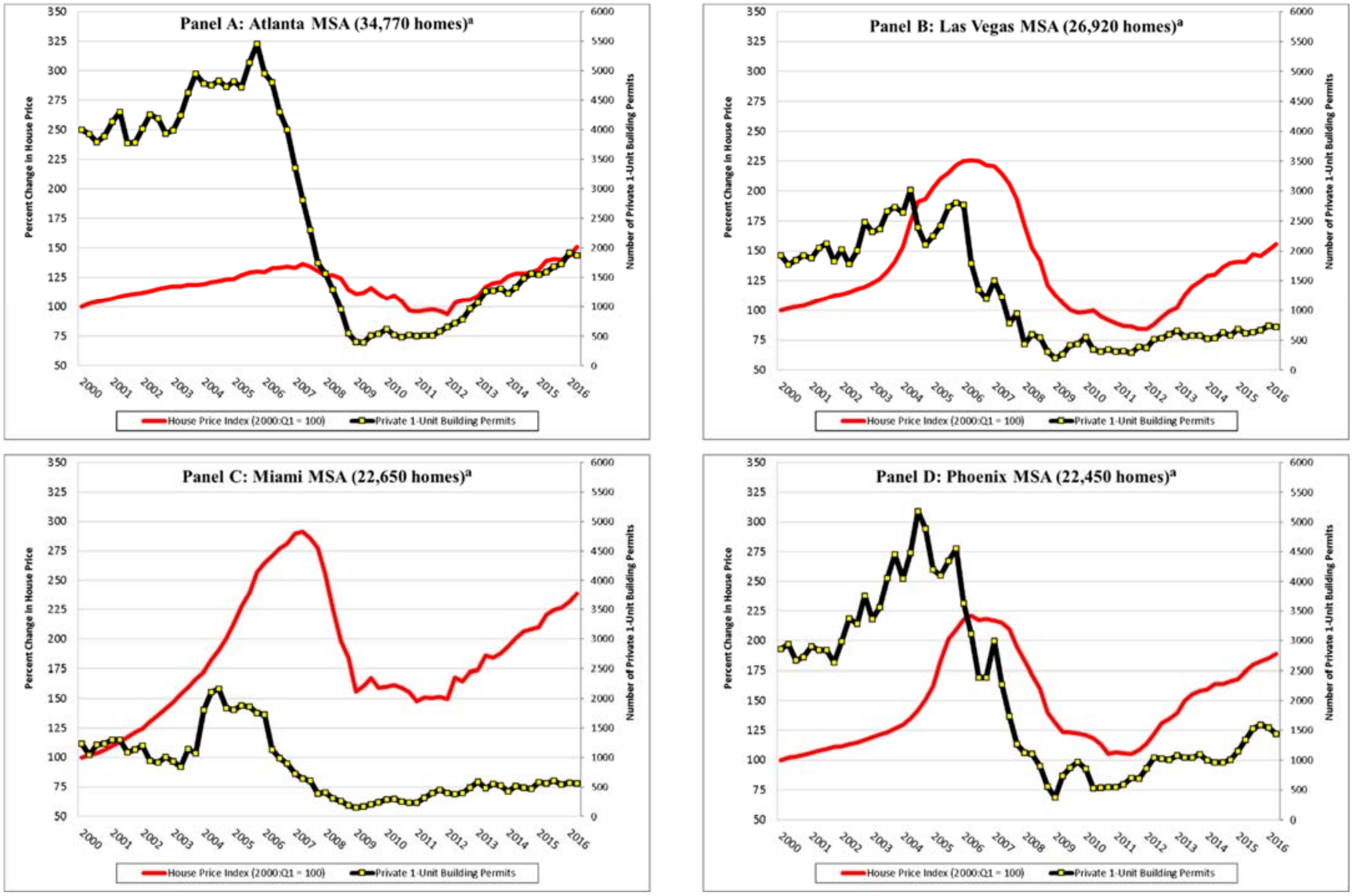
[a] Data were obtained from https://www.huduser.gov/portal/ushmc/hi_HOR.html .

Figure 1b: Single Family Residential Construction in the United States[a]



[a] Data on building permits were obtained from the US. Bureau of the Census, New Private Housing Units Authorized by Building Permits: 1-Unit Structures and downloaded from the FRED data portal at Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/ . The HPI indexes are from FHFA all transactions index.

Figure 1c: Single Family Housing Construction in Select Metropolitan Areas[a]



[a] Data on building permits were obtained from the US. Bureau of the Census, New Private Housing Units Authorized by Building Permits: 1-Unit Structures and downloaded from the FRED data portal at Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/ . The HPI indexes are from FHFA all transactions index.

Figure 2: Division of Housing Stock into Owner-Occupied and Rental

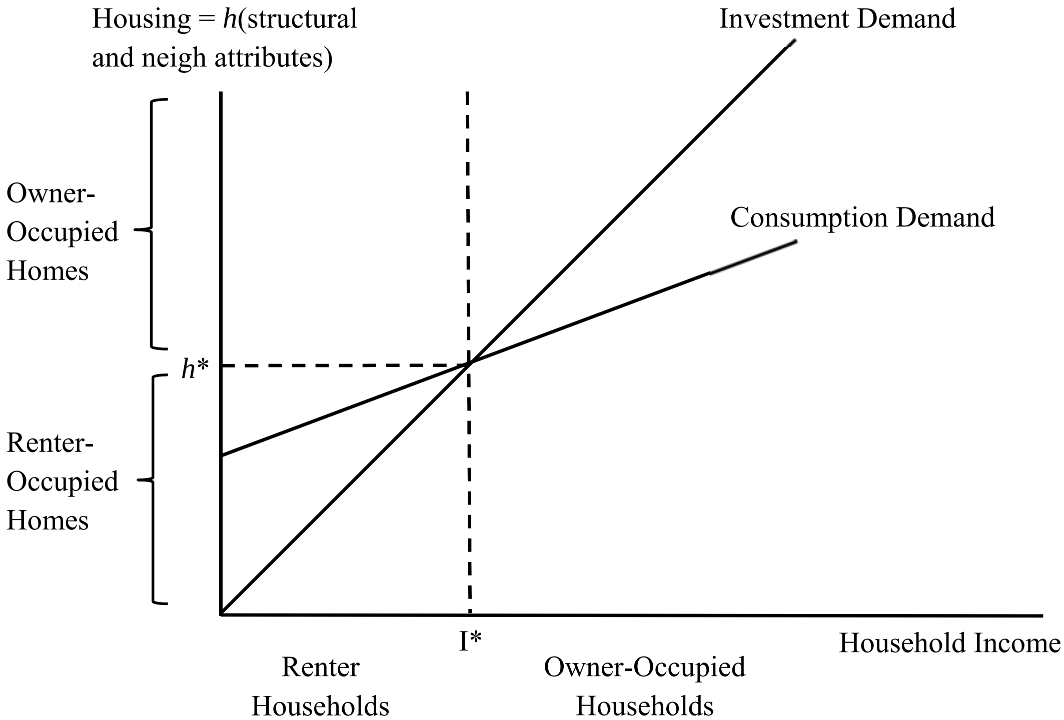


Figure 3: Homeownership Rates by Structure Type with a Common Vertical Scale (Based on Census and ACS Data)

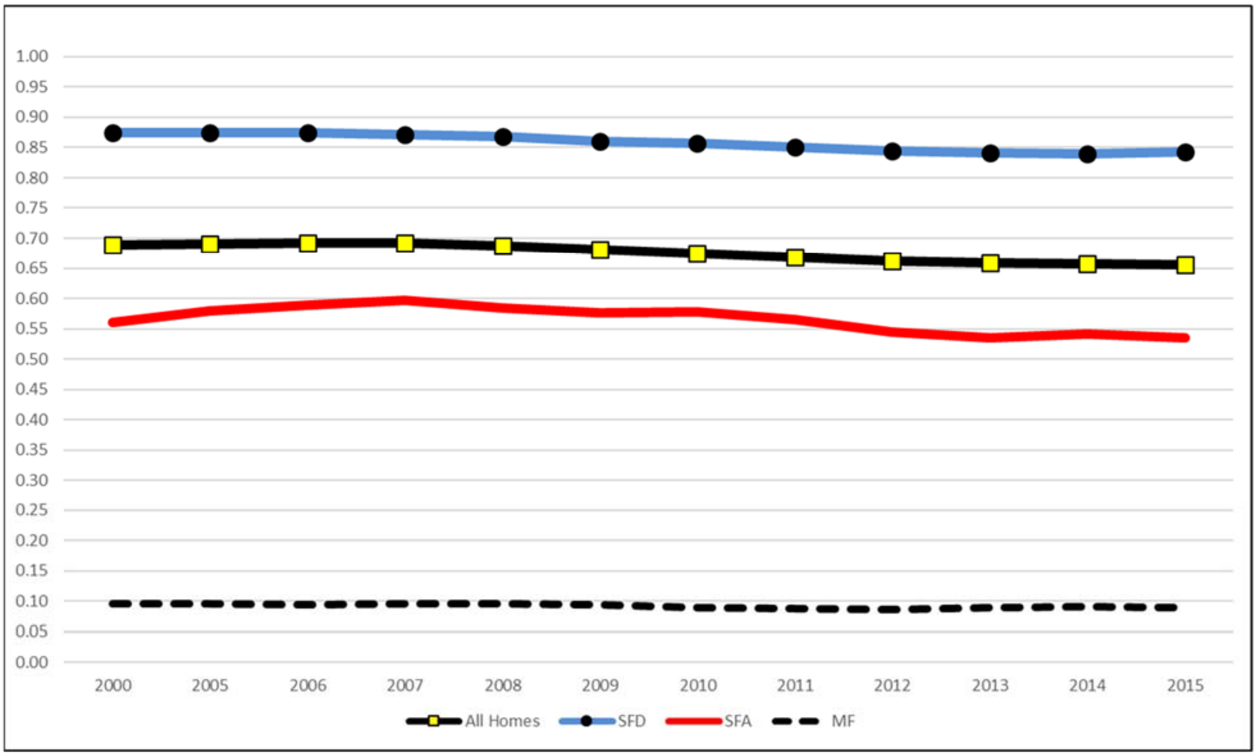


Figure 4: Homeownership Rates by Structure Type with Different Vertical Scales (Based on Census and ACS Data)

