Demographic Trends, Housing Equity, and the Financial Security of Future Retirees

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About 80 percent of households with heads at retirement age own a home. Aside from Social Security and dedicated retirement saving, home equity is the primary asset of a large fraction of these homeowners. Thus the financial security of many older households depends importantly on the value of their homes. Several analyses —Venti and Wise (1990, 2001, 2004), Megbolugbe, Sa-Aadu, and Shilling (1997), and Banks, Blundell. Oldfield, and Smith. (2007) —show that housing equity tends to be withdrawn when households experience shocks to family status like entry to a nursing home or death of a spouse. If, as these analyses suggest, housing equity is conserved for a "rainy day," then the value of housing can have important implications for the reserve of wealth in the event of such shocks.

In a series of earlier papers—Poterba, Venti, and Wise (2007 a,b.c,d)--we considered the retirement asset accumulation of future retirees. In particular we considered the implications of the transition from a pension system dominated by employer-provided defined benefit plans to a system dominated by 401(k) plans and personal retirement accounts. We concluded that future retirees in the United States were likely to have substantially greater retirement assets than current retirees. In this paper we begin to develop a parallel analysis of home equity, the other key asset of a large proportion of households. We consider how trends in housing equity could affect the well-being of future elderly.

To structure the analysis we distinguish two phases of housing equity accumulation. The first phase is the home equity that household have on the eve of retirement. The second phase is the trend in home equity after retirement. With these two phases in mind, there are two key goals of the analysis. The first goal is to understand the extent of uncertainty about home equity at older ages, given the home equity that households have at retirement. That is, how much home equity that will be available to households when the "rainy day" arrives? The second goal is to explore how one might project the trend in the home equity of younger cohorts as they approach retirement.

The second goal is a difficult issue to address with any degree of certainty, as past attempts to project home prices have demonstrated. To understand the difficulty of

projecting home prices, we begin this paper by describing the change (or persistence) over time in relationships between age and home ownership and home values. We illustrate how projections based on past empirical regularities can lead to substantial errors in projections. Nonetheless, although we recognize that any projections are extremely uncertain, we consider whether some "what if" scenarios based on the relationship of home equity to household wealth might be used to make informed judgments about the housing equity of future retirees.

While our focus is on the possible effect of housing equity on the financial security of future elderly, our discussion of housing equity is necessarily related to prior work on demographic trends and housing prices. Substantial attention was first drawn to this issue by Mankiw and Weil (1989) and their paper elicited responses from many reviewers. McFadden (1994) and Hoynes and McFadden (1997) also consider the effect of demographic change on future house prices. Demographic change is, of course, not the only explanation for changes in house prices. Poterba (1991) considers the role of construction costs, the after-tax cost of home ownership, as well as demographic change. Glaeser, Gyourko, and Saks (2005) investigate the possibility that restrictive zoning has resulted in rapid price increases in some cities. More recently, Shiller (2007) discusses some of the causes of the recent spike in house prices observed in some regions of the United States since 1998.

To put the importance of housing equity in perspective, we begin in this introduction with data on home equity relative to other assets of households near retirement. The tabulation below shows the dollar values of housing equity and other assets, calculated from responses to questions in the Health and Retirement Study (HRS) which included households with a member age 51 to 61 in 1992. Although housing equity represents about 15 percent of total wealth for all households in 2000, it represents about 33 percent of non-retirement assets. For about half of all households, housing equity represents over 50 percent of non-retirement assets. Because of the apparent special nature of home equity—as a reserve of last resort for many families—it may have a particularly important effect on the resources available to older families in the event of shocks to family status, such as entry into a nursing home, other health shocks, or death of a spouse.

Mean assets of HRS households in 2000

Asset category	Dollar amount		Percent ot total wealth	
	All households	Home-owners	All households	Home-owners
Retirement assets	370,748	415,357	53.93%	52.34%
Social Security wealth	174,865	188,185	25.44%	23.71%
DB pension wealth	94,118	108,038	13.69%	13.61%
401(k) assets	31,885	35,876	4.64%	4.52%
IRA & Keogh assets	69,879	83,258	10.16%	10.49%
Other non-retirement non-housing assets	212,928	249,420	30.97%	31.43%
Housing equity	103,820	128,843	15.10%	16.23%
Total wealth	687,497	793,620		

Percent of households with housing equity greater than a specified percentage of

	All households	Home owners
>25%	22.7	26.7
>50%	5.4	5.4
>75%	2.8	2.1

Percent of households with housing equity greater than a specified percentage of

>25%	70.1	83.0
>50%	50.2	58.5
>75%	30.6	34.4

The paper is an abridged version of a much longer paper with the same title. The table and figure numbers in this version correspond to the numbers in the longer unabridged version. We begin by briefly summarizing the findings in the first four sections of the longer unabridged version of this paper. These sections of the paper explore the relationships between age, home ownership, and home values in recent decades. The goal is to understand how projections based on the historical stability of these relationships can easily go astray. In the next two sections, we explore the relationship between household wealth on the one hand and home values, mortgage debt, and home equity on the other hand. In this shortened version of the paper we only describe in a sentence of two (under the unabridged heading titles) the findings in these

first six sections. For each of the first six sections the reader is referred to the unabridged version of the paper for details.

In section 7, given home equity at retirement, we use simulation methods to illustrate the potential effect of changes in home prices on the home equity of households as they age. In section 8, we explore the relationship between home equity and non-pension wealth more formally, with the goal of understanding whether projections of future trajectories for household wealth might be helpful in projecting the home equity of future retirees. In section 9 we summarize our findings and discuss future research plans.

1. Trends in Home Ownership

In this section we present cohort and cross-section descriptions of trends in home ownership by age. We find that the profiles of ownership by age changed little between 1984 and 2004—for couples, single men, and single women separately.

2. The Aggregate Number of Homes

In this section we combine the profile of home ownership by age with demographic projections to obtain projections of the aggregate number of homes in future years. These projections suggest that the total number of homes will continue to grow through 2040, but at a declining rate.

3. The Value of Owned Homes and Housing Equity

In section 3 we discuss the value of housing by age given ownership. Unlike the stable pattern for home ownership, we find that the real value of housing roughly doubled between 1984 and 2004--for couples, for single men, and for single women. These data highlight the difficulty of projecting home prices and home values based on past empirical relationships, as many projections have done. Projections based on the profiles of home values or home equity by age in 1984, for example, would be far from the mark in 2004.

4. The Aggregate Value of Housing and Home Equity between 1984 and 2004

To check our estimates of home values, in this section, we combine demographic data with ownership rates and home value given ownership to develop estimates of the aggregate value of housing between 1984 and 2004. Over these years our estimates correspond closely to Flow of Funds Accounts (FFA) estimates of aggregate housing value. The increase in home values is likely the result of many factors that affect housing

markets, including demographic trends, changes in financial market returns, and changes in consumer preferences for housing relative to all other goods. The wide historical variation in house values suggests that it is likely to be very difficult to forecast the future value of homes based on the past age profile of home values and projections of future demographic structure.

5. Home Value, Home Equity, and Household Wealth Between 1984 and 2004

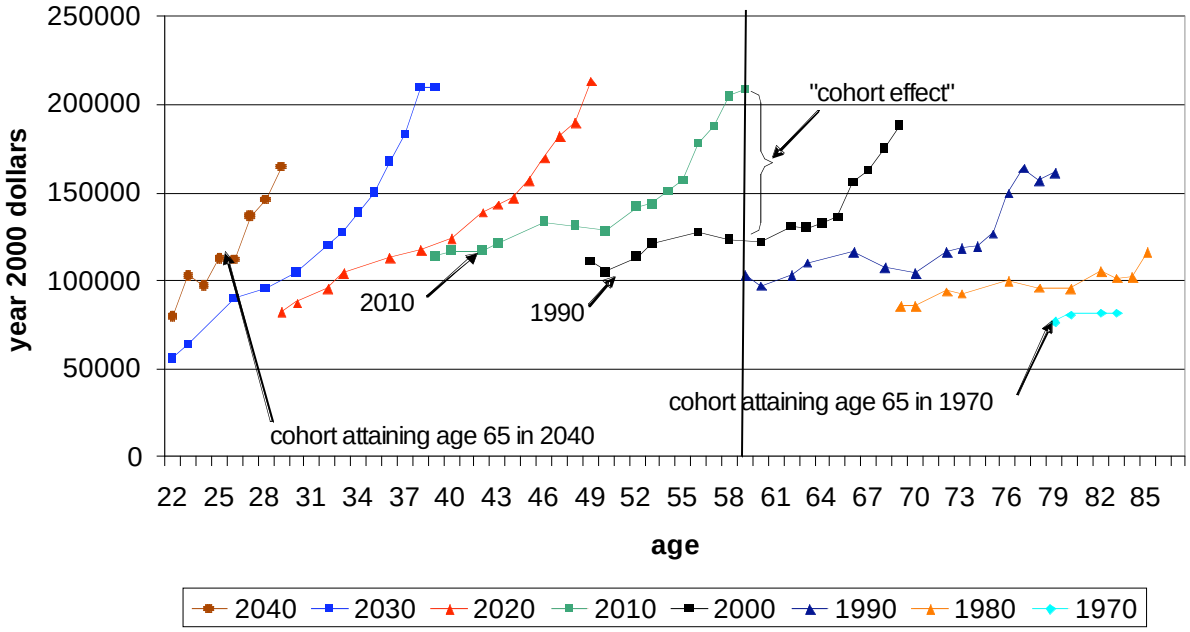
In this and the next section, we explore the relationship between household wealth on the one hand and home values, mortgage debt, and home equity on the other hand. In particular, we draw attention to the stability of the empirical correspondence between home equity and household wealth (which we return to more formally in section 8). We find that the ratio of home values to wealth increased somewhat between 1984 and 2004, while the ratio of mortgage debt to wealth increased substantially. On net, the ratio of home equity to wealth was essentially the same in 2004 as in 1984. This relative constancy leads us to consider whether this relationship might serve as a basis for predicting home equity in the future.

6. Cohort description of home values, home equity, mortgage debt, and wealth

In this section we consider cohort descriptions of home values, home equity, and mortgage debt, as well as the relationship between home equity and non-pension wealth. We find that the home values and home equity of successively younger cohorts increased very substantially over the 1984 to 2004 period. Figure 6-1 shows the increase in the mean home value of homeowners for selected cohorts. The data used in this figure are from the Survey of Income and Program Participation (SIPP) and are described more fully in section 1 of the unabridged version of this paper. Each cohort is observed in 15 of the years between 1984 and 2004. The figure presents profiles for cohorts attaining age 65 in 1970, 1980, 1990, 2000, 2010, 2020, 2030, and 2040. All values in this figure and subsequent figures have been converted to year 2000 dollars using the GDP implicit price deflator. The sharp acceleration in the rate of growth of real home values over the last eight years of data (beginning in about 1995) are common to all but the oldest cohorts and are largely year (time) effects, rather than cohort effects. The vertical differences between the cohort profiles represent "cohort effects." The combination of year effects and cohort effects leads to large difference in the home values of different cohorts at the

same age. For example, the cohort retiring in 2010 had mean home value of $208,766 when observed at age 59 in 2004 and the cohort retiring in 1990 had only $103,416 when observed at the same age 20 years earlier. The difference—the "cohort effect"—is shown on the figure. Without exception, more recent cohorts (those retiring later) have substantially higher home value at each age than earlier cohorts.

Figure 6-1. Mean house value for homeowners: eight selected cohorts identified by year cohort attains age 65



But the mortgage debt of younger cohorts also increased. Because the percent increase in mortgage debt was much greater than the percent increase in home values, the ratio of equity to home value decreased for successively younger cohorts and the ratio of mortgage debt to home value increased. Thus younger cohorts will approach retirement with more home equity than older cohorts, but also with more mortgage debt. In spite of the large changes in the ratios of home equity to home value, the cohort data also show that the age profile of the ratio of home equity to non-pension wealth remained strikingly stable over the 1984 to 2004 period.

7. Simulation of Home Equity as Cohorts Age

To understand the implications of fluctuations in home prices on the home equity of households after retirement, we use for illustration the very different home value,

home mortgage, and home equity profiles of the cohorts that attained age 59 in 1990 and 2010. To increase the sample sizes we combine the SIPP data for ages 57 to 61 and refer to the result as "age 59." The top panel of Table 7-1 shows the average values for all homeowners in each cohort. (The table shows data for the R2000 cohort—the cohort that attains age 65 in 2000—as well as the R1990 and R2010 cohorts. The graphical analysis that follows shows only the R1990 and the R2010 cohorts.) The lower panels show data for homeowners in the bottom quintile of the total wealth distribution, those in the 3rd quintile and those in the 5th quintile of the wealth distribution.

Table 7-1. Home value, home equity, mortgage debt, and ratios of equity and mortgage debt to equity, at age 59 for three cohorts, attaining age 65 in 1990, 2000, and 2010. (year 2000 dollars)

Wealth quintile and measure	Cohort attaining age 65 in:		
	1990	2000	2010
All:			
Home value	105,365	121,968	208,960
Equity	89,867	92,428	154,074
Mortgage	15,498	29,540	54,885
Equity to value	0.853	0.758	0.737
Mortgage to value	0.147	0.242	0.263
1st Wealth quintile			
Home value	28,855	40,949	76,964
Equity	14,049	12,249	26,289
Mortgage	14,806	28,700	50,674
Equity to value	0.487	0.299	0.342
Mortgage to value	0.513	0.701	0.658
3rd Wealth quintile			
Home value	82,801	90,732	147,082
Equity	69,496	66,555	100,221
Mortgage	13,305	24,177	46,860
Equity to value	0.839	0.734	0.681
Mortgage to value	0.161	0.266	0.319
5th Wealth quintile			
Home value	169,928	200,583	349,741
Equity	150,393	162,958	281,877
Mortgage	19,535	37,626	67,864
Equity to value	0.885	0.812	0.806
Mortgage to value	0.115	0.188	0.194

Moving from older to younger cohorts (left to right in the table), the decrease in the ratio of home equity to home value and the increase in the ratio of mortgage debt to home value are much more pronounced for poorer households than for the wealthier households

To understand the implications of these trends, suppose that the home equity that households in each cohort have at age 59 is the home equity that the households in these cohorts will have as they enter retirement. We would like to consider the expected level of future home equity and, in particular, the distribution of home equity as these homeowners age and house prices change. Previous work, including Venti and Wise (1990, 2001, 2004), Megbolugbe, Sa-Aadu, and Shilling (1997), and Banks, Blundell. Oldfield, and Smith. (2007) suggests that home equity tends to be saved for a "rainy day," and used when there is a shock to family status, such as the death of a spouse, entry into a nursing home, or the household faces large medical costs. Since home equity is the largest non-pension asset of a large fraction of households, we are interested in the level of home equity when the "rainy day" arrives. What is the risk that changing home prices place on the "rainy day" assets of retirees?