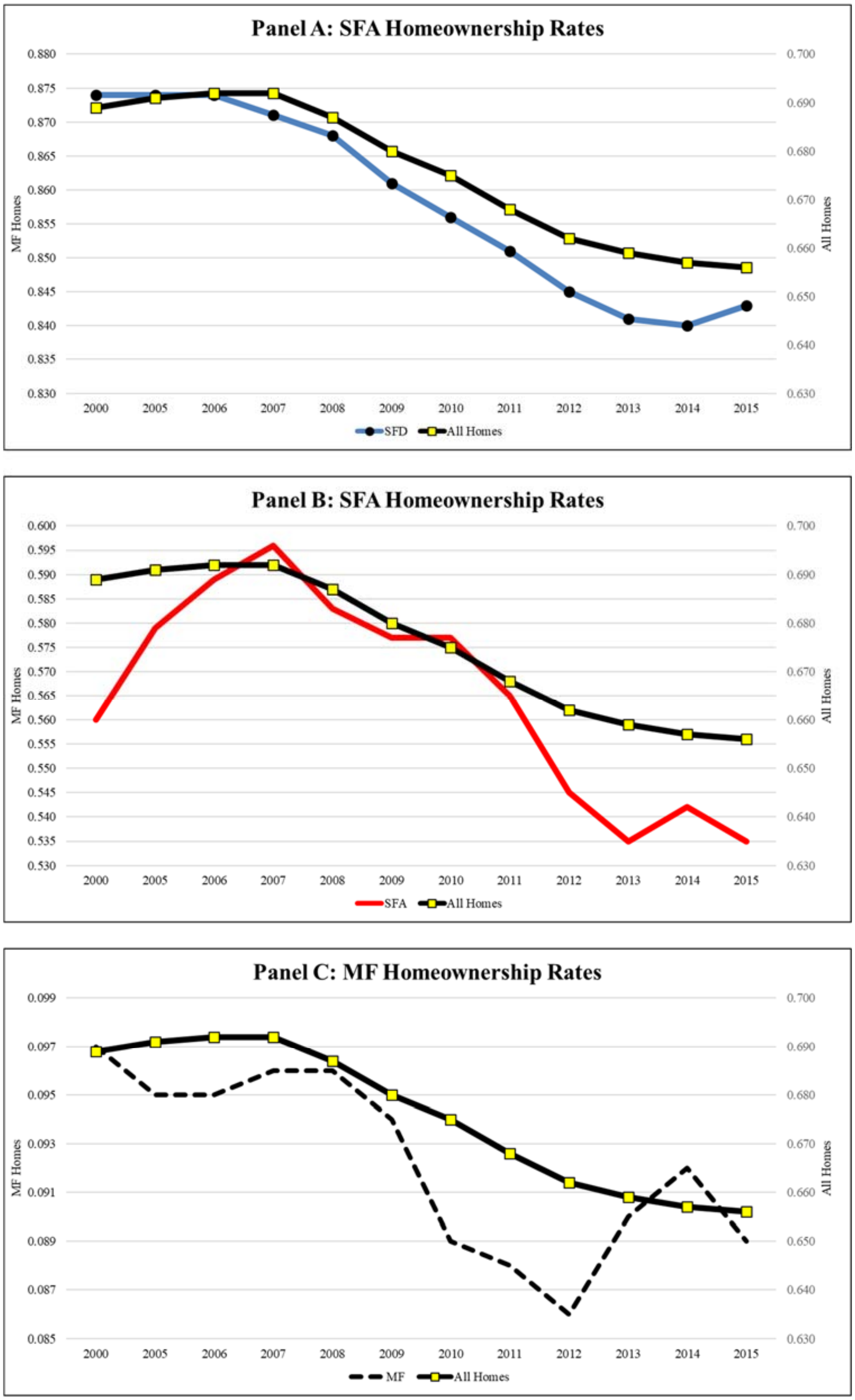


Figure 5: Change in Homeownership Rates Since 2000 (in percentage points)
(Based on Census and ACS Data)

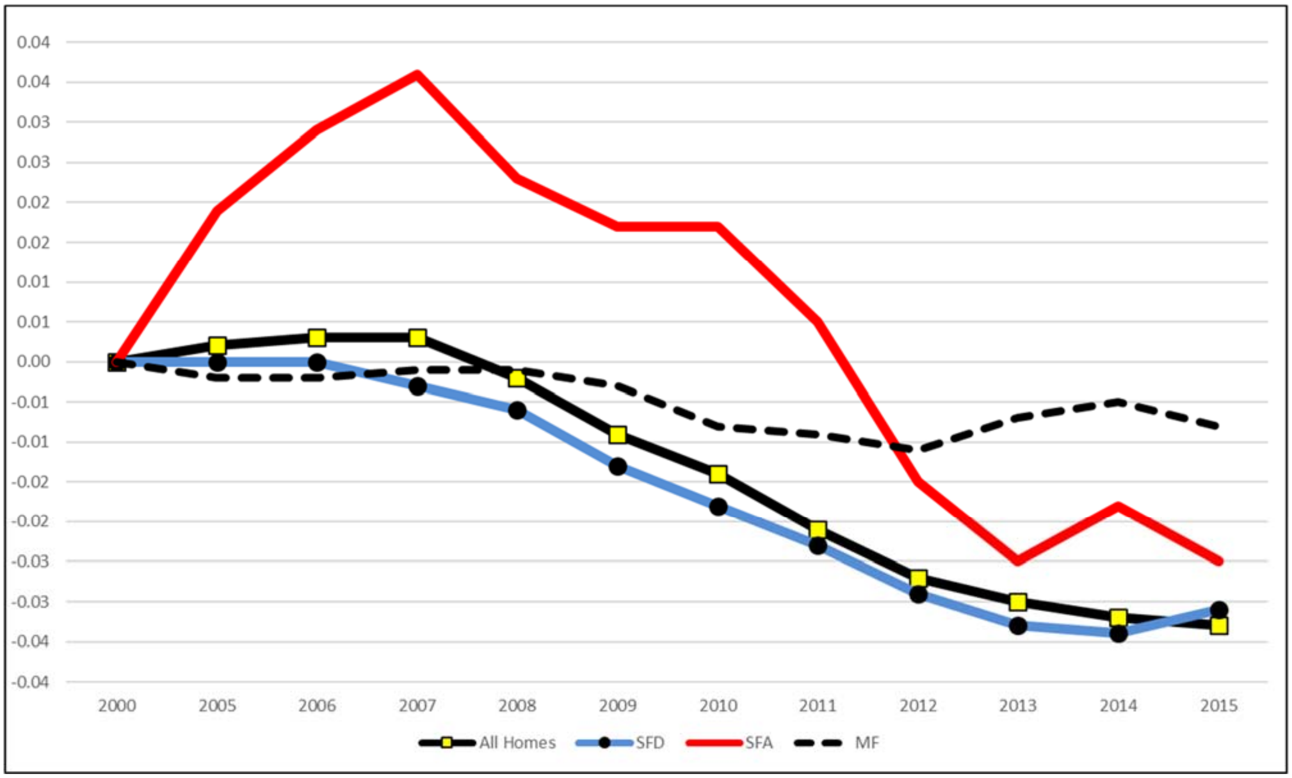


Figure 6a: Cross-MSA Distribution for the Change in the Number of Vintage-1990s Owner-Occupied Units Since 2006 (Based on Census and ACS Data)