We begin with observed home values of households approaching retirement, at age 59. We then simulate the distribution of home values (and thus home equity) over the next 20 years. We compare the home equity over this age range for members of the cohort retiring in 1990 (R1990) with the home equity of households over the same age range in the cohort retiring in 2010 (R2010). Members of the R1990 cohort were age 59 in 1984, the year of the first SIPP survey. The R2010 cohort was age 59 in 2004, the year of the latest SIPP survey. For each of these cohorts the baseline levels of home value, home equity, and mortgage debt are shown in the first and third columns of Table 7-1 above. The home equity of these two cohorts as they approached retirement were very different--$89,867 on average for the 1990 cohort and $154,074 for the 2010 cohort, both in year 2000 dollars.

To simulate the home prices that households in each of these cohorts will face in the future, we use the historical distribution of changes in home values by state for each year from 1975 to 2006, based on the Office of Federal Housing Enterprise Oversight (OFHEO) house price index. For each cohort we assume that future changes in house values after age 59 are uncertain. For a household in a given state, possible price changes

are determined by random draws (with replacement) from the historical distribution of price changes in that state. Thus, for example, to simulate the distribution of home prices at age 64, we draw five values at random (with replacement) from the historical distribution of changes in home prices for that state. From these five changes we calculate the average home price at age 64. We assume that each person in a given state faces the same sequence of price changes. We repeat this process 10,000 times to produce a distribution of future home prices and report the results for ages 64, 69, 74, and 79. For each age, we calculate the expected home value. Home equity is obtained by subtracting mortgage debt from home value at each age. We assume that the mortgage debt observed at age 59 declines by 9.1 percent per year which is the observed rate of mortgage payoff for households age 59 to 79 in the SIPP

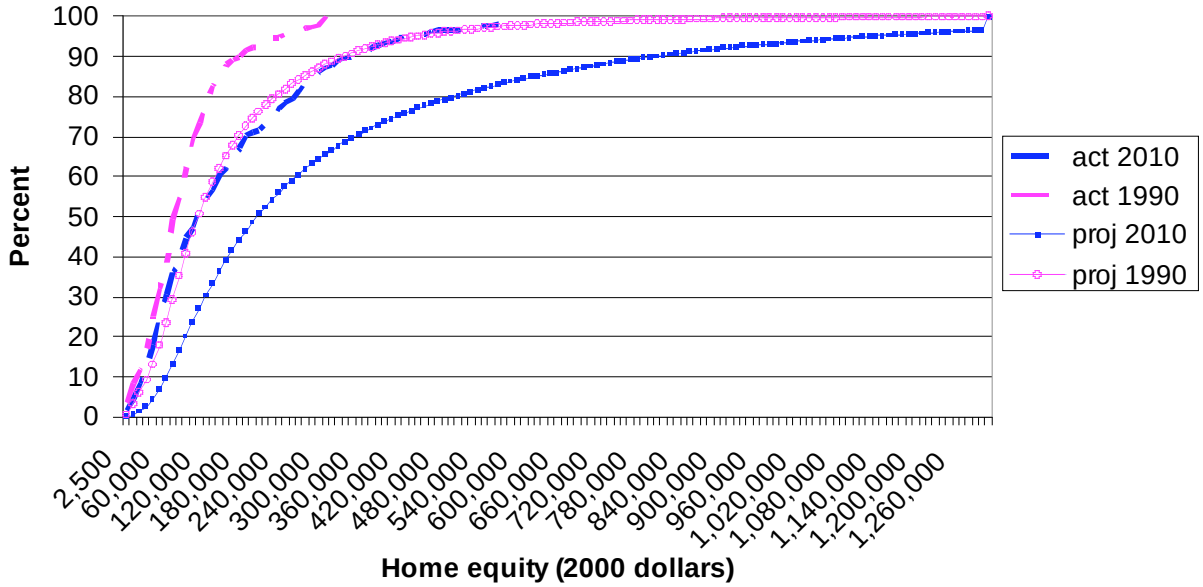
Our analysis is likely to understate the riskiness of home equity for individual households, because we assume that all houses appreciate or depreciate at the state-wide rate. In practice, households own individual houses and their experiences may differ from the state means. A similar point arises with regard to financial assets, where individuals hold specific and sometimes poorly-diversified portfolios but simulations impute market-wide returns.

We walk through the simulation procedure with the aid of several figures. The OFHEO home price index we use is shown in Figure 7-1 for the U.S. as a whole, together with two other indices. One is the National Association of Realtors (NAR) index, which corresponds very closely to the OFHEO index. The other is the Case-Shiller index. The Case-Shiller index shows much greater price fluctuations than the other two. It is a dollar-weighted index based on prices changes in twenty large metropolitan areas. The OFHEO index is nationally representative, but only includes "conforming" mortgages that are purchased by FannieMae or FreddieMac (currently less than $417,000). Because we use the OFHEO indices by state, the fluctuation in the actual values we use is much greater than the national OFHEO index. The national average year-to-year house price increase was 5.2 percent between 1980 and 2006. The standard deviation of the national price changes is 3.1. However, the standard deviation at the state level is more than twice as large, 6.3 percent. Moreover, the change in house prices at the national level was

positive in every year between 1980 and 2006, but at the state level double digit house price declines were common in the slumps of the early 1980's and the early 1990's.

The starting-point for our simulations is the actual distribution of the home equity of homeowners at age 59. We then simulate the cumulative distribution of home equity at age 79, twenty years after actual values of home equity were observed at age 59. Cumulative distributions of actual home equity at age 59 and projected home equity at age 79, for both the 1990 and 2010 cohorts, are shown in Figure 7-5. It is evident that home equity at age 59 was much larger for the R2010 cohort (households observed at age 59 in 2004) than for the R1990 cohort (households observed at age 59 in 1984). It is also apparent that the average simulated home equity at age 79 is much greater than actual home equity at age 59 for both the R1990 and the R2010 cohorts. In addition, projected equity at age 79 is much larger for the R2010 cohort than for the R1990 cohort—the mean for the 2010 cohort is $341,848 and for the 1990 cohort is $159,538.

Figure 7-5. Cumulative distribution of actual home equity at age 59 and projected home equity at age 79, 1990 and 2010 cohorts

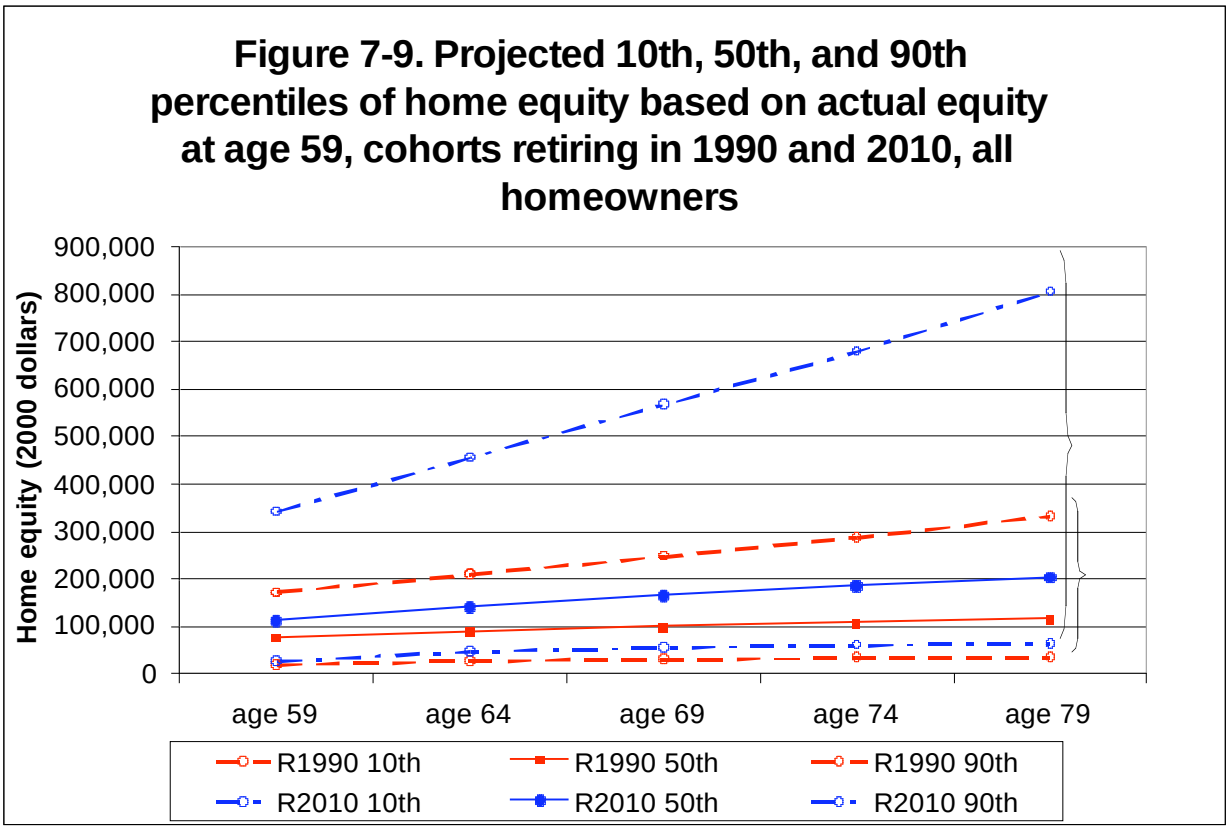


The increase of the simulated average over the actual average at age 59 arises because on average prices increased in each year over the 1976 to 2006 period, from which the random prices were drawn. These figures pertain to the distribution of home

equity across households for the two cohorts. Below we consider the distribution of the gains and loses of individual homeowners.

Although home equity at age 79 is simulated for the 1990 cohort, the actual distribution of home equity at age 79 is also observed for the 1990 cohort because members of this cohort were observed at age 59 in 1984 and at age 79 in 2004. The simulated distribution corresponds quite closely to the actual distribution. The 10^{th}, 50^{th}, and 90^{th} percentiles are $41,110, $118,763, and $319,746 respectively for the actual distribution and $36,929, $113,646, $333,610 for the simulated distribution. The mean of the actual distribution is $153,659 and for the simulated distribution is $159,538. Recall that the "historical" price changes were drawn from the period 1975 through 2006 and thus include most of the years over which the 1990 cohort aged from 59 to 79 (the years 1984 to 2004).

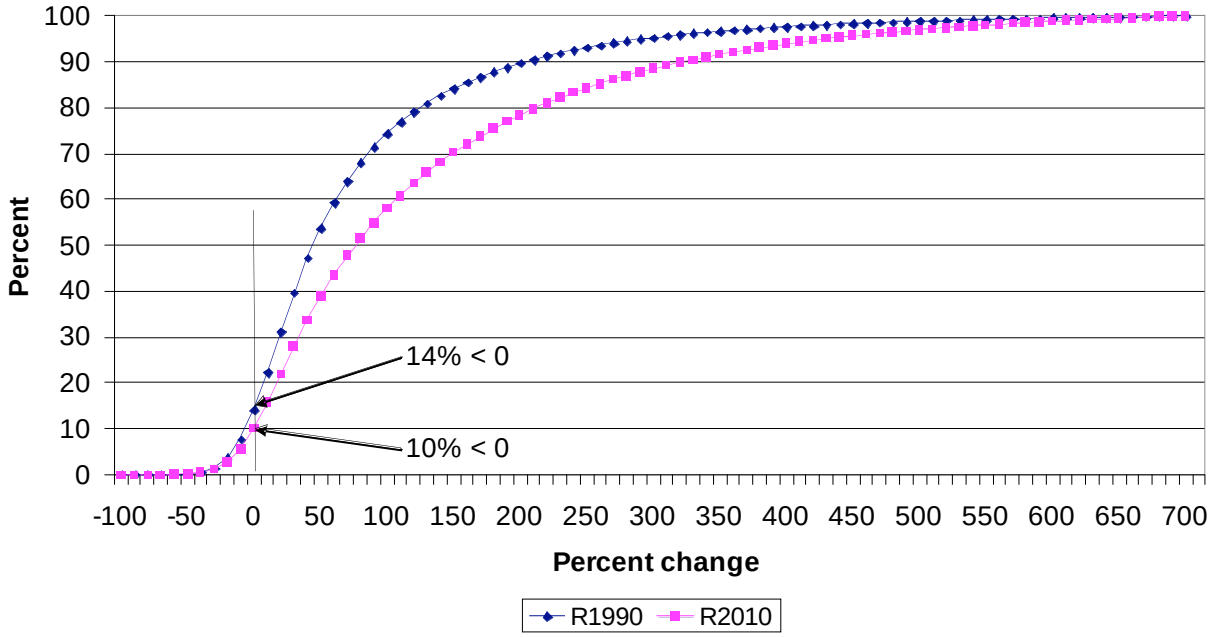
Given home equity at ages near retirement, we are interested in the extent of uncertainty about home equity at older ages when many homeowners will choose to use home equity to meet rainy day expenses. The uncertainty about future home values will increase with age. To illustrate the extent of the increase, we have simulated the distribution of home equity at five-year intervals, following actual observed home equity at age 59. The 10^{th}, 50^{th}, and 90^{th} percentiles of these simulated distributions are shown for all homeowners in Figure 7-9. Two features of the distributions stand out. The first is the large increase in the 90^{th} percentile for the 2010 cohort over the 90^{th} percentile for the 1990 cohort as the cohort ages. The second is the substantial overlap in the distributions for the two cohorts. For example, at all ages, including the distribution of actual values at age 59, the 10^{th} percentile for the 2010 cohort is well below the 50^{th} percentile of the 1990 cohort. And, the 90^{th} percentile of the 1990 cohort is well above the 50^{th} percentile for the 2010 cohort.