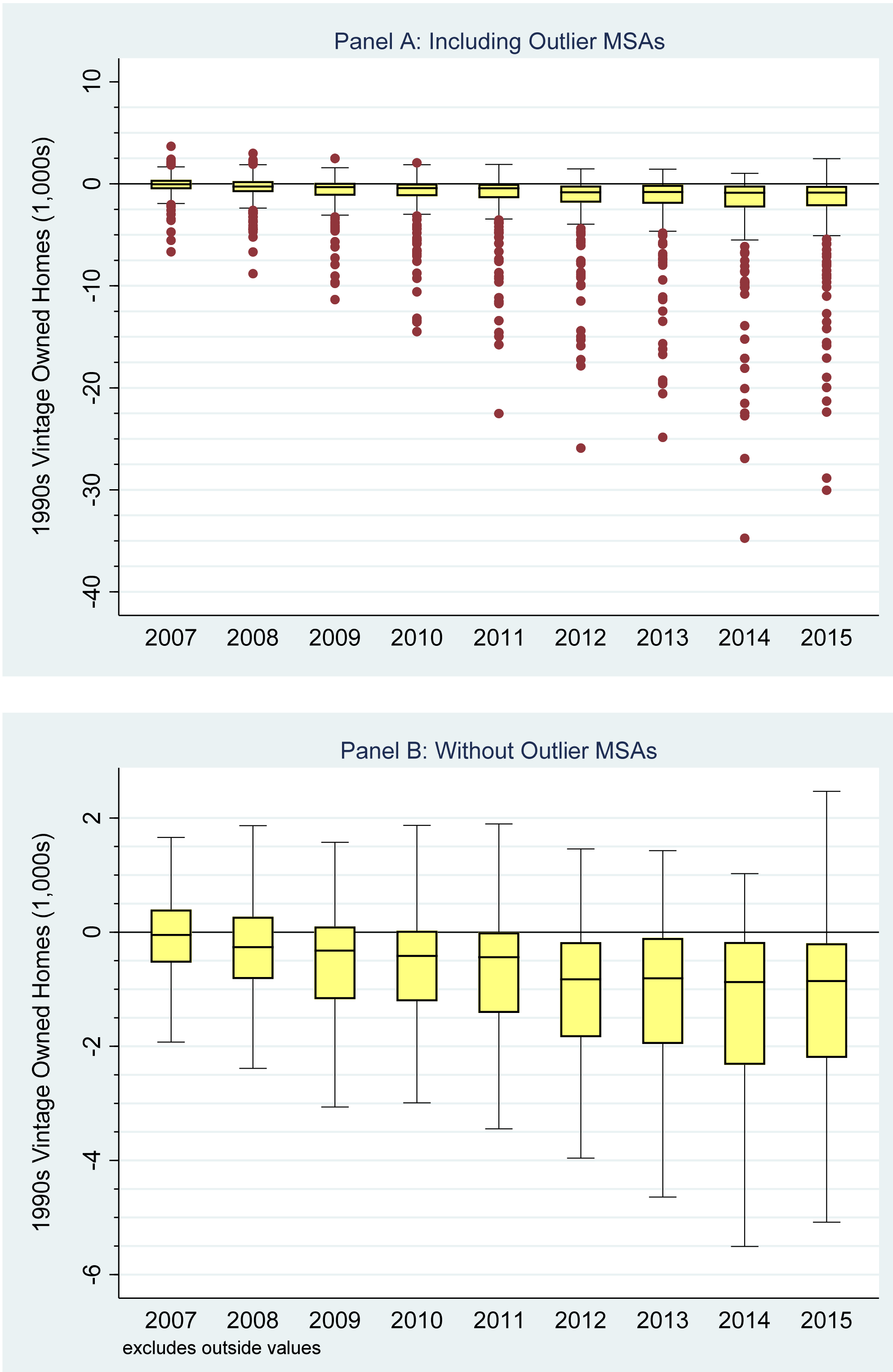


Figure 6b: Cross-MSA Distribution for the Change in the Number of SFD Vintage-1990s Owner-Occupied Units Since 2006 (Based on Census and ACS Data)

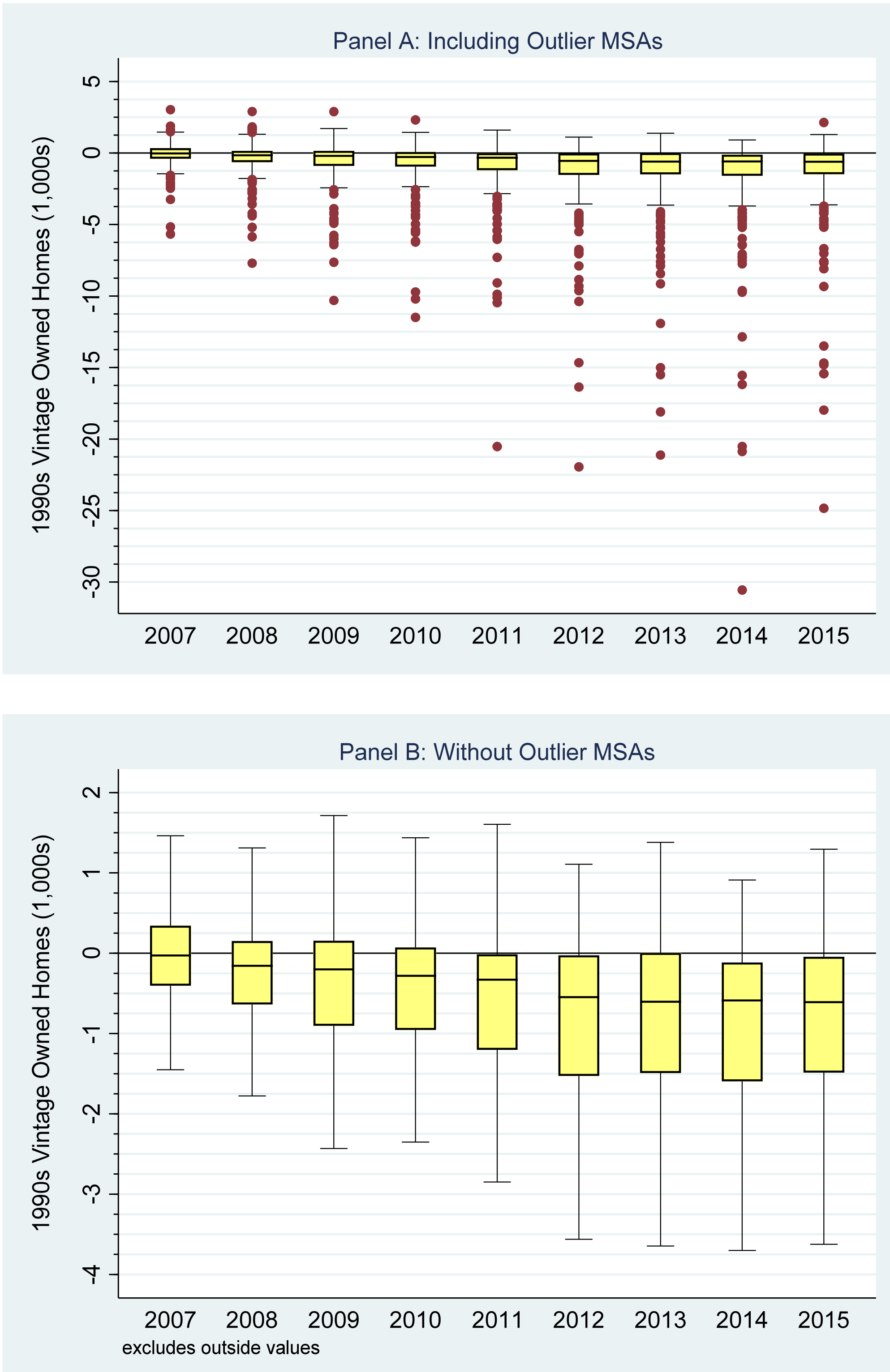


Figure 6c: Cross-MSA Distribution for the Change in the Number of SFA Vintage-1990s Owner-Occupied Units Since 2006 (Based on Census and ACS Data)

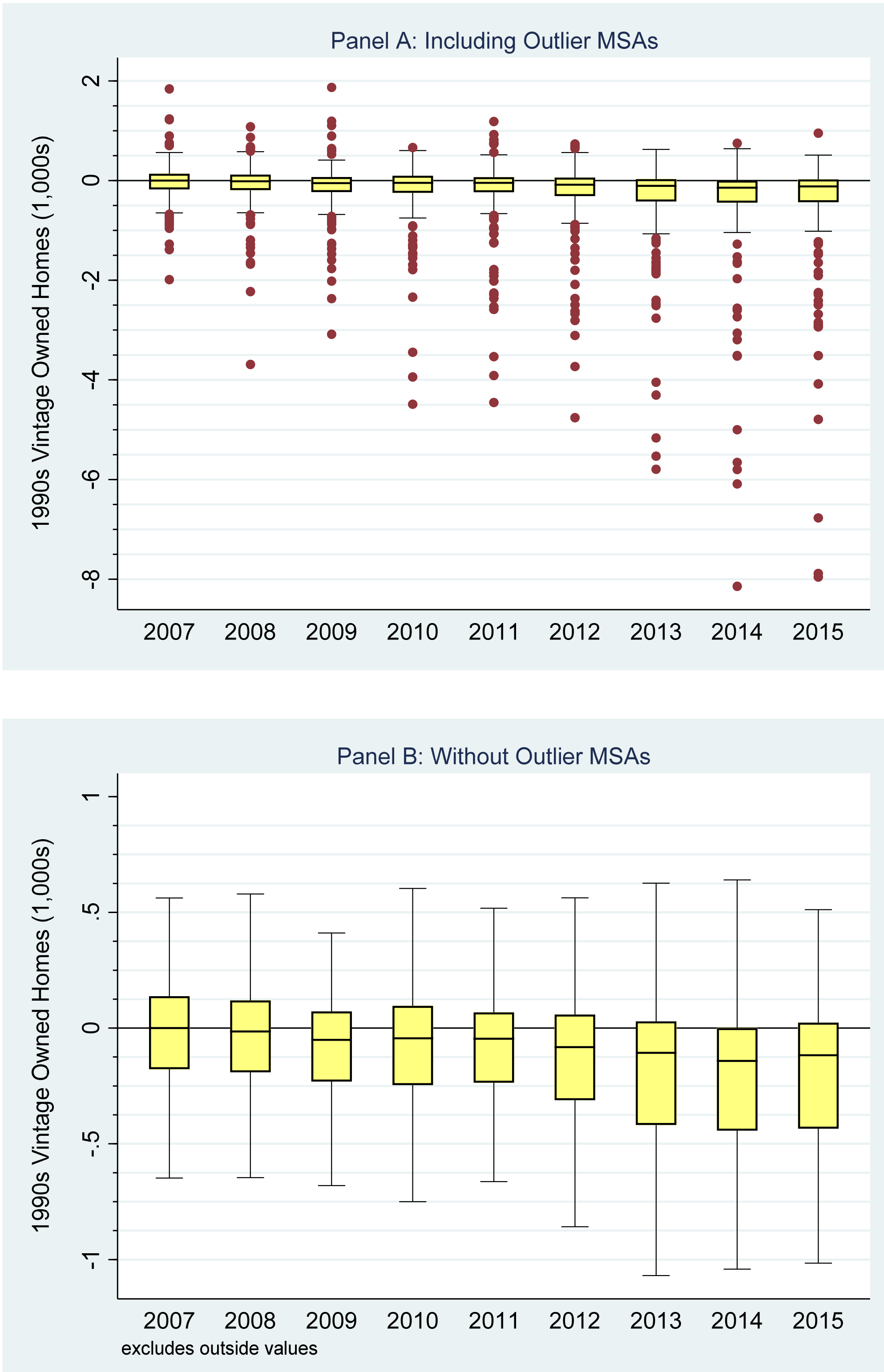
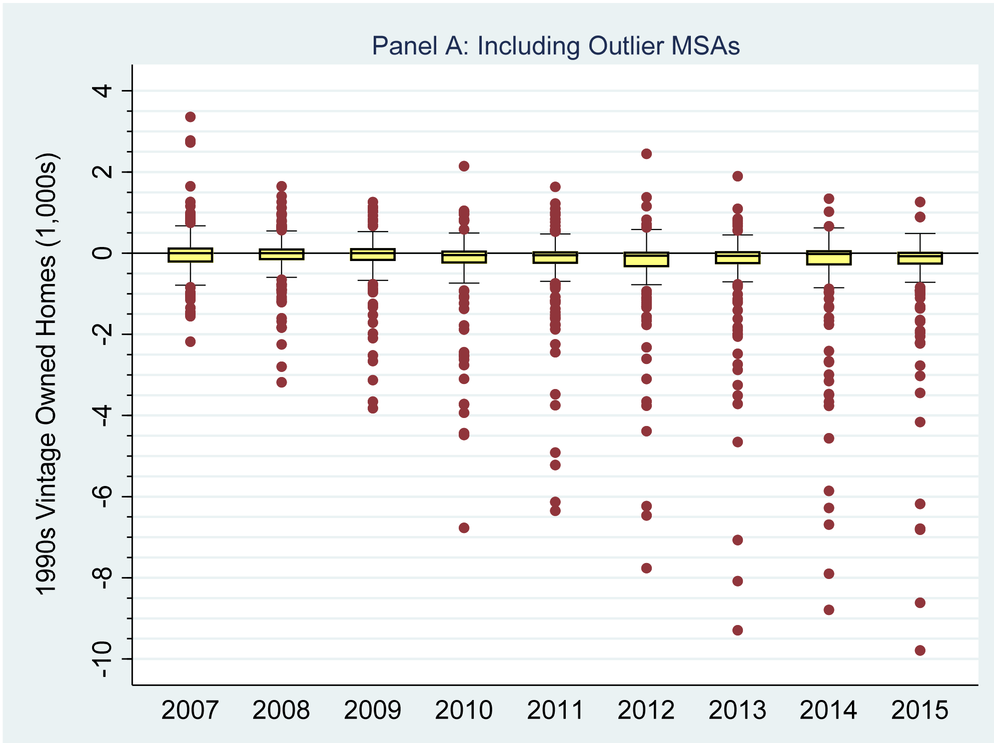


Figure 6d: Cross-MSA Distribution for the Change in the Number of MF Vintage-1990s Owner-Occupied Units Since 2006 (Based on Census and ACS Data)



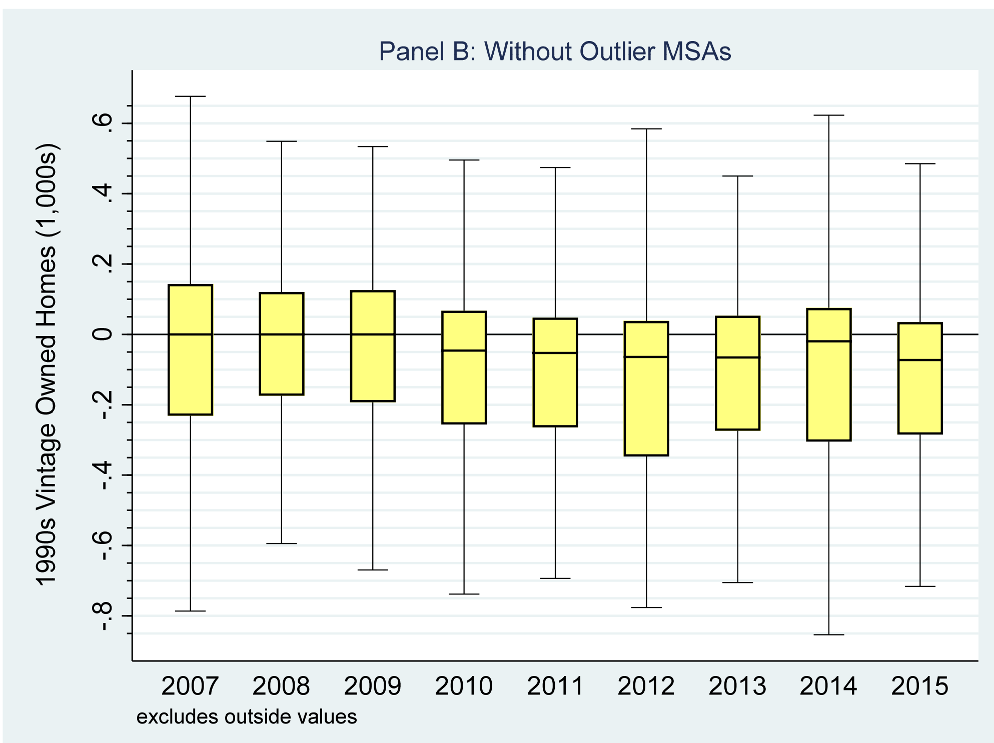
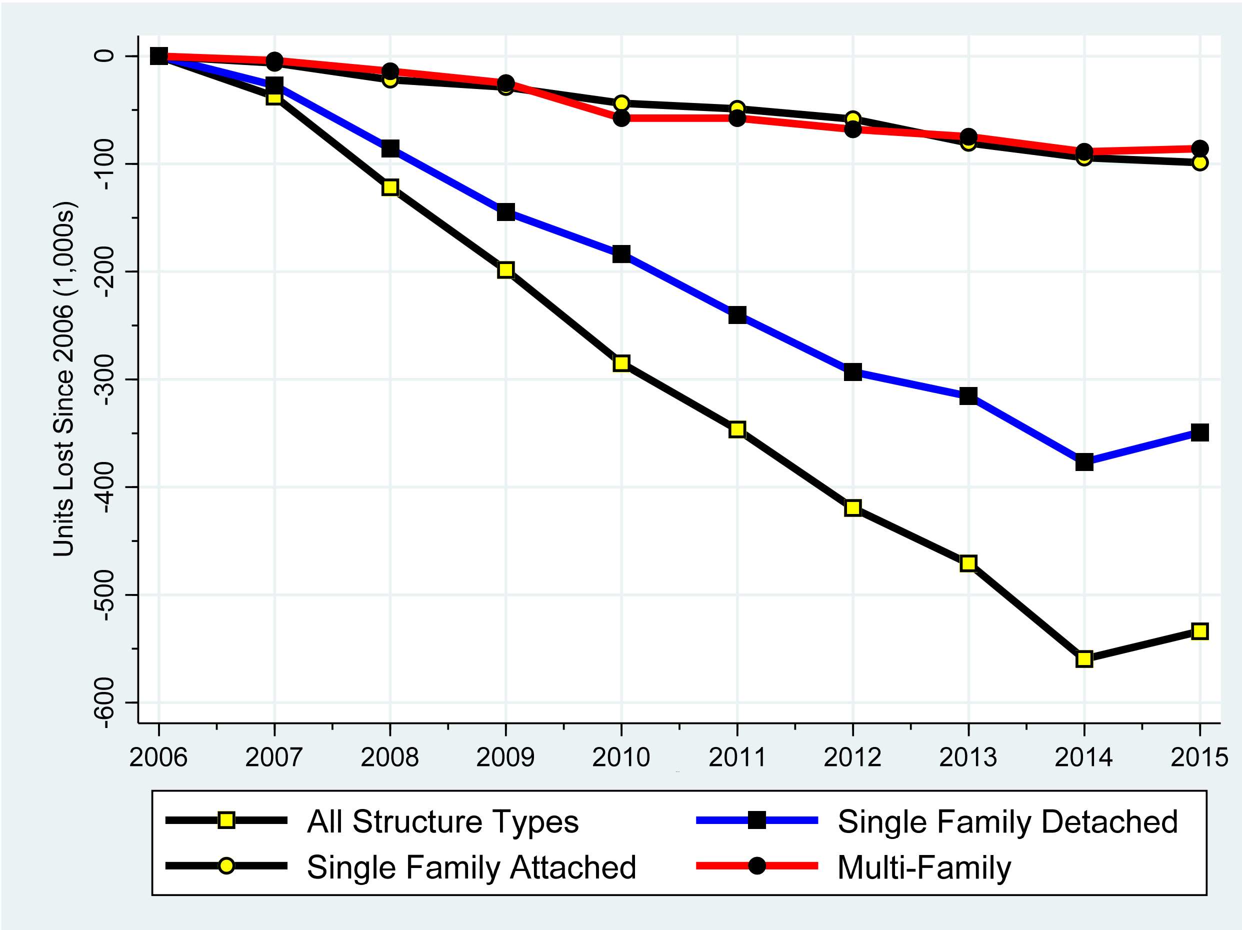
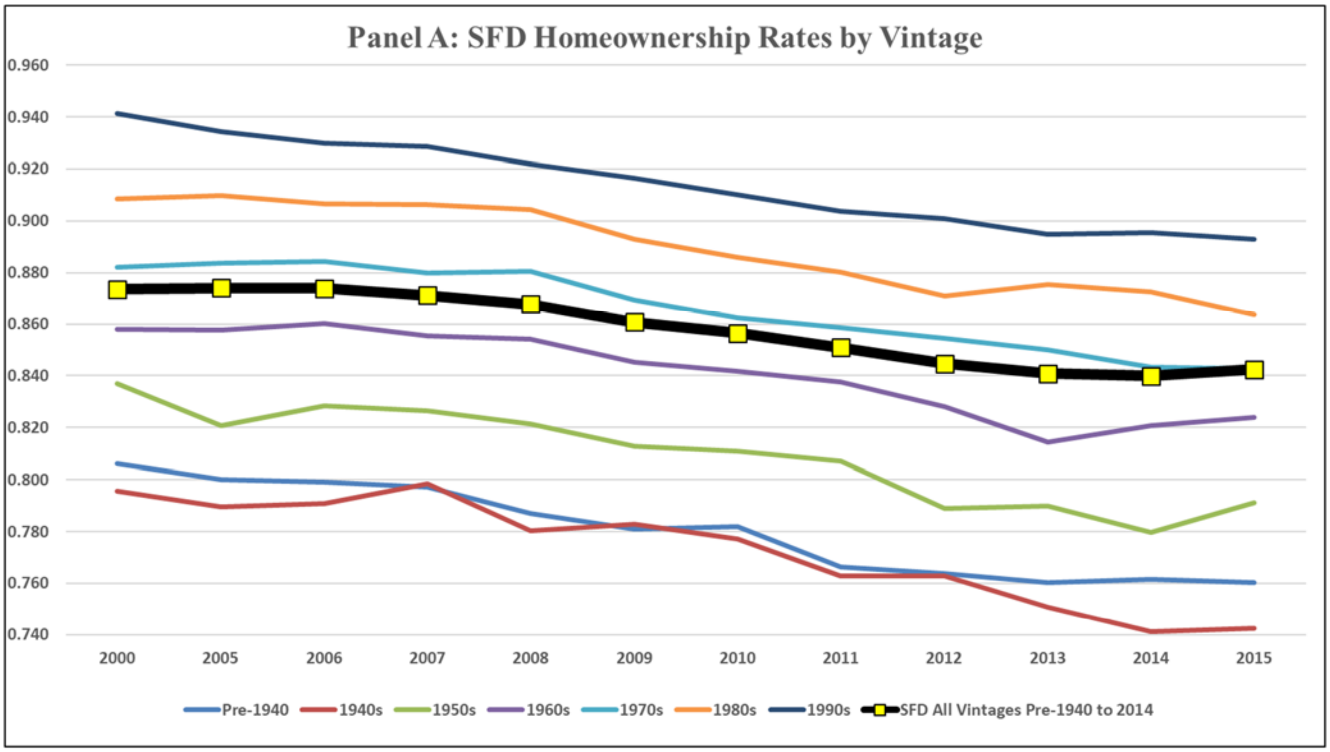