The illustrations discussed in this section suggest that on average households in both the R1990 and the R2010 cohorts will have more home equity at age 79 than they had when they approached retirement, at age 59. Nonetheless, although most households will have more equity at 79 than at 59, some household will have less. Recall that for our simulations, future home price changes are drawn from the historical distribution of price changes in that household's state. The state distributions include price decreases as well as price increases. Figure 7-12 shows the cumulative distribution of the percent changes in home equity over the 20 year projection period over all households in our sample. The figure illustrates that there is a noticeable probability that some households will experience a fall in home equity, even though home equity will increase substantially for most households, even under the assumptions underlying these simulations. For the 1990 cohort, home equity will decline between ages 59 and 79 for almost 14 percent of

households. For the 2010 cohort, equity will decline for about 10 percent of households.

Figure 7-12. Cumulative distribution of projected percent change in home equity between ages 59 and 79, cohorts attaining age 65 in 1990 and 2010



Of course, as recent turmoil in the housing market has made clear there can be substantial changes in average home values even in the short run. To address the potential implications of this "macro risk," we have obtained simulations for the R2010 cohort trying to incorporate recent changes in house values. To do this, we make two changes in the procedure described above. First we take house prices in 2008, when the R2010 cohort was age 63, as a base for simulation (instead of age 59). To establish the distribution of prices in 2008, we assume that between 2004 and 2006 home prices increased in each state according to the OFHEO index—an average increase of 12.96 percent in 2005 and 6.10 percent in 2006, at the national level. We further assume that home prices were flat in 2007 and fell 10 percent in 2008. (The outstanding mortgage balance is assumed to decline at the same rate described above.) Second, we add three home price changes to the sample of prices from which price changes were drawn for the simulations above—zero percent for 2007, minus10 percent for 2008, and minus 5 percent for 2009.

Figure 7-13 shows the percentiles of home prices at ages 59, 64, 69, 74, and 79 under these assumptions. The increase in median home prices between age 59 and 79 is about $66,000, compared to an increase of almost $91,000 based on the assumptions underlining Figure 7-9. At the 10th percentile the increase is about $30,000, compared to about $38,000 in Figure 7-9; at the 90th percentile the increase is about $330,000 compared to $463,000 in Figure 7-9.

Figure 7-14 shows that under these assumptions almost 19 percent of households experience a decline in home equity between ages 59 and 79, compared to about 10 percent under the prior assumptions, underlying the cumulative distributions for both cohorts in Figure 7-12. For comparison Figure 7-14 also shows the distribution for the R1990 cohort, which is the same as the distribution shown in Figure 7-12.

Figure 7-13. Projected 10th, 50th, and 90th percentiles of projected home equity for the R2010 cohort, based on actual equity at age 59 adjusted for changes in home prices between ages 59 and 63 (2004 and 2008), all households

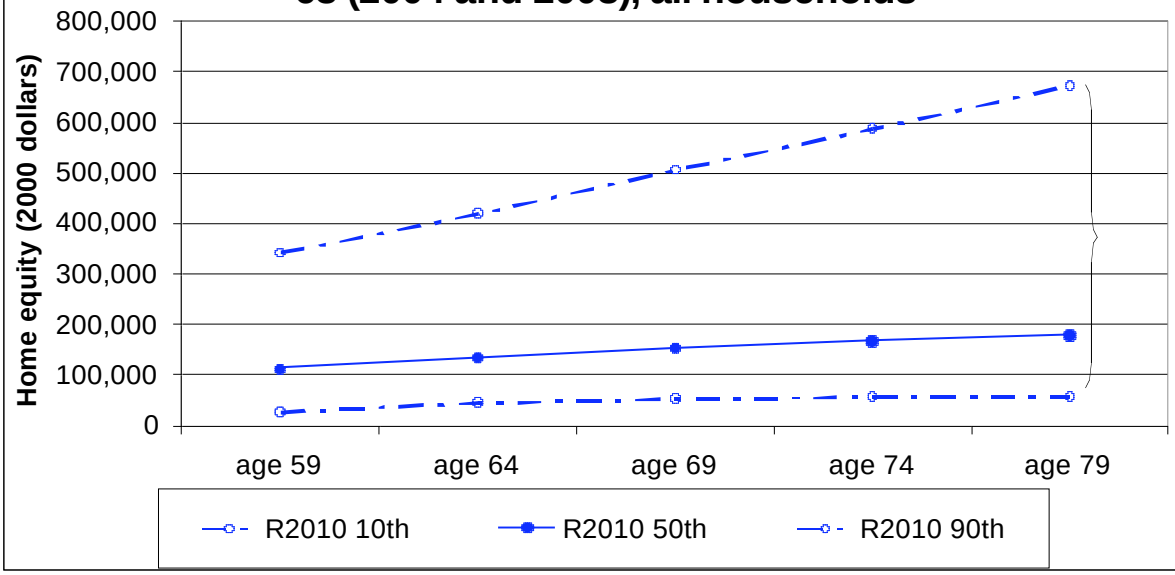
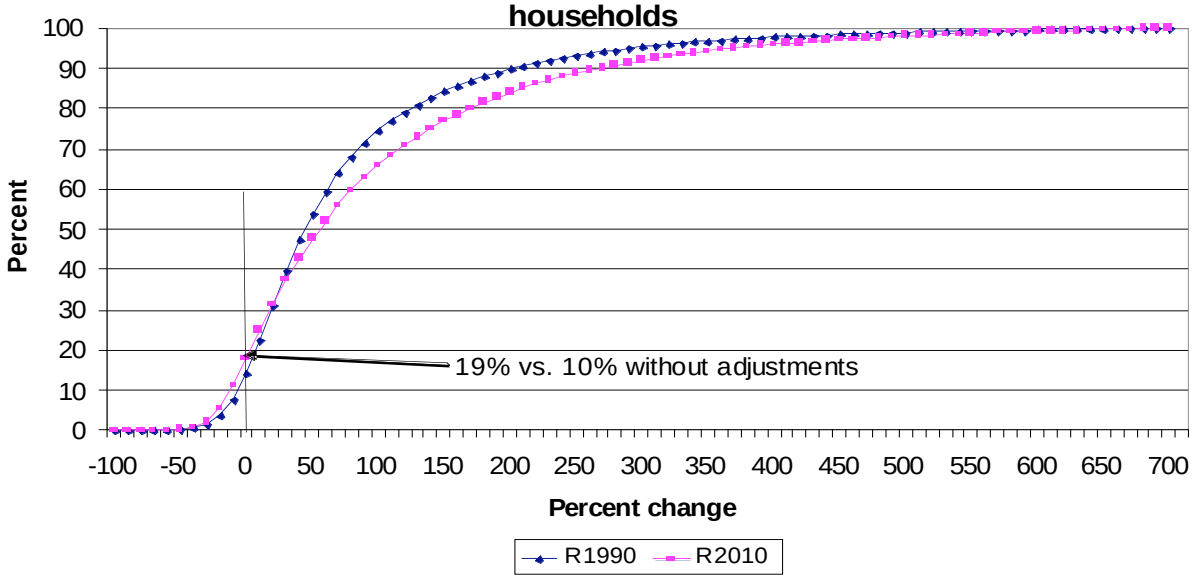