Figure 7: Change in the Total Number of Vintage-1990s Owner-Occupied Units Since 2006[a]



[a]All values are calculated using ACS data as described in the text. Values are aggregated across all MSAs identified in the ACS data.

Figure 8: SFD Homeownership Rates by Vintage using ACS Data



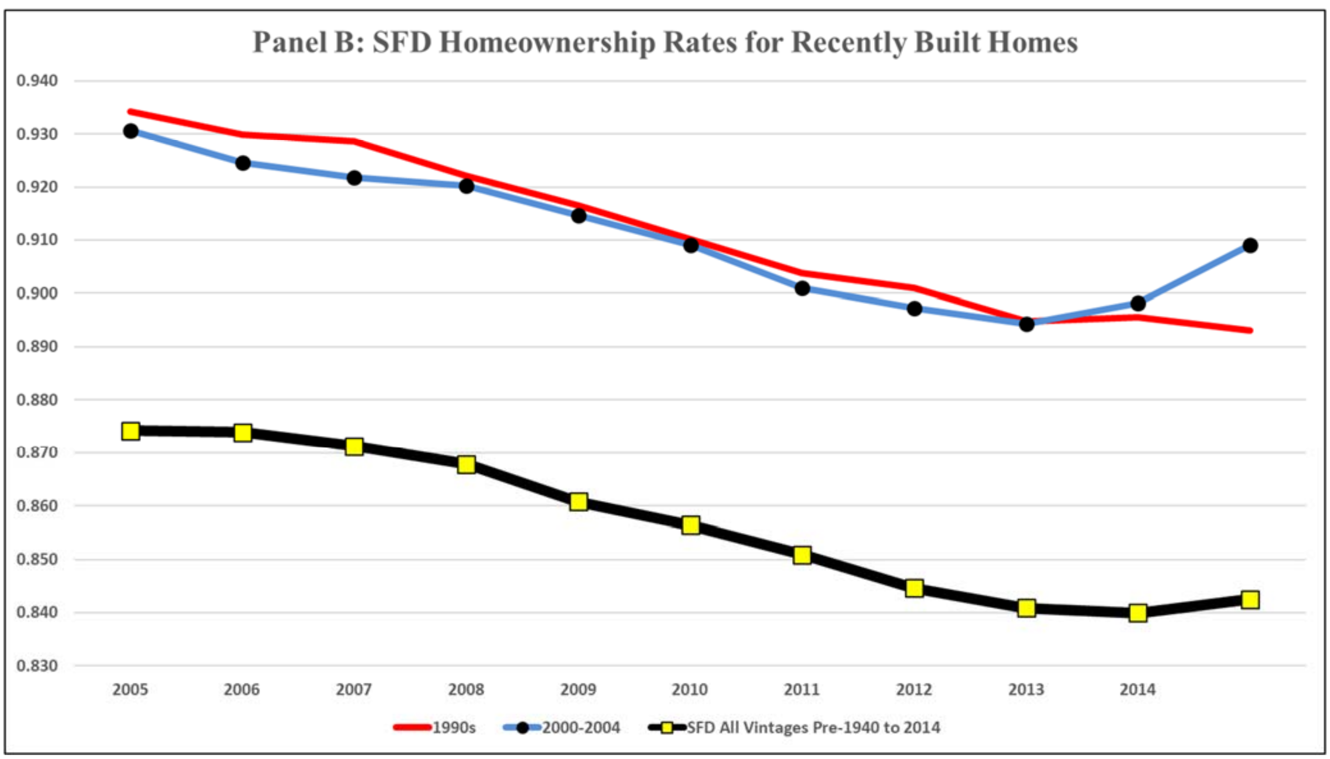


Figure 9: Select Tenure Transition Coefficients from Table 4
(Dependent variable equals 1 if own in year t+K and 0 if rent)

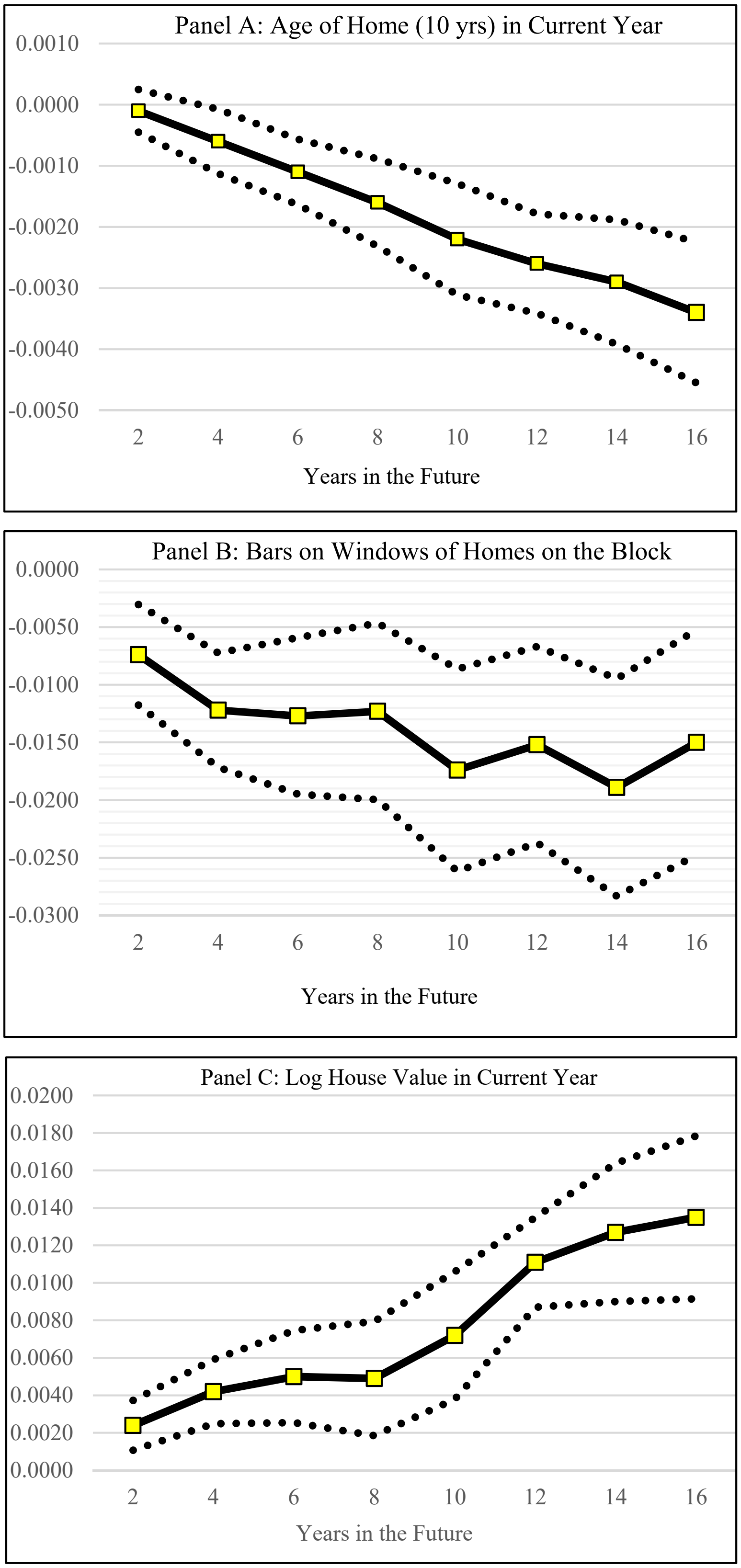


Figure 10: CLTV Tenure Transition Coefficients from Table 4
(Dependent variable equals 1 if own in year t+K and 0 if rent)

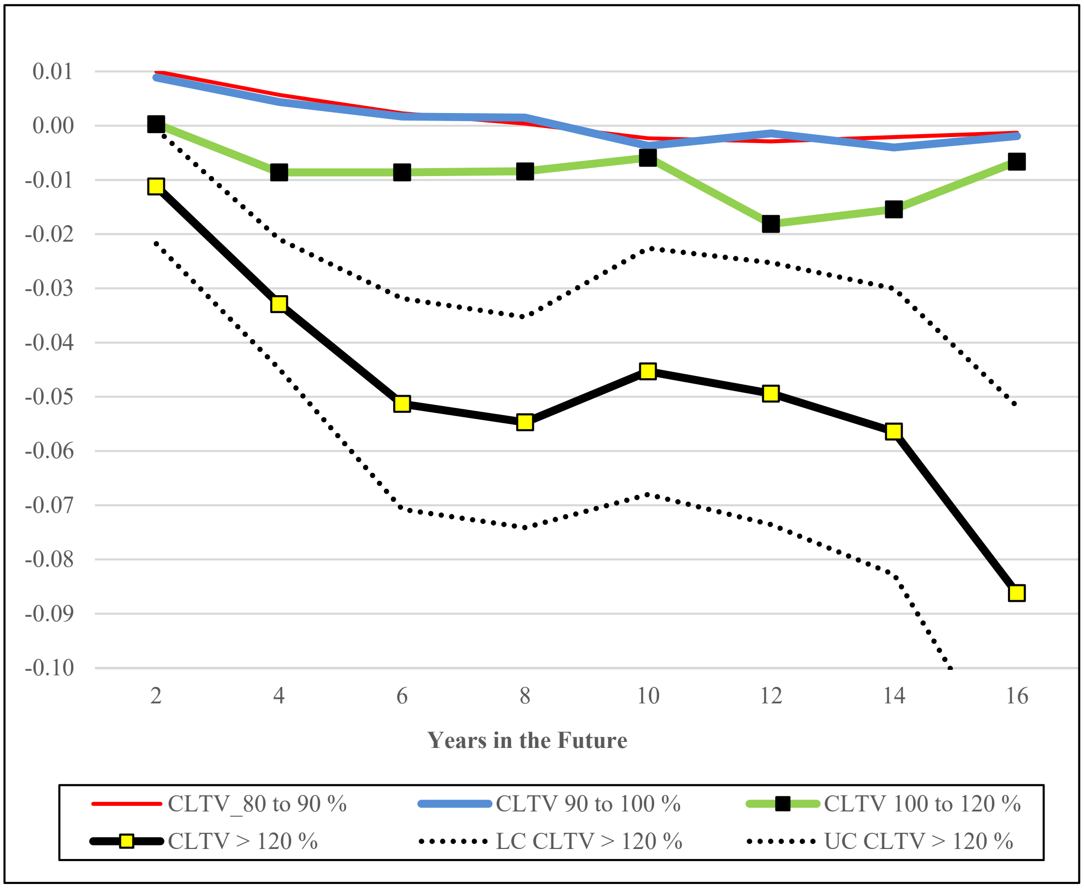
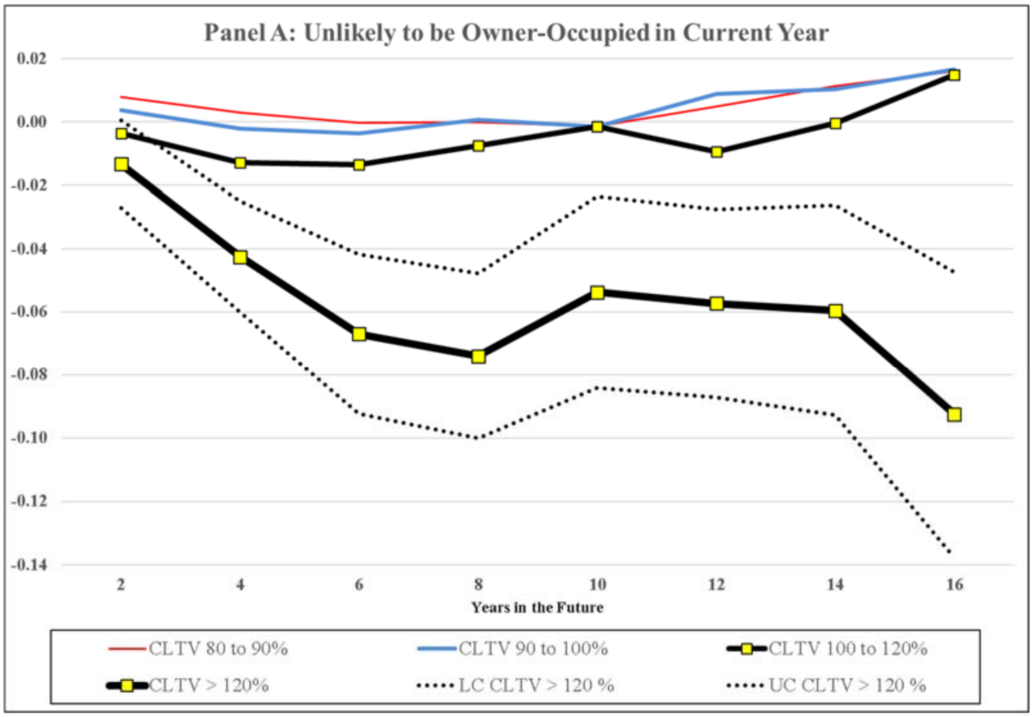


Figure 11: CLTV Tenure Transition Coefficients from Tables 7a and 7b
(Dependent variable equals 1 if own in year t+K and 0 if rent)



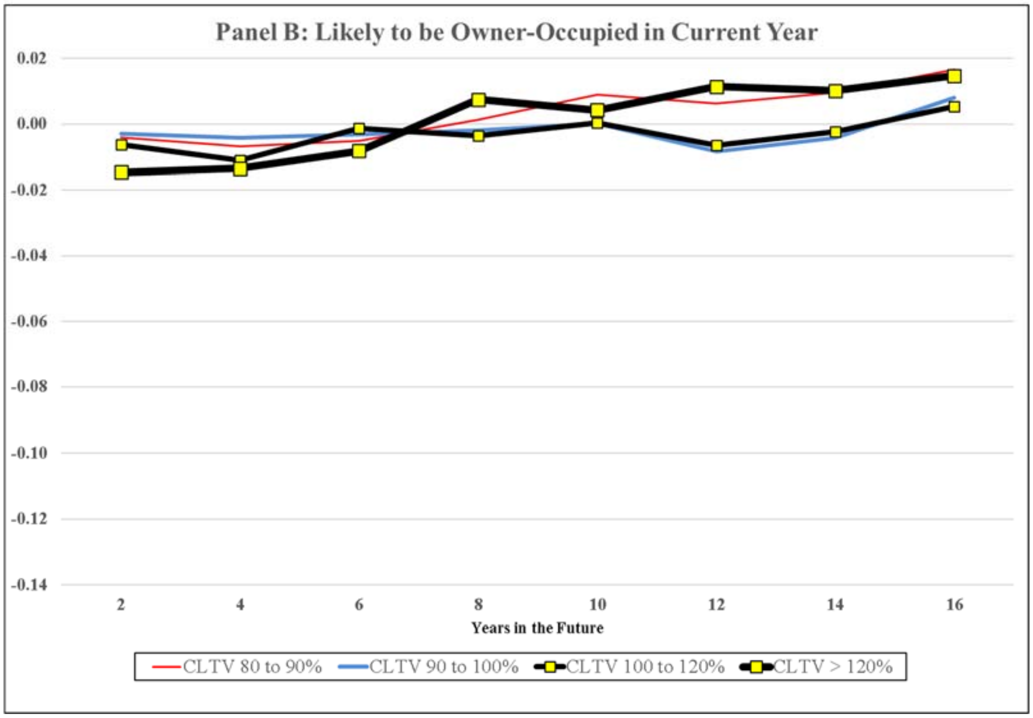


Table 1a: Log Number of MSA-Level Owner-Occupied Units Relative to Year 2000 by Vintage in the 2000-2015 ACS Data[a]

	(1) Built Prior to 2000	(2) Built Prior to 1940	(3) Built in the 1990s
Survey year 2005	-0.0030	-0.0009	-0.0210
	(-1.42)	(-0.09)	(-4.42)
Survey year 2006	-0.0018	-0.0052	-0.0244
	(-0.86)	(-0.69)	(-5.00)
Survey year 2007	-0.0019	-0.0011	-0.0204
	(-0.87)	(-0.13)	(-4.37)
Survey year 2008	-0.0131	-0.0299	-0.0381
	(-5.77)	(-3.30)	(-8.59)
Survey year 2009	-0.0235	-0.0366	-0.0511
	(-10.70)	(-3.88)	(-9.70)
Survey year 2010	-0.0290	-0.0352	-0.0611
	(-12.31)	(-3.98)	(-11.86)
Survey year 2011	-0.0409	-0.0597	-0.0745
	(-16.40)	(-6.64)	(-11.44)
Survey year 2012	-0.0511	-0.0664	-0.0875
	(-19.57)	(-7.03)	(-15.38)
Survey year 2013	-0.0600	-0.0690	-0.1086
	(-21.88)	(-6.14)	(-19.88)
Survey year 2014	-0.0654	-0.0748	-0.1030
	(-22.74)	(-7.08)	(-17.37)
Survey year 2015	-0.0663	-0.0684	-0.1199
	(-22.92)	(-6.23)	(-18.51)
Observations	3,145	3,143	3,145
MSA Fixed Effects	290	290	290
Within R-Squared	0.435	0.043	0.215
Total R-Squared	0.000474	0.000258	0.000878

[a]Data are from the year 2000 5% decennial census and the 2005 to 2015 1% American Community Survey (ACS). Data in each survey year are aggregated to MSA level using household weights. All samples pool SFD, SFA and MF homes together while excluding Mobile homes. T-ratios based on robust standard errors clustered at the MSA level are in parentheses.