Figure 7-14. Cumulative distribution of percent change in home equity between 59 and 79 for the R1990 and R2010 cohorts, adjusted for changes in home prices between ages 59 and 63 (2004 and 2008) for the R2010 cohort, all households



8. Further Evidence on the Consistency of the Ratio of Home Equity to Wealth

The simulations in section 7 illustrate the how housing equity at older ages can fluctuate, given the home equity held by households approaching retirement. These simulations compare the distribution of home equity for two cohorts -- attaining age 59 in 1984 and 2004 -- a period over which home prices and home equity increased substantially. But what might the level of home equity at retirement be for cohorts that will retire 10 or 20 or 30 years from now. Are there any "what if" assumptions that could be used to speculate about future levels of home equity at retirement? The cross-section data in section 5 suggest that non-housing wealth and home equity are strongly related. In this section we consider additional data on the relationship between housing equity and wealth. We then present regression analyses to help to understand this regularity more fully.

Figure 8-1 shows the ratio of home equity to (non-pension) wealth by wealth quintile for owners for the years 1984 through 2004. The figure also shows the average of the ratio over all quintiles. Two features of the figure stand out. One is that the fluctuation over time in the average is determined almost entirely by the fluctuation in the

ratio for the fifth quintile. The households in the fifth wealth quintile hold the bulk of financial wealth. As stock wealth peaked in the late 1990s, the ratio of home equity to wealth declined. The second feature of the data is the quite modest fluctuation over time for households in the 2nd through 4th quintiles. The ratios for the first quintile show a large increase, with substantial fluctuation, beginning in the mid 1990s. The increase may be the result of the sub-prime mortgage explosion. The ratio is sensitive to non-pension wealth in the denominator and many households in this quintile have little or no wealth other than housing equity, which may explain the substantial fluctuation.

Figure 8-2 shows several percentiles of the distribution of real home equity. The 5th percentile was close to zero for all years between 1984 and 2004. The 50th percentile and the mean increased substantially over the period. The increase at the 95th percentile was especially large, over three-fold. The increase in home equity kept pace with the increase in wealth so that the ratio of equity to wealth showed little variation over the 1984 to 2004 period. This is true for the 5th the 50th and the 95th percentiles, as well as the mean, as shown in Figure 8-3. The percentiles in this figure, as well as the mean, are based on the average of ratios and are thus not dollar weighted. The average in Figure 8-1 on the other hand is based on the ratio of means and thus the trend is affected by aggregate dollar values.