Table 1b: Log Number of MSA-Level Owner-Occupied Units Relative to Year 2000 by Vintage and Structure Type in the 2000-2015 ACS Data[a]

	Single Family Detached			Single Family Attached			Multi-Family		
	(1) Built Prior to 2000	(2) Built Prior to 1940	(3) Built in the 1990s	(4) Built Prior to 2000	(5) Built Prior to 1940	(6) Built in the 1990s	(7) Built Prior to 2000	(8) Built Prior to 1940	(9) Built in the 1990s
Survey year 2005	-0.0065	-0.0139	-0.0086	-0.0182	0.1288	0.0674	-0.0899	0.1155	0.1794
	(-4.29)	(-1.59)	(-3.19)	(-0.97)	(2.19)	(2.60)	(-3.03)	(1.95)	(3.12)
Survey year 2006	-0.0073	-0.0125	-0.0135	0.0078	0.1381	0.0753	-0.1149	0.0322	0.1919
	(-4.87)	(-2.00)	(-4.51)	(0.46)	(2.41)	(2.56)	(-3.54)	(0.53)	(3.73)
Survey year 2007	-0.0114	-0.0147	-0.0149	0.0015	0.1327	0.0847	-0.1154	0.0705	0.1557
	(-7.23)	(-2.14)	(-5.41)	(0.07)	(2.34)	(2.69)	(-3.96)	(1.42)	(2.75)
Survey year 2008	-0.0160	-0.0306	-0.0222	-0.0250	0.0295	0.0759	-0.1323	0.0168	0.1086
	(-9.17)	(-3.84)	(-6.94)	(-1.17)	(0.52)	(2.50)	(-4.03)	(0.30)	(1.96)
Survey year 2009	-0.0254	-0.0400	-0.0284	-0.0304	0.1117	0.0104	-0.1048	0.0158	0.1988
	(-13.90)	(-4.65)	(-8.64)	(-1.46)	(2.13)	(0.35)	(-3.79)	(0.28)	(3.53)
Survey year 2010	-0.0305	-0.0355	-0.0355	-0.0382	0.0744	0.0018	-0.1855	-0.0193	0.0537
	(-15.36)	(-5.07)	(-11.07)	(-1.93)	(1.32)	(0.05)	(-6.06)	(-0.34)	(1.04)
Survey year 2011	-0.0377	-0.0574	-0.0433	-0.0388	0.0377	0.0291	-0.2255	-0.0727	0.0651
	(-17.11)	(-7.65)	(-11.02)	(-1.90)	(0.62)	(0.86)	(-6.40)	(-1.37)	(1.08)
Survey year 2012	-0.0480	-0.0603	-0.0494	-0.1165	-0.0831	-0.0450	-0.2838	-0.1361	-0.0407
	(-21.30)	(-7.36)	(-11.96)	(-5.25)	(-1.29)	(-1.40)	(-8.17)	(-2.32)	(-0.64)
Survey year 2013	-0.0549	-0.0638	-0.0559	-0.1252	-0.0258	-0.0966	-0.2642	-0.0059	0.0420
	(-22.01)	(-7.53)	(-14.34)	(-6.48)	(-0.38)	(-2.99)	(-7.81)	(-0.10)	(0.68)
Survey year 2014	-0.0574	-0.0630	-0.0548	-0.1287	-0.1204	-0.0851	-0.1808	-0.0421	0.0391
	(-22.46)	(-6.95)	(-14.79)	(-5.86)	(-1.73)	(-2.40)	(-5.85)	(-0.74)	(0.61)
Survey year 2015	-0.0562	-0.0660	-0.0580	-0.1477	-0.0984	-0.1126	-0.2356	0.0010	-0.0363
	(-22.37)	(-7.20)	(-14.44)	(-6.79)	(-1.45)	(-3.43)	(-7.32)	(0.02)	(-0.62)
Observations	3,145	3,143	3,145	3,121	1,968	2,824	3,064	2,144	2,284
MSA Fixed Effects	290	290	290	290	277	290	290	282	286
Within R-Squared	0.416	0.039	0.157	0.037	0.025	0.032	0.035	0.013	0.021
Total R-Squared	0.000336	0.000181	0.000158	0.00502	0.000262	0.00518	0.000880	0.000677	0.00607

[a] Data are from the year 2000 5% decennial census and the 2005 to 2015 1% American Community Survey (ACS). Data in each survey year are aggregated to MSA level using household weights. Mobile homes are excluded from all samples. T-ratios based on robust standard errors clustered at the MSA level are in parentheses.

Table 2: Percent of Current Homes Owner-Occupied K-Years in the Future by Initial Tenure in AHS Data[a]

	All Homes		Single Family Homes[b]		Multi-Family Homes	
	Currently Owner-Occupied	Currently Renter-Occupied	Currently Owner-Occupied	Currently Renter-Occupied	Currently Owner-Occupied	Currently Renter-Occupied
	(1)	(2)	(3)	(4)	(5)	(6)
2 Years Ahead	0.963	0.075	0.974	0.203	0.853	0.035
4 Years Ahead	0.946	0.109	0.961	0.302	0.803	0.051
6 Years Ahead	0.935	0.131	0.951	0.368	0.775	0.061
8 Years Ahead	0.926	0.149	0.944	0.423	0.749	0.069
10 Years Ahead	0.919	0.166	0.938	0.471	0.729	0.076
12 Years Ahead	0.912	0.181	0.932	0.512	0.710	0.083
14 Years Ahead	0.907	0.192	0.928	0.541	0.698	0.088
16 Years Ahead	0.902	0.201	0.923	0.561	0.686	0.091

[a]Data are from the American Housing Survey 1985-2013 bi-annual panel. All samples exclude mobile homes.
[b]Includes single family detached and single family attached.

Table 3a: Current Homeownership Status of Individual Homes by Vintage in the 2000-2015 ACS Data[a]
(Dependent Variable Equals 1 if Owned and 0 if Rented)

	(1) Built Prior to 1940	(2) Built in 1940s	(3) Built in 1950s	(4) Built 1960s	(5) Built in 1970s	(6) Built in 1980s	(7) Built in 1990s	(8) Built 2000 to 2004
HPI % Chg Since 2000	0.0044	0.0063	0.0105	0.0164	0.0160	0.0215	0.0187	0.0208
	(0.59)	(0.55)	(1.49)	(3.88)	(5.27)	(7.43)	(4.91)	(5.23)
SFD	0.5188	0.6086	0.6231	0.5371	0.4343	0.4121	0.4250	0.4902
	(39.62)	(59.07)	(39.07)	(40.86)	(25.78)	(31.00)	(35.66)	(42.10)
SFA	0.3478	0.3607	0.3337	0.2592	0.3065	0.3701	0.3643	0.4109
	(11.67)	(11.28)	(9.21)	(11.05)	(15.42)	(25.70)	(22.34)	(33.75)
Number of rooms	0.0446	0.0391	0.0291	0.0317	0.0372	0.0284	0.0199	0.0168
	(19.69)	(21.31)	(22.08)	(24.92)	(20.87)	(19.41)	(17.64)	(17.01)
Number of bedrooms	0.0163	0.0195	0.0281	0.0364	0.0490	0.0631	0.0703	0.0482
	(10.39)	(7.51)	(11.61)	(13.63)	(17.15)	(16.19)	(16.15)	(15.01)
Survey Year FE	12	12	12	12	12	12	12	12
Number of MSA FE	290	290	290	290	290	290	290	290
Observations	1,729,759	808,722	1,659,120	1,630,843	2,132,552	1,884,397	1,878,529	767,569
Within R-Squared	0.401	0.406	0.416	0.453	0.409	0.390	0.414	0.401
Total R-Squared	0.413	0.409	0.414	0.456	0.406	0.388	0.412	0.401

[a] Data are from the year 2000 5% decennial census and the 2005 to 2015 1% American Community Survey (ACS). Mobile homes are excluded from all samples. The omitted structure type is MF housing. T-ratios based on robust standard errors clustered at the MSA level are in parentheses.

Table 3b: Current Homeownership Status of Individual Homes by Structure Type in the 2000-2015 ACS Data (Dependent Variable Equals 1 if Owned and 0 if Rented)[a]

	All Structure Types	Single Family Detached	Single Family Attached	Multi-Family
HPI % Chg Since 2000	0.0145	0.0136	-0.0112	0.0115
	(4.21)	(5.27)	(-1.62)	(1.33)
SFD	0.4910	-	-	-
	(53.99)	-	-	-
SFA	0.3515	-	-	-
	(24.01)	-	-	-
Number of rooms	0.0288	0.0212	0.0516	0.0521
	(19.41)	(25.75)	(25.71)	(8.75)
Number of bedrooms	0.0435	0.0202	0.0217	0.0179
	(18.04)	(8.21)	(3.40)	(3.97)
Survey Year Fixed Effects	12	12	12	12
Vintage Fixed Effects	9	9	9	9
Observations	13,040,310	8,326,439	872,158	3,265,690
MSA Fixed Effects	290	290	290	290
Within R-squared	0.410	0.0439	0.0871	0.0779
Total R-squared	0.412	0.0449	0.0920	0.0808

[a] Data are from the 2005 to 2015 American Community Survey 1 percent samples. Mobile homes are excluded from the sample. Omitted vintage category are homes built after 2004. Omitted year is 2005. T-ratios based on robust standard errors clustered at the MSA level are in parentheses.

Table 3c: Current Homeownership Status of Individual Homes by Structure Type in the AHS Data
(Dependent Variable Equals 1 if Owned and 0 if Rented)[a]

	Omitting Controls for Home Size				Including Controls for Home Size			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Structure Types[b]	Single Family Detached	Single Family Attached	Multi-Family	All Structure Types[b]	Single Family Detached	Single Family Attached	Multi-Family
SFD	0.7009	-	-	-	0.5590	-	-	-
	(272.03)	-	-	-	(111.10)	-	-	-
SFA	0.5119	-	-	-	0.4256	-	-	-
	(48.19)	-	-	-	(42.42)	-	-	-
Number of rooms	-	-	-	-	0.0539	0.0376	0.00998	0.1609
	-	-	-	-	(44.50)	(43.10)	(16.77)	(48.65)
Number of bedrooms	-	-	-	-	0.0112	0.0147	-0.0403	-0.0864
	-	-	-	-	(7.75)	(10.84)	(-5.52)	(-20.84)
House Age (Years)	-0.00117	-0.00166	-0.00162	-0.00011	-0.00064	-0.00106	-0.00141	-0.00029
	(-33.45)	(-43.67)	(-4.87)	(-1.03)	(-20.94)	(-22.67)	(-4.76)	(-3.40)
MSA by Year FE	2,195	2,195	1,087	2,195	2,195	2,195	1,087	2,195
Observations	696,250	454,122	16,861	225,267	696,250	454,122	16,861	225,267
Within R-squared	0.476	0.061	0.073	0.117	0.476	0.061	0.073	0.117
Total R-squared	0.496	0.062	0.084	0.116	0.496	0.062	0.084	0.116

[a] Data are from the 1985-2013 American Housing Survey and exclude mobile homes. T-ratios based on robust standard errors clustered at the MSA-by-year level are in parentheses.
[b] Omitted structural category is multi-family.

Table 4: Single Family Own-to-Rent Tenure Transitions for Individual Homes in the 1985-2013 AHS [a]

	(1) 2 Years Ahead	(2) 4 Years Ahead	(3) 6 Years Ahead	(4) 8 Years Ahead	(5) 10 Years Ahead	(6) 12 Years Ahead	(7) 14 Years Ahead	(8) 16 Years Ahead
Current LTV Controls								
CLTV_80 to 90 %	0.0100	0.0057	0.0023	0.0004	-0.0023	-0.0029	-0.0021	-0.0013
	(6.40)	(2.89)	(0.99)	(0.18)	(-0.96)	(-1.05)	(-0.62)	(-0.34)
CLTV 90 to 100 %	0.0089	0.0044	0.0017	0.0015	-0.0037	-0.0014	-0.0040	-0.0019
	(4.30)	(1.33)	(0.48)	(0.38)	(-0.95)	(-0.34)	(-0.89)	(-0.39)
CLTV 100 to 120 %	0.0003	-0.0086	-0.0086	-0.0084	-0.0059	-0.0181	-0.0154	-0.0066
	(0.13)	(-2.32)	(-1.98)	(-1.37)	(-0.82)	(-3.04)	(-2.09)	(-0.77)
CLTV > 120 %	-0.0112	-0.0329	-0.0513	-0.0547	-0.0453	-0.0494	-0.0564	-0.0862
	(-2.08)	(-5.39)	(-5.17)	(-5.52)	(-3.91)	(-4.01)	(-4.19)	(-4.90)
Current Structure Controls								
SFD	0.0667	0.0959	0.1137	0.1288	0.1421	0.1556	0.1642	0.1726
	(31.21)	(36.26)	(40.59)	(40.90)	(39.19)	(36.94)	(35.84)	(32.56)
SFA	0.0572	0.0796	0.0950	0.1061	0.1223	0.1266	0.1385	0.1450
	(17.03)	(18.70)	(21.37)	(19.16)	(20.29)	(18.38)	(18.05)	(16.34)
Age of home (10 years)	-0.00001	-0.00006	-0.00011	-0.00016	-0.00022	-0.00026	-0.00029	-0.00034
	(-0.56)	(-2.23)	(-4.03)	(-4.39)	(-4.74)	(-6.26)	(-5.58)	(-5.79)
Garage present	0.0089	0.0119	0.0126	0.0150	0.0163	0.0156	0.0169	0.0186
	(11.67)	(12.67)	(10.29)	(10.31)	(10.54)	(8.58)	(9.27)	(9.35)
Rooms: 4 to 7	0.0489	0.0640	0.0719	0.0817	0.0898	0.0930	0.0915	0.0923
	(11.31)	(13.80)	(13.87)	(14.50)	(14.67)	(15.98)	(15.30)	(13.76)
Rooms: 8 to 10	0.0548	0.0749	0.0866	0.0993	0.1099	0.1160	0.1177	0.1210
	(13.32)	(17.31)	(17.91)	(19.54)	(19.23)	(19.91)	(18.46)	(17.82)
Rooms: > 10	0.0539	0.0764	0.0869	0.0991	0.1111	0.1143	0.1204	0.1213
	(12.85)	(16.64)	(18.45)	(20.00)	(19.46)	(16.33)	(16.32)	(16.43)
Baths: 2	0.0106	0.0157	0.0206	0.0238	0.0265	0.0284	0.0285	0.0287
	(12.66)	(14.90)	(15.67)	(17.01)	(14.71)	(14.95)	(14.53)	(14.66)
Baths: > 2	0.0128	0.0178	0.0231	0.0259	0.0288	0.0293	0.0289	0.0287
	(10.07)	(12.12)	(12.75)	(13.74)	(13.10)	(12.77)	(12.33)	(9.66)

Continued on next page

Table 4 continued: Single Family Own-to-Rent Tenure Transitions for Individual Homes in the 1985-2013 AHS [a]

	(1) 2 Years Ahead	(2) 4 Years Ahead	(3) 6 Years Ahead	(4) 8 Years Ahead	(5) 10 Years Ahead	(6) 12 Years Ahead	(7) 14 Years Ahead	(8) 16 Years Ahead
Current Neigh Controls								
Green space on block	0.0010	0.0009	0.0018	0.0019	0.0022	0.0016	0.0021	0.0020
	(1.32)	(0.82)	(1.16)	(0.98)	(1.05)	(0.71)	(0.91)	(0.88)
Water on block	0.0041	0.0056	0.0072	0.0076	0.0091	0.0088	0.0106	0.0106
	(4.45)	(5.44)	(5.84)	(4.32)	(5.46)	(4.07)	(4.57)	(2.38)
Bars on house	-0.0012	0.0031	-0.0013	-0.0013	-0.0010	-0.0028	0.0077	-0.0062
	(-0.44)	(0.85)	(-0.35)	(-0.26)	(-0.17)	(-0.39)	(0.84)	(-0.62)
Bars on block homes	-0.0074	-0.0122	-0.0127	-0.0123	-0.0174	-0.0152	-0.0189	-0.0150
	(-3.33)	(-4.82)	(-3.67)	(-3.15)	(-3.89)	(-3.50)	(-3.93)	(-3.01)
Junk on street	-0.0088	-0.0078	-0.0205	-0.0083	-0.0194	-0.0161	-0.0156	-0.0175
	(-2.31)	(-1.92)	(-3.75)	(-1.42)	(-2.61)	(-1.88)	(-1.84)	(-1.76)
Abandoned bldgs on block	-0.0027	-0.0059	-0.0104	-0.0184	-0.0105	-0.0140	-0.0227	-0.0235
	(-1.02)	(-1.84)	(-2.16)	(-3.14)	(-2.00)	(-1.95)	(-2.44)	(-2.14)
CBD of MSA	-0.0093	-0.0141	-0.0198	-0.0242	-0.0271	-0.0287	-0.0323	-0.0354
	(-6.83)	(-8.70)	(-10.52)	(-15.12)	(-12.04)	(-12.18)	(-11.79)	(-13.94)
Suburb of MSA	-0.0035	-0.0058	-0.0086	-0.0110	-0.0139	-0.0160	-0.0156	-0.0175
	(-3.62)	(-3.84)	(-5.44)	(-9.84)	(-8.82)	(-8.54)	(-6.58)	(-8.81)
Suburb of non-MSA	-0.0079	-0.0133	-0.0164	-0.0193	-0.0230	-0.0254	-0.0304	-0.0334
	(-7.49)	(-9.24)	(-6.79)	(-5.99)	(-8.72)	(-8.89)	(-11.40)	(-11.85)
Current Occupant Controls								
Log real current house value	0.0024	0.0042	0.0050	0.0049	0.0072	0.0111	0.0127	0.0135
	(3.54)	(4.80)	(3.99)	(3.15)	(4.15)	(9.09)	(6.74)	(6.09)
Log real income	0.0036	0.0046	0.0047	0.0063	0.0069	0.0069	0.0087	0.0103
	(8.59)	(9.07)	(8.03)	(9.14)	(7.44)	(6.35)	(7.85)	(7.98)
Age of household head	0.0038	0.0061	0.0078	0.0088	0.0095	0.0102	0.0099	0.0096
	(27.30)	(30.59)	(32.94)	(38.32)	(34.59)	(31.86)	(24.49)	(23.06)
Age squared	-0.0000	-0.0000	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(-23.95)	(-28.78)	(-32.93)	(-36.42)	(-33.04)	(-31.43)	(-24.62)	(-23.79)

Continued on next page

Table 4 continued: Single Family Own-to-Rent Tenure Transitions for Individual Homes in the 1985-2013 AHS [a]

	(1) 2 Years Ahead	(2) 4 Years Ahead	(3) 6 Years Ahead	(4) 8 Years Ahead	(5) 10 Years Ahead	(6) 12 Years Ahead	(7) 14 Years Ahead	(8) 16 Years Ahead
Married	0.0119	0.0191	0.0227	0.0243	0.0255	0.0277	0.0252	0.0243
	(17.10)	(19.43)	(17.26)	(15.98)	(14.88)	(12.89)	(9.09)	(7.21)
Children < 18 present	0.0013	0.0018	0.0011	-0.0005	-0.0015	-0.0037	-0.0041	-0.0024
	(1.34)	(1.60)	(0.75)	(-0.32)	(-0.91)	(-2.05)	(-2.15)	(-1.32)
Years since moved in	0.0004	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
	(10.92)	(11.90)	(12.18)	(11.11)	(8.53)	(7.19)	(6.62)	(6.43)
Like neigh (1 to 10)	0.0016	0.0026	0.0036	0.0043	0.0051	0.0050	0.0051	0.0056
	(6.74)	(9.00)	(9.75)	(11.67)	(11.23)	(9.51)	(9.23)	(8.19)
Like home (1 to 10)	0.0016	0.0024	0.0030	0.0027	0.0028	0.0028	0.0025	0.0015
	(5.45)	(7.00)	(8.00)	(5.59)	(5.17)	(5.39)	(4.35)	(2.03)
MSA by Year FE	2,047	1,900	1,753	1,606	1,459	1,312	1,167	1,021
Observations	316,444	302,639	259,581	241,216	209,429	184,617	160,499	137,661
Within R-squared	0.0382	0.0518	0.0602	0.0661	0.0728	0.0790	0.0806	0.0827
Total R-squared	0.0412	0.0547	0.0625	0.0683	0.0747	0.0806	0.0823	0.0841

[a] Estimates are from linear probability models using the 1985-2013 American Housing Survey Bi-Annual Panel. Dependent variables equals 1 if own in year t+K and 0 if rent. All observations are owner-occupied in year-t. T-ratios based on robust standard errors clustered at the MSA-by-year level are in parentheses.