Figure 8-1. Ratio of home equity to wealth, by wealth quintile--ratio of means

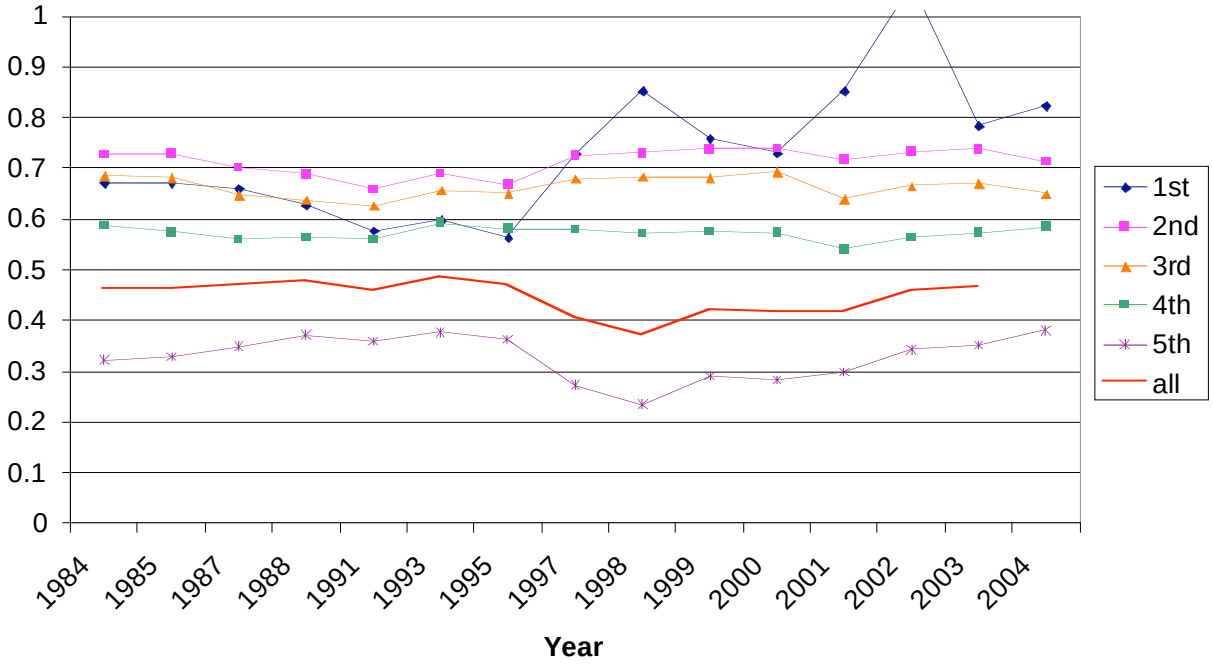


Figure 8-2. Percentiles of home equity by year--in 2000 dollars

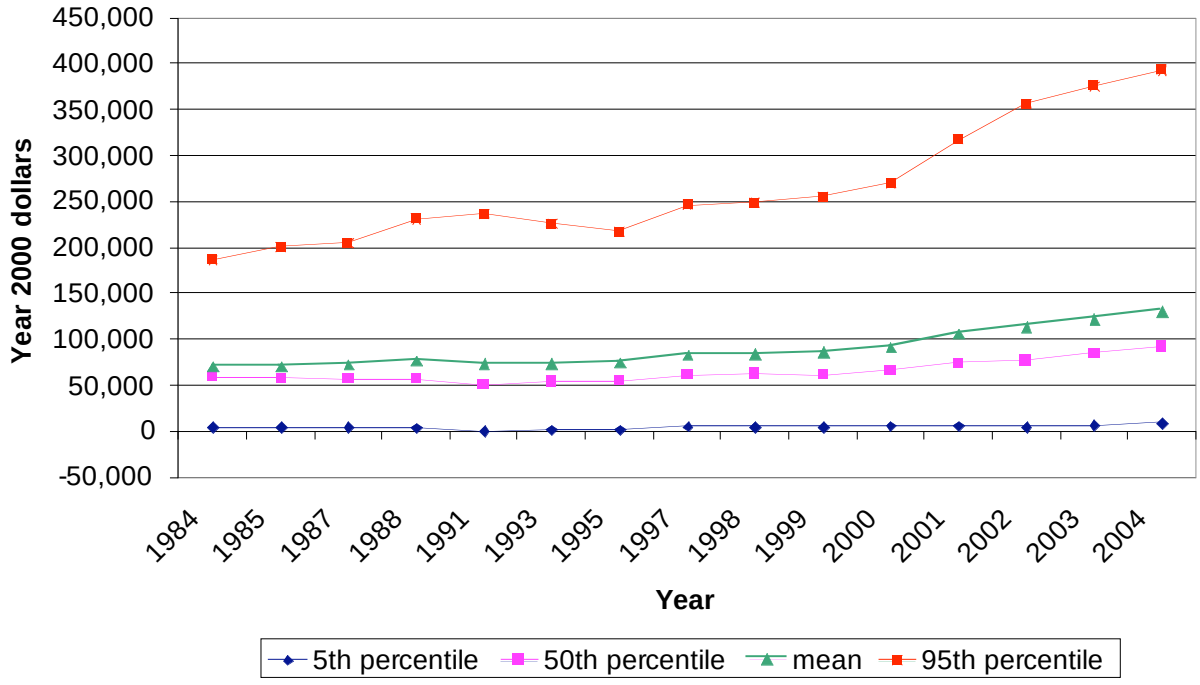
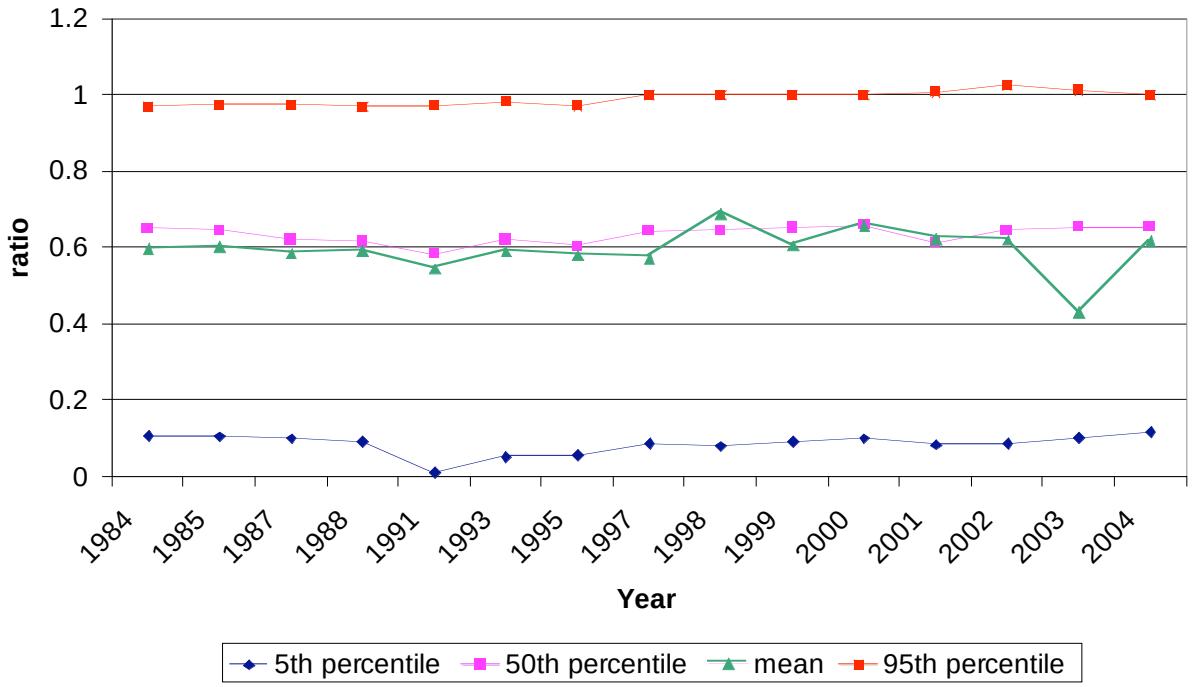


Figure 8-3. Percentiles of the ratio of home equity to wealth, by year (ratio of means)



To explore further whether forecasts of future non-housing wealth might be used to speculate about future trends in home equity, we present some simple regression summaries of the relationship. In large part, the regression analysis is used to formalize the relationships shown in the figures above. Suppose that there is on average some "desired" proportion of wealth in housing equity. At the household-level this desired proportion may vary by age, wealth, income or family status. We consider the proportion of wealth in home equity at a point in time. We recognize that the costs of changing houses and adjusting leverage after purchasing a home may create differences for some households between their observed home equity position and their desired position. The net difference, averaged over all households could be positive or negative. The disequilibrium may be especially large when there are abrupt changes in non-housing wealth or when there are house price shocks affecting a particular household. Households are likely to be more able to adjust housing equity than their housing stock, since they can refinance the mortgage on the existing home or take out a home equity loan on the existing house.

More formally, we analyze variation across households in the proportion of wealth that is in housing. We describe this relationship as having the form:

$$E_i = \left[f(X_i) \right] \cdot W_i + \varepsilon_i$$

where E_i is the housing equity of person i in year, W_i is total wealth of person i—housing equity plus other non-pension wealth—and X_i is a vector of personal attributes of person i. We begin with a simple ANOVA specification:

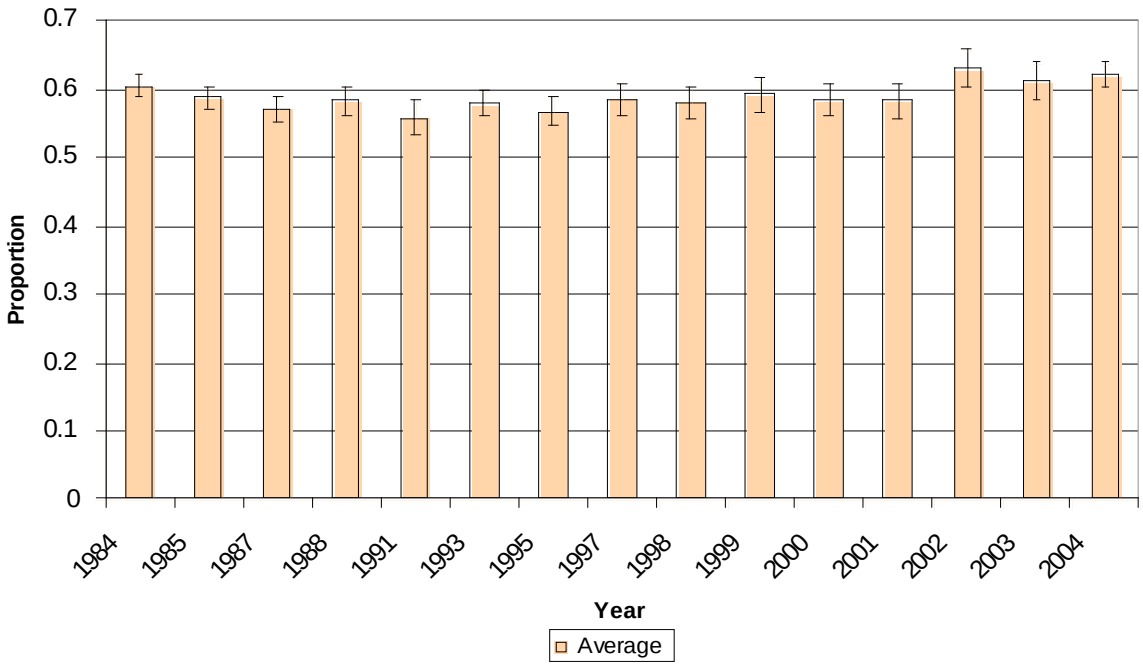
$$E_i = \left[c + age_{ai} + wealth_{wi} + income_{yi} + familytype_{fi} + \beta children \right] \cdot W_i + \varepsilon_i$$

where c is a constant term. There are age effects for each age from 24 to 84, wealth effects (indicated by wealth quintiles), income effects (indicated by income quintiles), family type effects (couple, single male, single female). and the number of children. The age, wealth, income, and family type effects are all normalized by setting the sum of each of the effects equal to zero. Thus the estimated effects should be interpreted as deviations from the estimated value of c, the mean of the proportion of wealth in home equity, over the whole sample.

We estimate this specification for each of the years between 1984 and 2004 for which the SIPP collected housing data. One might think that the mortgage rate (by state) should be included as a covariate in the regressions. We are interested, however, in the extent to which the home equity proportion of wealth adjusted to the increase in home values, whether due to the decline in mortgage rates or to other factors. For each year, 72 parameters are estimates. The comparative results for all years are shown in several figures.

The key result is in Figures 8-6, which shows the estimated overall average equity to wealth ratio in each year, as well as the 95 percent confidence interval for the estimate.

Figure 8-6. Estimated overall average equity proportion of wealth and 95% confidence interval, by year



The average is close to 0.60 in each year, which corresponds closely to the mean and 50th percentile shown in Figure 8-3. (The values in Figure 8-3 are ratios of means, however, whereas the estimates in Figure 8-5 reflect means of proportions, controlling for covariates.) Recall that over this period mortgage rates declined by almost 70 percent and real household non-housing-non-pension wealth increased by almost 75 percent. Both trends would suggest an increase in the demand for housing and presumably an increase in home values. Indeed average real home values almost doubled between 1984 and 2004. Yet, judging by the confidence intervals, the proportions of wealth in home equity over the 1984 to 2001 period were typically not significantly different one from the other. The estimates show an increase in the equity proportion of wealth after 2001, but the estimates for 2002 to 2004 are often not statistically different from the estimates for many of the preceding years. Thus it would seem that substantial active behavioral adjustments in home equity—through refinancing, home equity loans, and new purchases—were necessary to maintain a relatively constant proportion of wealth in home equity.

The regression estimates show that the proportion of wealth accounted for by home equity did not vary much over the 1984 to 2004 period, even though home values

and household wealth varied enormously over this period. Perhaps more important, after controlling for household wealth and household income, there are essentially no important cohort effects in the proportion of wealth allocated to home equity. Again, this is true even though home values and household wealth varied enormously over this period. Our results are in may ways complementary to the findings of Sinai and Souleles (2007) who emphasize the growth in household net worth over the 1983 to 2004 period, using data from the Survey of Consumer Finances (SCF). They find that younger elderly increased their housing debt to offset some of the rise in house values and invested some of the proceeds from the debt in other assets. This finding is consistent with our finding of a rather constant ratio of home equity to non-pension assets—after controlling for covariates—over this period. Sinai and Souleles also emphasize that net worth increased more than home equity, which is not inconsistent with a constant ratio of home equity to non-pension assets that we emphasize. And, while we emphasize the uncertain home equity that will be available to retirees as they age, Sinai and Souleles emphasize the proportion of housing equity that older households can actually tap through reverse mortgages, and is thus available to finance consumption at older ages.

A key question, then, is whether projections about household wealth in the future might be used to make informed judgments about future values of home equity. In several other papers we have made projections of pension wealth though 2040. These projections show very large increases in 401(k) assets are retirement. But for a large fraction of households, home equity comprises a large proportion of non-pension wealth. And this wealth seems in large part preserved for use in the event of shocks to family status such as the death of a spouse or entry into a nursing home. Thus to present a more complete picture of the assets of future retirees it is necessary to make informed judgments about future home equity. Perhaps the consistency of the ratio of equity to wealth may help. The current turmoil in the housing market and the potential for further declines in home values, however, raises the question: will the ratio of equity to wealth continue to persist over the next five of six years. If so, this would give further support for projections based on assumptions about household wealth.

9. Summary and Future Work

Housing equity accounts for a large share of the non-pension assets for a large fraction of retirees. We considered first how home ownership, housing equity and housing value have changed in recent decades and, in particular, how home equity of households approaching retirement age has changed. We find that the age profile of home ownership rates has been stable over the past two decades. This suggests that the prediction of the effect of demographic trends on the *number* of owned homes can be made with some confidence. On the other hand, there have been very large increases in the *value* of owned homes and home equity over the past two or three decades. Thus attempts to forecast the future value of homes based on the past age profile of home values can easily miss the mark.

We examined cohort data on home value, mortgage debt, and home equity for cohorts attaining age 65 between the late 1970s and 2040. We used simulation methods to illustrate the potential effect of changes in home prices on the home equity of households as they age. Our interest is in the home equity available to households when they experience a health or other shock to family status, and would like to tap into their home equity. Even though recent retirees have more mortgage debt than past retirees, they are also likely to have more home equity at older ages than past retirees had. We emphasize that although on average the home equity of households is likely to increase as they age, for the cohorts reaching retirement age in 1990 and 2010, a noticeable proportion of households will have less home equity at older ages than they did when they retired (in real terms). Our results are based on a simulation methodology that use the historical distribution of state-level house price changes to project changes in house prices in the future. There is, of course, the possibility that the U.S. will experience future price changes outside of the historical range. Bordo (2005) shows that the past record of house prices in the U.S. is unusually stable when compared to other major developed countries and that a future price change outside of the recent historical range has occurred frequently in other countries.

Finally, we considered the correlation between home equity and total non-pension wealth in both cross-sectional and cohort data. We find that the ratio of home equity to non-pension wealth has been remarkably stable over time. We pursued analysis of this relationship using more formal regression analysis to control for other household

attributes. Over the years between 1984 and 2004, we find very little change in the average proportion of household wealth allocated to home equity. In addition, we find very small differences in the ratio of equity to wealth among cohorts attaining retirement age as early as the late 1960s and as late as 2040. One interpretation of these two facts is that the increase in household wealth over the period led to an increase in the dollar value of resources allocated to housing and this wealth-induced demand offset the declining rate of increase of the demand for new homes that was associated with demographic change and that might otherwise have led to a decline in home values and thus in housing equity. This empirical regularity leads us to consider whether projections of the home equity of future retirees might be based on forecasts of the wealth of future households.

The analysis in this paper raises several questions for future work. In related work, we dealt with the accumulation of 401(k)-like assets through 2040. We concluded that that the accumulated pension wealth of persons age 65 in 2040 would likely be much larger than the pension wealth of persons retiring now. We also concluded that that aggregate pension assets in the economy would increase several fold between now and 2040. Given the accumulation of these retirement assets, how might the build-up of home equity and mortgage debt affect overall financial well-being of future retirees? We will want also to address this question, recognizing the negative correlation between price movement in housing on the one hand and stock and bond returns on the other hand.

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